THE REPUBLIC OF THE SUDAN
MINISTRY OF ENVIRONMENT, FORESTRY
AND PHYSICAL DEVELOPMENT

PREPARATORY SURVEY
ON
THE PROJECT
FOR
IMPROVEMENT OF SOLID WASTE MANAGEMENT
IN KHARTOUM STATE
IN THE REPUBLIC OF THE SUDAN

FINAL REPORT

FEBRUARY 2014

JAPAN INTERNATIONAL COOPERATION AGENCY

YACHIYO ENGINEERING CO., LTD.

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SUMMARY

Summary

1. Outline of the Recipient Country

The Republic of the Sudan (hereinafter referred to as "Sudan") has a national land area of 1,880,000km^2 (approximately five times that of Japan), the greater part of which is occupied by a broad plain traversed by the Nile River and its branches at its center.

The central region, including Khartoum State, has a dry season and a rainy season. During the rainy season, there is considerable rainfall. In particular, the Gezira area east of the White Nile is a fertile agricultural zone. In Khartoum State, the temperature is over 30°C on average from April to October with a mild climate, but sometimes, it is very hot and records over 40°C. The yearly average rainfall of Khartoum State is less than 150mm, and the highest rainfall is 60mm in August.

According to the Sudan Central Bureau of Statistics, the population of the country in 2012 was 35,060,000 people, and the population of Khartoum State in 2012 was 6,270,000 people. The major industries in Sudan are mining, agriculture, forestry, farming and fishery. The estimated GDP in 2012 was 51.5 billion US dollars. IMF estimation shows the economic growth rate in 2012 was -4.4% and the inflation ratioiwas 28.6%. The major export products are gold, livestock, sesames, raw cottons, Arabic rubber and petroleum products. These products are mainly exported to Chine, Japan, India and Indonesia (2010). After the independency of the Republic of South Sudan, the export of petroleum products decreased by approximately 75%, and consequently the national income decreased by 12 billion SDG (around 9% of the GDP). The export income decreased by around 6.4 billion US dollar (around 13% of the GDP) and the foreign exchange reserves decreased by around 0.5 billion US dollar. Under such severe financial circumstance, the government of Sudan started to implement three-year fiscal austerity plan including currency devaluation (as 66% of SDG), increase of major taxes, reduction of subsidy for petroleum products, and reduction of national expenditure from June 2012. As for the economic activities, most of the Khartoum State people work for private companies and government agencies. There are, however, some farmers of vegetables and fruits in rural areas, and people living along the river work for fishery, ceramic and other industries related to the river.

2. Background and Outline of the Project

According to the population growth in urban areas, around 5,000 ton of waste is generated in a day in Khartoum State, where the capital city of Sudan, Khartoum, is located. Under the supervision of the Supervisory Authority for Cleaning in Khartoum State (hereinafter referred to as "SACKS"), Locality Cleaning Affiliate (hereinafter referred to as "LCA") in each Locality collects and transfers wastes. Khartoum State has seven localities and 301 units of waste collection vehicles in total. However, these vehicles are not enough to collect the generated waste. The collection rate to the generation amount is only 65% (collection amount: 3,200 ton/day). In most of the areas without the collection service, scattered wastes left in residential areas have led to emission of foul odor, creation of harmful insects, and deterioration of hygine environment. In Khartoum State, there are three landfill sites, which SACKS operates, and wastes are received and disposed for twenty-four hours. However, the disposed wastes are not covered with soil because of the lack of equipment. Therefore, wastes are scattered and burnt in the surrounding areas.

Khartoum State has Environmental Protection Law 2008 issued by the Khartoum State Ministry which regulates the waste management at the state level, and Master Plan for waste management prepared in 2013 (hereinafter referred to as "M/P"). One of the targets of this M/P is to raise the collection rate up to 90% by 2028.

3. Results of Study and Project Contents

Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a Team for two field surveys: the first from 14th June to 6th July, 2013 and the second from 4th October to 29th August 2013. In these surveys, the JICA Survey Team confirmed the request contents for the Project, selected the equipment, and implemented the site survey. After that, the JICA Survey Team analyzed the field survey results, and prepared the draft outline design including estimation of the Project cost. This outline design was summarized in the "draft final report", and JICA sent the Team in Sudan to explain and discuss the contents of the draft

final report from 9th to 20th December, 2013.

Based on the above survey and discussions results, the main components of the Project were decided to be procurement of equipment for waste collection and for landfill management, and construction of Central Workshop to maintain the equipment for waste collection as shown in Table 1. The Project aims to develop the capacity for waste collection and disposal, and to improve the hygiene environment.

Table 1 Component of the Project

Item				Amount
Equipment Procurement	For Waste Collection	Compactor	To collect and transport household and market wastes	40 units
		Container Carrier Arm Type (including containers)	To collect and transport mainly market wastes	40 units
		Containers for waste collection		40 nos
	For Landfill Management	Bulldozer	To utilize in the landfill for leveling, compacting, and soil covering	3 units
		Excavator	To obtain covering soils	2 units
		Water Tanker	To transport water for offices and waste pickers in the landfills	1 unit
	For Vehicle Maintenance in Central Workshop		To utilize in Central Workshop constructed by the Project	1 set
	For Vehicle Maintenance in Locality Workshop		To utilize in the existing workshops in localities	1 set
Construction of Central Workshop			To maintain the collection vehicles procured by the Project	1 set
Soft Component			To support the management of Central Workshop and the maintenance of vehicles	1 set

Table 2 shows the breakdown of waste collection vehicles for each Locality.

Table 2 Breakdown of Waste Collection Vehicles for Each Locality

Locality / Equipment	Khartoum	Bahri	Jabal Aulia	Karary	Omdurm	Sharg En Nile	Um Badda	Total
Compactor	11	10	3	2	5	7	2	40
Container Carrier Arm Type (including containers)	12	9	3	2	4	7	3	40
Total	23	19	6	4	9	14	5	80

The Central Workshop is the two-storied building. In the first floor, five working bays are set for periodical inspection, maintenance and repair of eighty vehicles. Office and other space are in the second floor. The Soft Component consists of two plans: (1) to develop the management capacity for the Central Workshop and (2) to develop the maintenance capacity for vehicles.

Figure 1 Image of Central Workshop

4. Implementation Schedule and Major Undertakings to be taken by the Sudanese Side

According the Japanese Grant Aid guideline, the Project takes 17.5 months from Detailed Design to handing over. This period includes 5.5 months for Detailed Design, Tender and Contracts with Contractors, and 12.0 months for equipment procurement and facility construction. The major undertakings to be taken by the Sudanese side are construction of fence and gate at Central Workshop, necessary bank fees, etc.

5. Project Evaluation

(1) Relevance

1) Beneficiaries

The direct beneficiaries of the Project will be 6.27 million people living in Khartoum State (Khartoum Locality: 0.76 million people, Bahri Locality: 0.72 million people, Jabal Aulia Locality: 1.12 million people, Karary Locality: 0.85 million people, Omdurman Locality: 0.61 million people, Sharg En Nile Locality: 1.03 million people, and Um Badda Locality: 1.18 million people).

2) Urgency

In Khartoum State, which has the capital city of Sudan, population is increasing by the rapid urban development, and by incoming of refugee. Consequently, the waste generation is increasing, but they are not being collected and deposed appropriately. This is deteriorating the living environment in Khartoum State. Khartoum State should collect and dispose wastes with the limited number of equipment because there is not any national subsidy system, or other donor's supports. The collection rate to the generation is only 65%, and some areas are not provided with the collection service at all. In most cases, low-income people live in these areas without the collection service. Therefore, the urgent improvement by the Project is required.

3) Contribution to the mid and long term development plans in Sudan

Khartoum State has M/P for waste management, which was prepared in 2013, and plans to procure equipment and construct facility for waste management to optimize collection and transportation, to promote reduction of waste generation, to maintain the sanitary working environment, and so on. One of the targets of this M/P is to raise the collection rate up to 90% by 2028.

The Project targets the improvement the waste collection and disposal capacity of Khartoum State by procurement of collection vehicles, heavy equipment for landfill, and by construction of the Central Workshop. Therefore, this Project contributes to realize the M/P mentioned above.

4) Consistency with Japan's assistance plan

According to the Japan's country assistance policy for Sudan (December, 2012), the priority areas of

assistance (Sub Goals) were (1) Consolidation of Peace, (2) Support of Basic Human Needs (hereinafter referred to as "BHN"), and (3) Agricultural Development. Waste management was categorized in (2) BHN. And the policy indicated that "Japan's continuous assistance to health care and water and sanitation sectors will contribute to the achievement of Millennium Development Goals in Sudan". Therefore, the Project follows the Japan's assistance plan.

(2) Effectiveness

1) Quantitative effects

Table 3 shows the indicators, reference values and target values of quantitative effects of the Project.

Table 3 Quantitative Effects of the Project

Indicator	Baseline (2013)	Target (2016)
Sum of collection amounts by each LCA	3,200 ton/day	4,601 ton/day
Collection rate in Khartoum State	65%	80%

Note:
Collection Rate = Collection amount / Generation amount
Generation amount in 2012 = 4,890 ton
Estimation of generation amount in 2016 = 5,752 ton

2) Qualitative effects

The expected qualitative effects of the Project are as shown in Table 4 below.

Table 4 Expected Qualitative Effects

Expansion of collection areas and improvement of living environment	It is expected that the collection service will expand into the areas without the collection service and the frequency of collection will increase. Consequently, the living environment will be improved by reduction of the scattered wastes around the cities and the negative effects by the uncollected wastes, such as odors and harmful insects.
Upgrade of final disposal work and improvement of surrounding environment	It will be possible to change the existing landfills, which are almost open dumping sites, into the controlled dumping sites. The detailed disposal plan can be prepared, and the appropriate final disposal will be realized according to the plan. Finally, the capacity of landfills will increase and the illegal dumping around the landfills will decrease. Also the working environment of landfill workers and sanitary situation of waste pickers will be improved by the periodical water supply by the water tanker procured in the Project.
Optimization of O&M for collection vehicles	At present, the collection vehicles are maintained only after the troubles happen. Construction and operation of Central Workshop will make the periodical preventive maintenance possible. Therefore, it is expected that the Sudanese side can prepare the detailed O&M plan and implement effective O&M for collection vehicles.

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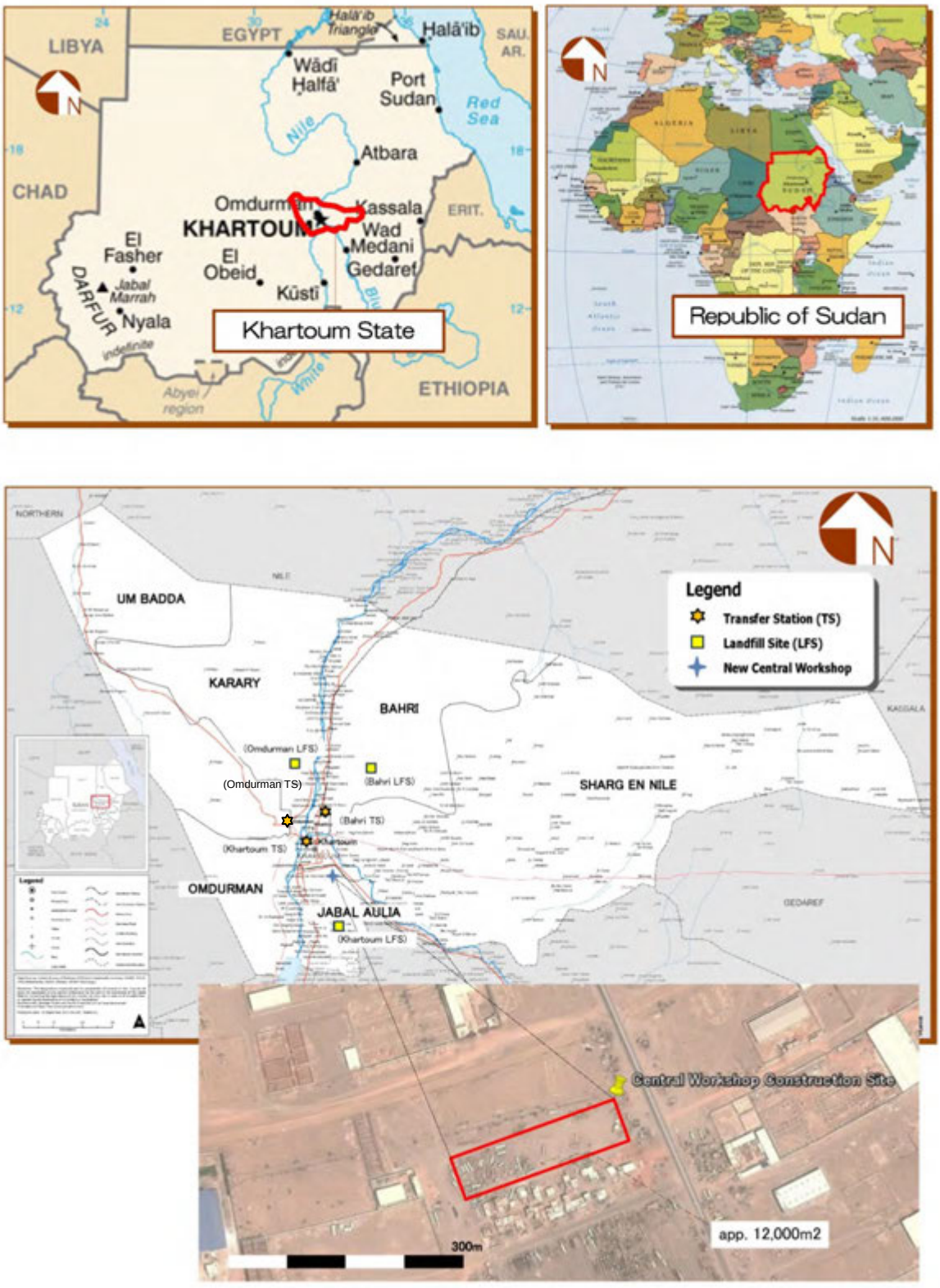

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Abbreviation

BLCA	Bahri Locality Cleaning Affiliate
E/N	Exchange of Notes
GDS	the Government of Sudan
GOJ	the Government of Japan
HP	Horse Power
JPY	Japanese Yen
JICA	Japan International Cooperation Agency
JLCA	Jabal Aulia Locality Cleaning Affiliate
KLCA	Karary Locality Cleaning Affiliate
KHLCA	Khartoum Locality Cleaning Affiliate
LCA	Locality Cleaning Affiliate
M/D	Minutes of Discussion
MEFPD	Ministry of Environment, Forestry and Physical Development
M/P	Master Plan
OLCA	Omdurm Locality Cleaning Affiliate
SACKS	Supervisory Authority for Cleaning in Khartoum State
SLCA	Sharg En Nile Locality Cleaning Affiliate
ULCA	Um Badda Locality Cleaning Affiliate

CHAPTER 1

BASIC CONCEPT OF THE PROJECT

Chapter 1 Basic Concept of the Project

1-1 Background

In the Republic of the Sudan (hereinafter referred to as “Sudan”), the urban development has proceeded rapidly and population has increased along with the recent economic growth. Consequently, Khartoum State, which has the capital city of Sudan, has faced a serious situation of environment, hygiene and safety deterioration. Sudan revised Environmental Protection Act with support from UNEP; however, there are not any legalized documents on water and air pollution protection and waste management. The Ministry of Environment, Forestry and Physical Development (hereinafter referred to as “MEFPD”) has tried to legalize these documents although they have not had enough budgets.

Khartoum State has a land area of 20,000km^2, and its population is 6,270,000 people. The daily waste generation in Khartoum State is about 5,000 ton. Under the supervision of MEFPD, the Supervisory Authority for Cleaning in Khartoum State (hereinafter referred to as “SACKS”) and the Local Cleaning Affiliate (hereinafter referred to as “LCA”) in each Locality implement waste management together. The collected wastes are transferred to three landfill sites through three transfer stations in Khartoum State. SACKS and LCAs collect and transport wastes with old vehicles and equipment because of the poor financial situation of Khartoum State and the lack of any waste management subsidy from the Government of Sudan (hereinafter referred to as “GOS”). Therefore, the collection rate is only 65%. And the areas where low-income people live do not have the waste collection service. The total area of three landfill sites is 1,000 ha and wasts are transferred to these landfills for 24 hours. However, the disposed wastes are not covered with soil at all landfills because of the lack of heavy equipment.

Under such circumstances, Japan International Cooperation Agency (hereinafter referred to as “JICA”) dispatched an environmental management advisor to Sudan between fiscal 2010 and fiscal 2013 in order to support for multiple capacity development in the waste management field. This advisor supported the pilot projects on waste collection and final disposal implemented by the Sudanese side. The pilot project on waste collection was implemented in 10 areas in Khartoum State. In the final disposal pilot projects, administration buildings were constructed in two landfill sites. Moreover, the advisor instructed the management of receiving collection vehicles and of landfilling. With the support of the advisor, MEFPD and SACKS prepared Master Plan for waste management in 2013 (hereinafter referred to as “M/P”) in order to solve the Khartoum State waste management issues comprehensively by 2028.

As a result of the advisor’s activities, GOS submitted another request for grant aid assistance to the Government of Japan (hereinafter referred to as “GOJ”) for the procurement of equipment and construction of facilities to improve the waste management system. Based on this request, GOJ decided to implement the Preparatory Survey for Outline Design of this Project and dispatched a team (hereinafter referred to as “JICA Survey Team”). In this Survey, JICA Survey Team confirmed the background, purpose and the contents of the request, and examined the necessity, effects, technical and financial relevance of the Project. And JICA Survey Team prepared the outline design and cost estimation based on the necessary contents and scale of the Project.

Table 1-1 shows the original component requested by GOS.

Table 1-1 Original Component Requested by GOS

	Item	Quantity
1	Construction of a workshop	1 set
2	Vehicles for waste collection with containers	100 sets
3	Heavy equipment for landfill management	To be decided
4	Spare parts	To be decided
5	Equipment for maintenance	To be decided
6	Training of the community and government members for operation and maintenance	To be decided

1-2 Natural Conditions

1-2-1 Location of Project Site

The construction site of the Central Workshop planned under this Project is located in the Soba area of the newly-developed large-scale industrial zone located 20km southeast of the center of Khartoum.

1-2-2 Topographic and Geologic Features

Sudan has a national land area of 1.88 million square kilometers (1,880,000km^2 – approx. 5 times that of Japan), the greater part of which is occupied by a broad plain traversed by the Nile River and its branches at its center. Sudan had the largest national land area in the African Continent before the independence of the Republic of South Sudan in July 2011. At present, the country has the third largest area in the African Continent after the People's Democratic Republic of Algeria and the Democratic Republic of the Congo.

Khartoum is located on flat land south of the confluence of the White Nile and the Blue Nile, with an elevation of 380m. According to the topographic/geological surveys of the Central Workshop construction site, the site is located at a height of 385m, and the terrain consists of very hard cohesive soil and fine-grained silt soil.

1-2-3 Climatic Conditions

(1) Outline of Sudan

The Nubian Desert lies in the northern region of Sudan with a dry desert climate and the Sahel zone lies in the southern region with a steppe climate. In the central region, it is dry in the dry season, but there is considerable rainfall in the rainy season. In particular, the Gezira area east of the White Nile is a fertile agricultural zone. Kordofan in the south and Darfur in the west are similar in that farming is conducted in the rainy season and stock-raising thrives in the pastures in the broad grassland with abundant rainfall. There are several isolated mountain ranges such as the Marrah Mountains in the Darfur area in the west and the Nuba Mountains in central Sudan. The highest point is Deriba Caldera (3,042m) in the Marrah Mountains. Rainfall is greater in the southern areas with a steppe climate. The deserts in the north and the coastal areas on the Red Sea are searingly hot lands with a daytime temperature of over 40°C all the year round.

(2) Temperature

Khartoum State temperature is over 30°C on average from April to October with a mild climate, but sometimes, it is very hot and records over 40°C.

Table 1-2 Temperature in Khartoum State

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
High Temperature (°C)	27	29	32	37	38	37	35	34	36	36	32	28	33
Low Temperature (°C)	19	21	24	28	31	31	29	28	30	29	25	20	26
Average Temperature (°C)	23	25	28	32	34	34	32	31	32	32	28	25	30

Source: Weatherbase

(3) Humidity

Khartoum State humidity is low in the daytime and in the evening, and it is very dry.

Table 1-3 Humidity in Khartoum State

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
Morning Humidity (%)	34	27	22	21	27	36	54	60	56	36	33	37	37
Evening Humidity (%)	19	15	12	11	15	16	25	33	27	20	20	22	20

Source: Weatherbase

(4) Rainfall

Khartoum State rainfall is recorded from July to September. The highest rainfall is 60mm and occurs in

August. The yearly average rainfall is less than 150mm, which is little.

Table 1-4 Rainfall in Khartoum State

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly Average Rainfall (mm)	–	–	–	–	–	–	40	60	20	–	–	–
Yearly Average Rainfall (mm)	150											

Source: Weatherbase

(5) Wind Velocity

The yearly average wind velocity in Khartoum State is 14km/h (3.9m/s) and the highest average wind velocity is 17km/h (4.7m/s) and recorded in July, and the lowest average wind velocity is 12km/h (3.3m/s) and recorded in May, September, October and December. The wind velocity is almost constant all the year.

Table 1-5 Wind Velocity in Khartoum State

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
Average Wind Velocity (km/h)	14	14	16	14	12	16	17	16	12	12	14	12	14

Source: Weatherbase

(6) Earthquakes

No official record of large earthquakes has been found in Sudan. In 1913, an earthquake occurred in the suburbs of Asmara of Eritrea, a neighboring country, and it was felt in Kassala, Sudan, but there is no detailed record.

(7) Floods

Khartoum State is located at the confluence of the White Nile and the Blue Nile. The Nile flooded because of seasonal heavy rains in August 2007 and September 2009, causing a disaster in which several hundred houses were washed away.

In August 2013 during the period of the Preparatory Survey of this Project, the northern area of Khartoum was struck by heavy rain accompanied by strong winds and thunder. 5,000 houses were damaged and 150,000 people were affected, including 36 deaths. Modern buildings in the city of Khartoum were also inundated.

1-3 Environmental and Social Considerations

1-3-1 Outline of the Project Components Having Environmental and Social Impacts

Among the Project components, the construction of the Central Workshop shall be the component to be examined. The related issues that shall be examined were land procurement, the access road for construction and the temporal storage area.

1-3-2 Environmental and Social Baseline Situation

The site for the Central Workshop is in the industrial area of the southern part of Khartoum Locality in Khartoum State. The state government owns this area and developed as an industrial area. Therefore, there are not any housings (legal or illegal) or protected natural environmental areas around this site.

1-3-3 System and Organization for Environmental and Social Considerations in Sudan

(1) Laws and Standards related to Environmental and Social Considerations

As the National Plan for Environment, Sudan and Republic of South Sudan jointly prepared the “National Plan for Environmental Management in Post-Conflict Sudan” supported mainly by UNEP. However, this plan was not finalized yet (as of February 2014).

Laws related to the Environmental and Social Considerations are shown in Table 1-6. The Environmental

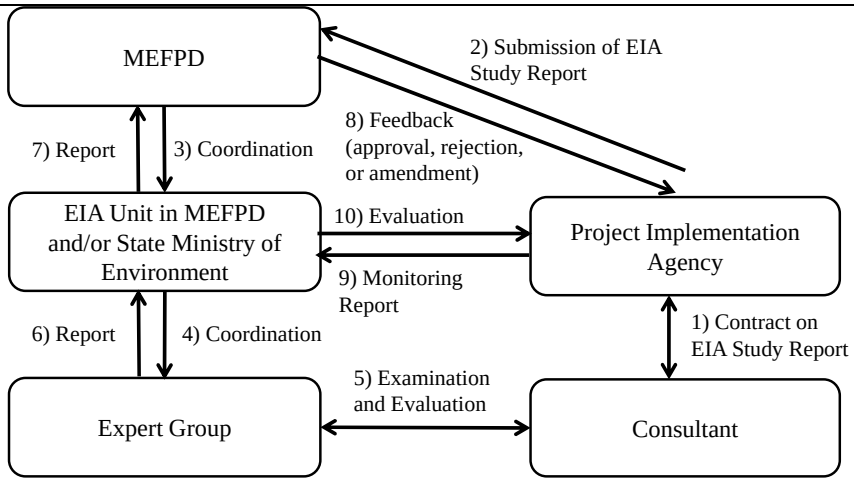
Protection Law 2008 by the Khartoum State Ministry which is based on the national law "Environmental Protection Act 2001" (hereinafter referred to as "EPA2001") regulates the EIA. All projects need the approval of the EIA. Also, Environmental Health Act 2009 indicates that all public and/or private implementation agencies of industrial, agricultural and other projects should survey the impacts on environment and human health, and can start the projects only after the examination of the survey results by the governmental and related agencies. Therefore, the EIA approval is necessary, according to the Sudanese law, to construct the Central Workshop.

Table 1-6 Laws related to Environmental and Social Considerations

Laws	Outline
Environmental Protection Act 2001	This law is the principles for environmental protection and appropriate use of natural resources. It regulates the establishment of the national committee for environmental authority. EIA examination is obligatory for all projects. This law carries penalties for violators.
Public Health Act 2008 (PHA) (revision of PHA 1975)	This law regulates the establishment of the national committee in the Ministry of Health, which has a responsibility to overall policies and plans related to environment and sanitation.
Environmental Health Act 2008 (EHA) (revision of EHA 1975)	This law regulates the establishment of the environmental committee for environmental and sanitary protection at the national level. Its purpose is, especially, to prevent air, water and soil pollution. This law established Environmental Health Committee (hereinafter referred to as "EEC") at the national and state levels. The state EEC has a responsibility to report the national EEC.
Industrial Waste Local Order for Khartoum North 1971	This law provides the qualitative regulations and conditions for the disposal of industrial wastes to the central sewerage treatment plant and others. It carries penalties for violators.
Environmental Protection Law 2008 by Khartoum State Ministry	This law is for the environmental protection at the state level. It is applied to implement the solid waste management at the state level.

Source: prepared by JICA Survey Team based on each law and the results of hearing to MEFPD

Figure 1-1 shows the procedure for EIA approval based on EPA 2001.



EIA application procedure:

1) An implementation agency of a project hires a consultant and prepare EIA Study Report which includes the following item:

- Description of the existing environmental conditions as a baseline.
- Description of the project.
- Assessment of potential environmental impacts, both positive and negative, throughout the project phases.
- Provision of recommendations to mitigate the negative environmental effects.

2) The implementation agency submits EIA Study Report to MEFPD.

3), 4) EIA Unit in Department of Environmental Affairs of MEFPD organizes the Expert Group. If necessary, EIA Unit cooperates with the state ministry of environment (In case of Khartoum state, the sub department of environmental assessment and licensing is in charge of it).

5) Expert Group discusses with the consultant directly and evaluates EIA Study Report.

6), 7), 8) Based on the evaluation results, MEFPD provides the feedback, which is approval, rejection or amendment, to the Project implementation agency.

9), 10) The implementation agency submits the monitoring report to EIA Unit, and EIA Unit evaluates it.

Source: prepared by JICA Survey Team based on EPA 2001 and the results of hearing to MEFPD

Figure 1-1 Procedure for EIA Approval

The process, from submission to feedback, takes two months at maximum as indicated in the figure (from step 2 to 8). There are not any categorizations, such as a categorization by the project scale. The grade of examination and evaluation varies according to the EIA report. EPA 2001 does not require information disclosure and stakeholder meetings. This Project needs the EIA approval for the construction of the Central Workshop. SACKS will hire a consultant, prepare the EIA report and obtain the EIA approval from the MEFPD by April 2014. Although EPA 2001 does not require information disclosure and stakeholder meetings, SACKS will plan to do them if necessary. It is also mentioned in the Environmental Checklist submitted by SACKS.

(2) Related Agencies

The implementation agency of this Project is SACKS; therefore, SACKS will submit EIA Report to MEFPD which will evaluate it. SACKS has a lot of experiences in land acquisition; however, their experiences in EIA is limited. As a result of discussions among MEFPD, SACKS and JICA Survey Team, SACKS will prepare the EIA report with the support of MEFPD if necessary.

1-3-4 Examination of Alternatives

The following 4 options were examined as alternatives for the construction of the Central Workshop:

- Option 1: Zero option (to keep the present situation)
- Option 2: Rehabilitation of the existing workshop in Omdurman Locality (to additionally serve as the Central Workshop)
- Option 3: Rehabilitation of the existing workshop in Bahri Locality (to additionally serve as the Central Workshop)
- Option 4: Construction of new Central Workshop in Khartoum Locality

In July 2013, MEFPD, SACKS and JICA Survey Team discussed on the results of the site survey conducted by SACKS and JICA Survey Team. As a result, Option 4 was selected as shown in Table 1-7.

Table 1-7 Examination of Alternatives

	Option 1: Zero option (to keep the present situation)	**Option 2: Rehabilitation of the existing workshop in Omdurman Locality** (to add the function as the Central Workshop)	**Option 3: Rehabilitation of the existing workshop in Bahri Locality** (to add the function as the Central Workshop)	**Option 4: Newly construction of the Central Workshop in Khartoum Locality**
Surrounding Area	Localities workshops are in commercial and industrial areas.	The existing workshop is in the commercial area.	The existing workshop is in the commercial area.	The site is in the industrial area.
Technical Points	Daily maintenance can be done. However, there are not any equipment and space for overhaul and other important periodical maintenance and examination.	It is convenient that the existing workshop is near the center of Locality. The access to the existing workshop is not good because the access road from the main road is narrow. It is necessary to demolish the existing workshop because it does not have the necessary facility for overhaul and other important periodical maintenance and examination. The existing workshop is not only for waste management vehicles, but also for other Locality's works, and the demarcation is not decided among sections in the Locality.	The site area is small. The access to the existing workshop is not good because the access road from the main road is narrow. It is necessary to demolish the existing workshop because it does not have the necessary facility for overhaul and other important periodical maintenance and examination. The existing workshop is not only for waste management vehicles, but also for other Locality's works, and the demarcation is not decided among sections in the Locality.	The site area is large and the boundary of the site is clear. The access to the site is good because the access road from the main road is wide enough.
Project Cost		Construction cost and demolition cost of the existing workshop	Construction cost and demolition cost of the existing workshop	Only construction cost
Natural Environment		Not any significant impacts.	Not any significant impacts.	Not any significant impacts.
Social Environment		It is necessary to consider the negative impact on the surrounding small shops. Construction wastes will generate by demolition of the existing workshop.	It is necessary to consider the negative impact on the surrounding small shops. Construction wastes will generate by demolition of the existing workshop.	There are not any significant impacts on surrounding industries because the distance between the site and surrounding industries is secured.
Optimum Option and selection reasons	Not recommended. Under this situation, overhaul and other important periodical maintenance and examination cannot be done.	Not recommended. There are not many advantages from the technical and financial point of views because this option will not be rehabilitation, but demolition and new construction.	Not recommended. There are not many advantages from the technical and financial point of views because this option will not be rehabilitation, but demolition and new construction.	Recommended. Effectiveness of the Central Workshop is highly expected.

Source) prepared by JICA Survey Team

1-3-5 Scoping

The Project is categorized as "B" according to the JICA Guideline for Environmental and Social Considerations. Among the Project components, the construction of the Central Workshop shall be examined. Table 1-8 shows the draft of scoping for environmental and social consideration.

Table 1-8 Draft of Scoping

Category	Item		Rating		Reasons
			Construction Phase	Operation Phase	
Pollution Control	1	Air Quality	B-	B-/C+	Construction Phase: There is a possibility of temporal air pollution by the construction vehicles. Operation Phase: There is a possibility that exhausted gas emission will be increased by the increase of incoming vehicles. However, the impact will be small as a whole because the vehicles will not come so frequently.
	2	Water Quality	B-	B-/C-	Construction Phase: There is a possibility of water pollution by waste water and waste oil from the construction site and vehicles. Operation Phase: There is a possibility of water pollution by waste water from the washing area and by waste oil from the vehicle maintenance area.
	3	Waste	B-	D	Construction Phase: There is a possibility to generate construction surplus soil and waste materials. Operation Phase: There is no possibility to generate wastes.
	4	Soil Contamination	C-	B-/C	Construction Phase: There is a possibility of soil contamination by waste oil from the construction site and vehicles. Operation Phase: There is a possibility of soil contamination by waste oil of the vehicles.
	5	Noise and Vibration	B-	C-	Construction Phase: There is a possibility of noise generation by the construction vehicles. Operation Phase: There is a possibility of noise generation by maintenance works and the increase of incoming vehicles.
	6	Offensive Odor	D	D	There are not any possibilities to generate offensive odor.
Natural Environment	1	Protected Areas	D	D	There are not any protected areas in and around the site.
	2	Ecosystem	D	D	There are not any ecologically valuable habitats in and around the site.
Social Environment	1	Resettlement	D	D	There are not any legal or illegal houses areas in and around the site.
	2	Living and Livelihood	D	D	There is no possibility of impact on living and livelihood because there are not any legal or illegal housing areas in and around the site, and the distance from the site to surrounding plants is far enough.
	3	Heritage	D	D	There are not any local archeological, historical, cultural and religious heritages.
	4	Landscape	D	D	There is no possibility of impact on landscape because the site is in the industrial area.
	5	Ethnic Minorities and Indigenous Peoples	D	D	There are not any ethnic minorities and indigenous peoples in and around the site.
	6	Working Conditions	B-	D	Construction Phase: It is necessary to take into consideration of the construction workers. Operation Phase: There is no possibility of impact on working environment.
Others	1	Accidents	B-	D	Construction Phase: There is a possibility of traffic accidents by construction vehicles. Operation Phase: Accidents are unlikely to occur as the traffic is extremely limited.
	2	Global Warming	D	B+	Operation Phase: There is a possibility of positive impact because the high emission (old) vehicles will be decreased and the low emission (new) vehicles will be increased.

Source: prepared by JICA Survey Team

Note:

A+/-: Significant positive/negative impact is expected.

B+/-: Positive/negative impact is expected to some extent.
C+/-: Extent of positive/negative impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses)
D: No impact is expected.

1-3-6 TOR for Survey of Environmental and Social Considerations

Table 1-9 shows the TOR for survey of environmental and social considerations.

Table 1-9 TOR for Survey of Environmental and Social Considerations

Items for Environmental and Social Considerations	Survey Item	Survey Method
Air Quality	Similar existing workshops	Review of the existing documents
	Impact during the construction phase	Review of the existing documents and estimation
	Impact during the operation phase	Estimation based on collected data
Water Quality	Surrounding water environment	Site investigation and hearing survey
	Similar existing workshops	Site investigation and hearing survey
	Impact during the construction phase	Confirmation of construction work items, construction vehicles, construction period, etc.
	Impact during the operation phase	Estimation based on collected data
Waste	Disposal method for construction wastes	Data collection from related agencies
		Site survey
Noise and Vibration	Similar existing workshops	Review of the existing documents
	Impact during the construction phase	Confirmation of construction work items, construction vehicles, construction period, etc.
	Impact during the operation phase	Estimation based on collected data
Land Acquisition	Size of the site and necessary procedure for land acquisition	Confirmation of related laws and similar cases
		Hearing survey with related agencies
Working Condition	Sudanese laws and regulations	Review of the existing documents
	Impact during the construction phase	Confirmation of construction work items, construction period, safety measures, etc.
Accidents	Impact during the construction phase	Confirmation of construction work items, construction period, safety measures, etc.
Global Warming	Impact during the construction phase	Estimation based on collected data

Source: prepared by JICA Survey Team

1-3-7 Survey Results of Environmental and Social Considerations

Survey results of environmental and social considerations are shown in Table 1-10.

Table 1-10 Survey Results of Environmental and Social Considerations

Items for Environmental and Social Considerations	Survey Method	Survey Results
Air Quality	• Site investigation and hearing survey • Confirmation of construction work items, construction period, etc. • Estimation based on collected data	Construction Phase: Although there is a possibility of air pollution by exhausted gas from construction vehicles, there is no possibility of significant impact on air quality. Operation Phase: According to the site survey at the existing workshops, there were not any significant air pollution because of the appropriate ventilation and management of the working time. Therefore, there is no possibility of significant impact on air quality although the incoming vehicles will increase.
Water Quality	• Site investigation and hearing survey	Surrounding environment: There are not any rivers and lakes in and around the site. The level of groundwater is around GL-150m. Therefore,

Items for Environmental and Social Considerations	Survey Method	Survey Results
	• Confirmation of construction work items, construction period, etc. • Estimation based on collected data	there is no possibility of impact on surface water and groundwater. Construction Phase: Although turbid water will be generated, there is no possibility of significant impact on water quality because surface water and groundwater are not found near the site. Operation Phase: There is a possibility of oil leak when changing oil and doing other works. It is necessary to install an oil separator in order to prevent the oil leak.
Waste	• Site investigation and hearing survey • Data collection from related agencies	Construction Phase: Construction wastes will be generated. Based on the discussion with SACKS, the generated construction wastes can be disposed at Khartoum landfill site.
Noise and Vibration	• Site investigation and hearing survey • Confirmation of construction work items, construction period, etc. • Estimation based on collected data	Construction Phase: Although construction vehicles may generate noise and vibration, there is no possibility of significant impact of the noise and vibration. Operation Phase: According to the site survey at the existing workshops, there were not any significant noise and vibration because of the appropriate management of the working time. Therefore, there is no possibility of significant impact of noise and vibration.
Land Acquisition	• Confirmation of related laws and similar cases • Hearing survey with related agencies	SACKS received the approval for land acquisition from the state government in November 2013.
Working Condition	• Review of the existing documents • Confirmation of construction work items, construction period, safety measures, etc.	It is necessary for construction and operation to follow the Public Health Act 2008.
Accidents	• Review of the existing documents • Confirmation of construction work items, construction period, safety measures, etc.	It is necessary for construction and operation to follow the Public Health Act 2008.
Global Warming	• Review of the existing documents	The fuel efficiency of the existing vehicles and new vehicles are mostly same. However, the impact on air quality will be small because the high-emission (old) vehicles will be out of service.

Source: prepared by JICA Survey Team

1-3-8 Rating based on Survey Results

Rating based on the survey results is shown in Table 1-11.

Table 1-11 Rating based on Survey Results

Category	Item		Rating based on Scoping		Rating based on Survey Results		Reasons
			Construction Phase	Operation Phase	Construction Phase	Operation Phase	
Pollution Control	1	Air Quality	B-	B-/C+	B-	D	Construction Phase: There is a possibility of temporal air pollution by the construction vehicles. Operation Phase: Although gas emission will be increased by the increase of incoming vehicles, the impact on air quality is not significant.
	2	Water Quality	B-	B-/C-	B-	B-	Construction Phase: There is a possibility to generate turbid water. Operation Phase: There is a possibility of leaking waste oil, which is used for vehicle maintenance.

Category	Item		Rating based on Scoping		Rating based on Survey Results		Reasons
			Construction Phase	Operation Phase	Construction Phase	Operation Phase	
	3	Waste	B-	D	B-	D	Construction Phase: There is a possibility to generate surplus soil and waste materials.
	4	Soil Contamination	C-	B-/C	D	B-	Operation Phase: There is a possibility of leaking waste oil, which is used for vehicle maintenance.
	5	Noise and Vibration	B-	C-	B-	B-	Construction Phase: There is a possibility of impact of noise and vibration by construction equipment and vehicles. Operation Phase: There is a possibility of noise and vibration by incoming vehicles and maintenance works.
	6	Offensive Odor	D	D	N/A	N/A	Not applicable.
Natural Environment	1	Protected Areas	D	D	N/A	N/A	Not applicable.
	2	Ecosystem	D	D	N/A	N/A	Not applicable.
Social Environment	1	Resettlement	D	D	N/A	N/A	Not applicable.
	2	Living and Livelihood	D	D	N/A	N/A	Not applicable.
	3	Heritage	D	D	N/A	N/A	Not applicable.
	4	Landscape	D	D	N/A	N/A	Not applicable.
	5	Ethnic Minorities and Indigenous Peoples	D	D	N/A	N/A	Not applicable.
	6	Working Conditions	B-	D	B-	D	Construction Phase: It is necessary to take into consideration of the construction workers.
Others	1	Accidents	B-	D	B-	D	Construction Phase: There is a possibility of traffic accidents by construction vehicles.
	2	Global Warming	D	B+	D	B+	Operation Phase: There is a possibility of positive impact because the high emission (old) vehicles will be decreased and the low emission (new) vehicles will be increased.

Source: prepared by JICA Survey Team

Note)

A+/-: Significant positive/negative impact is expected. B+/-: Positive/negative impact is expected to some extent.

D: No impact is expected. N/A: Not Applicable

1-3-9 Cost for Planning and Implementing Mitigation Measures

Table 1-12 shows the cost for planning and implementing the mitigation measures for the items which may have environmental and social impacts (shown in Section 1-3-8 above). The construction costs of portable toilet and oil separator are included in the Project construction cost .

Table 1-12 Cost for Planning and Implementing Mitigation Measures

Phase	Item	Mitigation Measure	Implementation Agency	Responsible Agency	Cost
Construction	Air Quality	The contractor will try to use low-emission equipment and vehicles, and implement periodical maintenance and inspection of the construction equipment and vehicles. And the contractor will follow the appropriate construction procedures.	Contractor	MEFPD, SACKS	-
	Water Quality	The contractor will manage waste water appropriately in order to prevent turbid water	Contractor	MEFPD, SACKS	Portable toilet: around 500

Phase	Item	Mitigation Measure	Implementation Agency	Responsible Agency	Cost
		discharging. During the construction period, the contractor will install and manage portable toilets for workers.			USD (except for labor cost)
	Waste	The Contractor will transport generated wastes with prevention of scattering and dropping to the disposal place. SACKS will dispose these wastes appropriately.	Contractor and SACKS	MEFPD, SACKS	-
	Noise and Vibration	SACKS will notify the construction schedule for the surrounding areas. The contractor will try to use the low-emission equipment and vehicles, and implement periodical maintenance and inspection of construction equipment vehicles.	Contractor and SACKS	MEFPD, SACKS	-
	Working Conditions	The Contractor will confirm the construction schedule and working management periodically.	Contractor	MEFPD, SACKS	-
	Accidents	The Contractor will select the optimum route for the construction vehicles in order to minimize the accidents based on the construction schedule with the consideration of traffic situation. The contractor will implement periodical maintenance and inspection of construction equipment vehicles.	Contractor	MEFPD, SACKS	-
Operation	Water Quality	The waste oil will be separated from the waste water by the oil separator. It will be stored in the Central Workshop and disposed in Khartoum landfill site. Waste water will be discharged through the waste water facility and soaked into the ground.	SACKS	MEFPD	Oil separator: around 2,000 USD (except for labor cost)
	Soil Contamination	The waste oil will be separated from the waste water by the oil separator. It will be stored in the Central Workshop and disposed in Khartoum landfill site. Waste water will be discharged through the waste water facility and soaked into the ground.	SACKS	MEFPD	ditto
	Noise and Vibration	Appropriate working schedule will be prepared. Equipment and vehicles will be maintained and inspected periodically.	SACKS	MEFPD	-

Source: prepared by JICA Survey Team

1-3-10 Monitoring Plan

The following table shows the monitoring plan of the items which may have environmental and social impacts (shown in 1-3-8 the above).

Table 1-13 Monitoring Plan

Phase	Item	Monitoring Item	Place	Frequency	Implementation Agency	Responsible Agency
Construction	Air Quality	• Confirm the construction and working schedules, and record them • Maintain and inspect the equipment, and record it	Around the construction site	Once per day	Contractor	MEFPD, SACKS
	Water Quality	• Confirm the management of waste water • Confirm the management of portable toilet	At the end of discharging points	Once per day	Contractor	MEFPD, SACKS
	Waste	• Confirm and record the contents and amount of wastes, transportation and disposal date	Around the construction site	Once per day	Contractor	MEFPD, SACKS
	Noise and Vibration	• Maintain and inspect the equipment, and record it	Around the construction site	Once per day	Contractor	MEFPD, SACKS

Phase	Item	Monitoring Item	Place	Frequency	Implementation Agency	Responsible Agency
	Working Conditions	• Confirm the construction and working schedules, and record them	Around the construction site	Once per day	Contractor	MEFPD, SACKS
	Accidents	• Confirm the construction and working schedules, and record them • Maintain and inspect the equipment, and record it	Around the construction site	Once per day	Contractor	MEFPD, SACKS
Operation	Water Quality	• Confirm and record the separation work with the oil separator	At the end of discharging points	Once per month	SACKS	MEFPD
	Soil Contamination	• Confirm and record the separation work with the oil separator	At the end of discharging points	Once per month	SACKS	MEFPD
	Noise and Vibration	• Confirm the construction and working schedules, and record them • Maintain and inspect the equipment, and record it	-	Once per month	SACKS	MEFPD

Source) prepared by JICA Survey Team

1-3-11 Stakeholder Meeting

As a result of discussions with related agencies in the second field survey, it was decided that holding stakeholder meetings during the field survey period was not necessary. By the commencement of the construction, SACKS will hold them if necessary.

1-3-12 Land Acquisition and Resettlement

(1) Necessity of Land Acquisition and Resettlement

In November 2013, SACKS obtained the approval of land use for the site as Central Workshop from the state government. However, construction materials were stored in this site illegally (as of December 2013). The Sudanese side and JICA Survey Team agreed that SACKS would remove these materials.

Regarding the resettlement, there is no possibility of resettlement because the site does not have any legal or illegal residential areas.

(2) Legal system, Implementation Agency and Schedule for Land Acquisition

The necessary procedure for land acquisition is as follows:

i) SACKS submit the application to the state government.
ii) Planning Division of the State Ministry of Physical Planning decide the first approval.
iii) SACKS submit the detailed land use plan to the state government.
iv) Planning Committee of the state government decide the final approval and send the approval letter to SACKS.

(3) Area and boundary of land acquisition

The area of the requested land is around 12,000 m^2.

(4) Others

a) Drafts of Monitoring Forms

Monitoring forms for construction and operation phases are planned as shown in Table 1-14 and Table 1-15 respectively.

Table 1-14 Monitoring Form for Construction Phase (draft)

Monitoring Form for Construction Phase (draft)

The latest results of the monitoring items listed below shall be submitted.

	Agency of preparation	Agency of approval
Comments		
Sign		

No.	Monitoring Item		Condition/Value	Remarks	Sign by checker
1-1	Air Quality	Construction plan and work schedule			
1-2		Maintenance of construction vehicle and equipment			
2-1	Water Quality	Management situation of drainage of waste water			
2-2		Management situation of portable toilet			
3-1	Waste	Waste composition, amount (or volume)			
3-2		Date of transportation			
3-3		Date of disposal			
4	Noise and Vibration	Maintenance of construction vehicle and equipment			
5	Working Conditions	Construction plan and work schedule			
6-1	Accidents	Construction plan and work schedule			
6-2		Maintenance of construction vehicle and equipment			

Source: prepared by JICA Survey Team

Table 1-15 Monitoring Form for Operation Phase (draft)

Monitoring Form for Operation Phase (draft)

The latest results of the below monitoring items shall be submitted.

	Agency of preparation	Agency of approval
Comments		
Sign		

No.	Monitoring Item		Condition/Value	Remarks	Sign by checker
1	Water Quality	Separation of waste oil from waste water in the oil separator			
2	Soil Contamination	Separation of waste oil from waste water in the oil separator			
3-1	Noise and Vibration	Work plan and work schedule			
3-2		Maintenance of vehicle and equipment			

Source: prepared by JICA Survey Team

b) Environmental Check List

SACKS prepared the environmental check list and JICA Survey Team received it (Appendix 7).

CHAPTER 2

CONTENTS OF THE PROJECT

Chapter 2 Contents of the Project

2-1 Basic Concept of the Project

2-1-1 Overall Goal and Project Purpose

Overall Goal and Project Purpose are as follows;

Overall Goal	To provide sustainable and sanitary solid waste management service to Khartoum State citizens.
Project Purpose	To strengthen waste collection and transportation capacity of Khartoum State and to increase waste collection rate.
Project Outcome Indicator	• Waste collection amount by each LCA • Waste collection rate

2-1-2 Proposed Component

As a result of the field survey in Sudan, JICA Survey Team tentatively proposes the following component to the Sudanese side:

2-1-2-1 Equipment for Waste Collection

The number of waste collection vehicles is planned with the targeted collection amount and the collection capacity of the existing vehicles in 2016 (the target year of the Project). According to M/P showing the collection rate in 2016 as 80%, the targeted collection amount and the collection capacity of the existing vehicles in 2016 are calculated as 4,601 ton/day and 3,138 ton/day respectively. This shows that there will be a collection capacity shortage of 1,263 ton/day in Khartoum State in 2016. Therefore, the number of collection vehicles to be procured is planned as 80 units in total: 40 units of compactor and 40 units of container carrier (arm type) as summarized in Table 2-1. The detail analysis is shown in “2-2-2-1 Equipment Plan for Waste Collection” in “2-2-2 Basic Plan”.

Table 2-1 Planned Number of Vehicles to be Procured

	Khartoum	Bahri	Jabal Aulia	Karary	Omdurman	Sharg En Nile	Um Badda	Total
Compactor	11	10	3	2	5	7	2	40
Container Carrier (Arm Type)	12	9	3	2	4	7	3	40
Total	23	19	6	4	9	14	5	80

In addition to the vehicles, 40 containers of Container Carrier (Arm Type) will be procured by the Project.

2-1-2-2 Equipment for Landfill Management

The summary of the preliminary number of landfill management equipment is as follows:

Bulldozer (24ton class) or Landfill Loader (21ton class)	3 units
Excavator (19 ton class)	2 units
Water Tanker ($6m^3$ class)	1 unit

2-1-2-3 Central Workshop

(1) Construction of Central Workshop

The construction plan of the Central Workshop is as following:

Table 2-2 Scale of Project Facilities (Central Workshop)

Item	Structure	Facilities	Total Building Floor Area (m^2)		
			1 Building	Number of Buildings	Total
Central Workshop	・Structure: Reinforced concrete ・Roof framework: Steel flame ・Roof: Hot-dip aluminum-zinc alloy-coated steel sheet (Galvalume Steel Sheet) 0.8mm ・Wall: Concrete masonry ・External wall: Concrete block masonry + Brick masonry ・Floor: Steel trowel finish mortar + Oil-resistant coating (Working Bay), tiled (Office) ・Hygienic equipment: Water supply system, Septic tank, Oil & water separator pit, Soak pit, Water pump ・Electrical equipment: 50kVA generator,11kV/415-240V Power distribution panel	5 Working Bays, Washing Area, Storage, Electrical & Mechanical Room, 1 Office, Open Area, Entrance Hall, Toilets, Kitchen	708 m^2	1	708 m^2
Total				1	708 m^2

(2) Equipment for Central Workshop

The summary of the equipment plan for the Central Workshop is as shown in Table 2-3.

Table 2-3 Planned Equipment for Vehicle Maintenance (Central Workshop)

No.	Workshop Equipment Items	Unit	Quantity
1	Air Compressor		
(1)	Air Compressor	unit	1
(2)	Air Reservoir Tank	unit	1
(3)	Air Hose Reel	pcs.	10
2	Hot Water High Pressure Washer	unit	1
3	Hydraulic Garage Jack		
(1)	Hydraulic Garage Jack 2t	unit	1
(2)	Hydraulic Garage Jack 5t	unit	1
4	Rigid Rack 3t	set	1
5	Drill, Grinder, Cutter and Abrasive Tool Set		
(1)	Bench Drill Press	unit	1
(2)	Electric Hand Drill	pcs.	2
(3)	Disc Grinder	pcs.	2
(4)	High-speed Abrasive Cutter	pc.	1
(5)	Bench Grinder	pc.	1
(6)	Cord Reel	pcs.	4
6	Tire Changer		
(1)	Tire Changer	unit	1
(2)	Wheel Dolly	pc.	1
(3)	Tire Lever Set	set	1
7	Diesel Engine Welder	unit	1
8	Oxygen Acetylene Gas Welder Set	set	1
9	Air Impact Wrench		
(1)	Air Impact Wrench (3/4")	pc.	1

No.	Workshop Equipment Items	Unit	Quantity
(2)	Air Impact Wrench (1”)	pc.	1
10	Air Blow Gun	pcs.	10
11	Gas Manifold Set for Air Conditioner	set	1
12	Mechanic Tool Set for Automobile	set	4
13	Mechanic Tool Set for Large Vehicle	set	4
14	Electrician’s Tool Set	set	1
15	Standard Measuring Tools	set	1
(1)	Vernier Caliper Gauge	pc.	1
(2)	Micrometer Set	set	1
(3)	Dial Indicator	pc.	1
(4)	Magnetic Base	pc.	1
(5)	Measuring Tape	pc.	1
(6)	Tachometer	pc.	1
(7)	Torque Wrench (1/2”)	pc.	1
(8)	Torque Wrench (3/4”)	pc.	1
16	Nozzle Tester	pc.	1
17	Electrical Test and Repair Set		
(1)	Digital Circuit Tester	pcs.	2
(2)	Solderless Terminal Kit	set	2
18	Battery Quick Charger	unit	1
19	Grease Supply Set		
(1)	Grease Pump	pc.	1
(2)	Grease Gun	pc.	1
20	Drain Pan (Cleaning Pan)	pcs.	3
21	Drum Can	pcs.	3
22	Work Bench Set		
(1)	Work Bench	pcs.	4
(2)	Mobile Work Bench	pcs.	4
(3)	Steel Cabinet	pcs.	2
23	Drum Pump	pcs.	2
24	Shop Press 15t	unit	1
25	Service Creeper	pcs.	4
26	Lift Materials	set	1
27	Parts Washing Stand	pc.	1
28	Paint Spray Gun with Container	pc.	1

2-1-2-4 Locality Workshops

(1) Equipment for the Seven Local Workshops

The summary of the equipment plan for the workshops in the seven LCAs (KHLCA, BLCA, LLCA, KLCA, OLCA, SLCA and ULCA) are as shown in Table 2-4.

Table 2-4 Planned Equipment for Vehicle Maintenance (Locality Workshop)

No.	Workshop Equipment Items	Unit	Quantity
1	Mechanic Tool Set		
(1)	3/4” Sq. Drive Socket Set	set	7
(2)	3/8” Sq. Drive Socket Set	set	7
(3)	Combination Spanner Set	set	7
(4)	Heavy Duty Combination Spanner Set	set	7
(5)	Adjustable Wrenches	set	7
(6)	Ratchet Torque Wrench	set	7
(7)	Adjustable Pipe Wrench	set	7
(8)	Adjustable Pipe Wrench	set	7
(9)	Strap Wrench	set	7

No.	Workshop Equipment Items	Unit	Quantity
(10)	Angle Key Set	set	7
(11)	Angle Key Set	set	7
(12)	Long Pattern Hexagon Key Set	set	7
(13)	Driver Set	set	7
(14)	Fiberglass Shaft Club Hammers	set	7
(15)	Fiberglass Shaft Sledge Hammers	set	7
(16)	36” Utility Bar	set	7
(17)	Pry Nail Bar	set	7
(18)	Pliers Set	set	7
(19)	Crimping Tool	set	7
(20)	Roller Cabinet	set	7
2	Drill, Grinder, Cutter and Abrasive Tool Set		
(1)	Steel Hacksaw Frame	set	7
(2)	Bench Vices	set	7
(3)	Chisel & Punch Set	set	7
(4)	Needle File Set	set	7
3	Standard Measuring Tools Set		
(1)	20 Blade Metric Feeler Gauge Set	set	7
(2)	Digital Multimeter	set	7
(3)	Vernier Caliper	set	7
(4)	Tap & Die Set	set	7

2-1-3 Road Map toward Achieving Master Plan

The M/P stipulates that the targeted collection rate in 2028 shall be 90%. The road map toward achieving 90% in 2028 is shown below.

If the status quo continues, the amount of solid waste generated in 2028 will be 9,344 ton/day; therefore, the target of the collection amount will be 8,410 ton/day (present scenario). There are 301 units of waste collection vehicles which collected 65% (3,200 ton) of the wastes generated in 2012. Only 130 vehicles out of the 301 will be able to work in 2028 and can collect only 954 ton/day of waste due to their deterioration. Therefore, SACKS shall procure 480 vehicles, including 80 vehicles of the Project, for collecting the remaining amount of the waste, as shown in Figure 2-1.

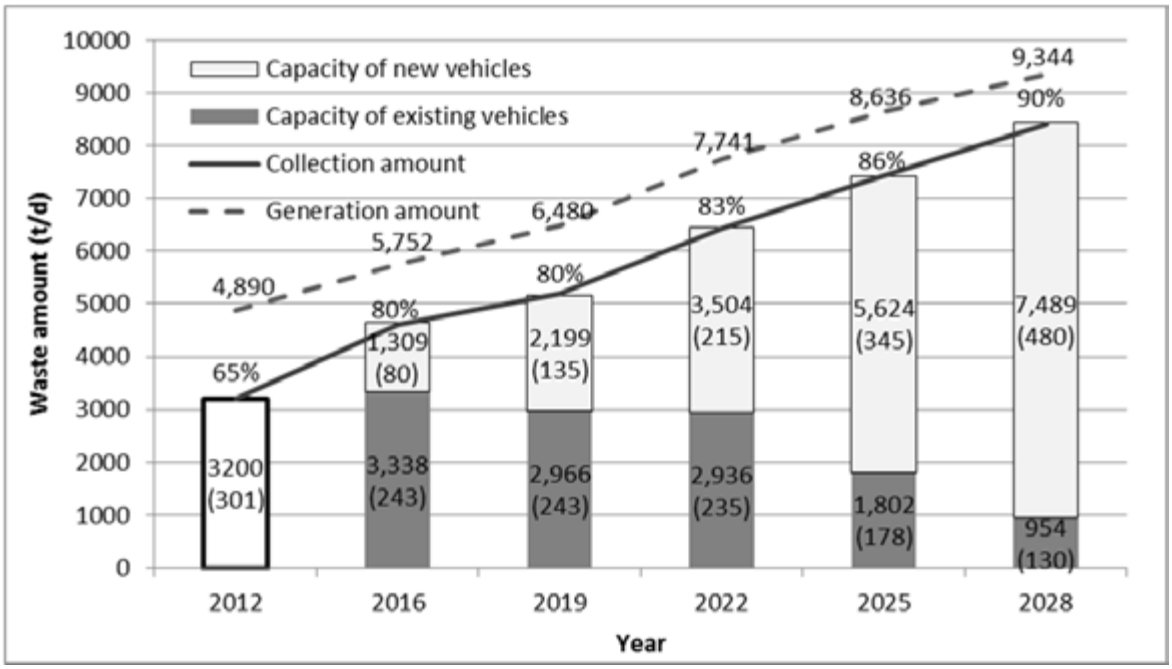


Figure 2-1 Road Map toward Achieving M/P (Present scenario)

Other scenarios toward achieving the M/P are shown in Table 2-5. Scenario 1 is for increasing the number of trips of each waste collection vehicle by one trip compared to the present scenario. Scenario 2 is for reducing the waste generation amount by 10% by strengthening waste reduction activities. Scenario 3 is the combination of scenario 1 and scenario 2. Scenario 4 is in case of improper maintenance of the vehicles and without the Central Workshop to be constructed by the Project.

Table 2-5 Alternative Scenario toward Achieving M/P

Scenario		No. of vehicles to be procured from 2014 to 2028
Present scenario		480
Scenario 1	Efficiency of collection will be improved. No. of trips of each vehicle will be increased by one trip compared to the present number of trips.	380
Scenario 2	Generation amount will be reduced by 10% compared to the present amount.	425
Scenario 3	Scenario 1 & 2 (Improvement of collection and 10 % reduction of generation amount)	340
Scenario 4	Without Central Workshop: Life of vehicles will be reduced by three years, compared to their present life cycle	560

With regard to the equipment for landfill sites, SACKS shall procure eight or nine bulldozers and three excavators by 2028, including equipment purchased by the Project.

2-2 Outline Design of the Japanese Assistance

2-2-1 Design Policy

2-2-1-1 Policies for Equipment Selection

(1) Policies on Equipment Types

The vehicles for waste collection are closely associated with the waste disposal forms and waste collection methods. Figure 2-2 shows the existing combinations of vehicles for waste collection with waste collection methods in Khartoum State.

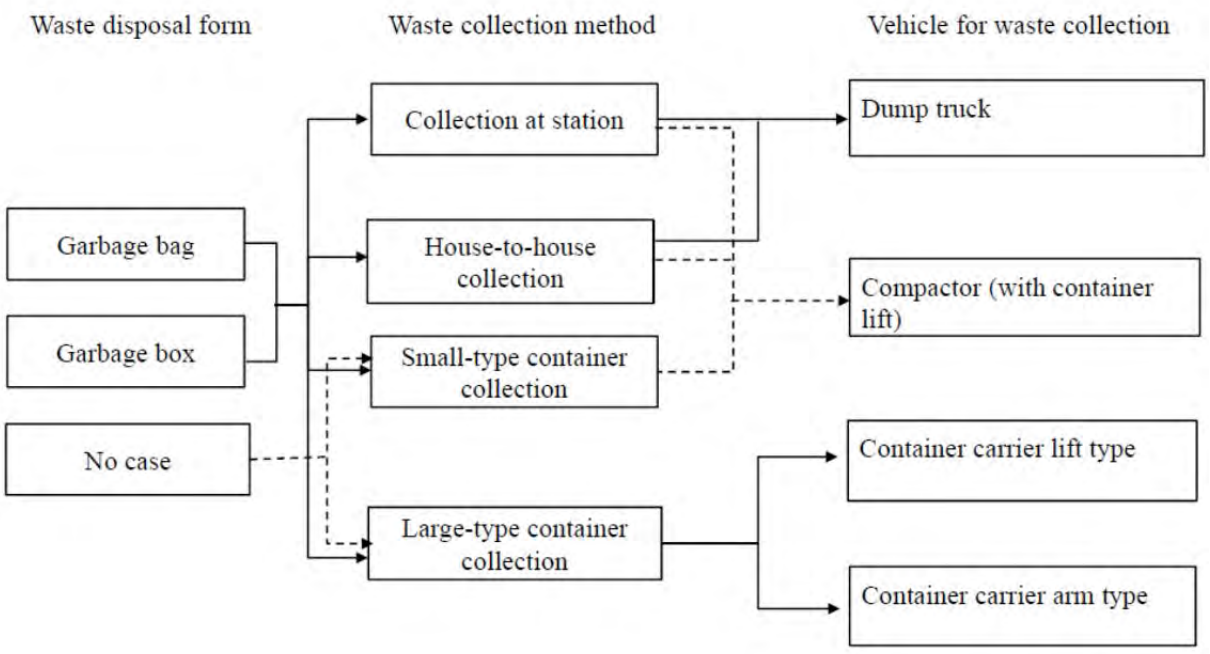


Figure 2-2 Combinations of Waste Disposal Forms, Collection Methods and Vehicles in Khartoum State

SACKS and LCAs have intention to collect household waste by ‘Collection at station’ and ‘’Small-type container collection’ . On the other hand, LCAs will gradually increase the rate of ‘Large-type container collection’ for the market waste. Therefore, compactors and container carriers will be procured by the Project. Although there are two types of container carriers in Khartoum state, Lift type and Arm type, the Arm type will be procured because there is more experience in handling them than the lift type. Compactors and container carriers (arm type) are commonly used waste collection vehicles without specific technical requirement.

Container carriers (arm type) definitely needs the container for its operation. Minimum of two containers per vehicle should be procured. On the other hand, containers are not necessary for the operation of compactor, which can apply ‘Collection at station’; therefore, containers for compactors will not be purchased by the Project.

2-2-1-2 Policies for Natural Condition

The design policies on the natural environmental conditions for the Central Workshop construction in this Project are described below.

(1) Topographic and Geologic Features of Construction Site

The terrain of the construction site planned for the Central Workshop is almost flat, with undulations having no impact on the design of the facilities. The geological features of the site are GL-1.5m and very hard cohesive soil and fine-grained silt soil, with a bearing capacity of about 500kN/m^2 (kPa).

(2) Temperature

The temperature in Khartoum State is in the range of 25°C to 35°C on average, though it may rise to nearly 40°C in the daytime. As the sunlight is very intensive, working bays will be provided on the north side to prevent direct sunlight on the vehicles under maintenance.

(3) Humidity/Rainfall

Khartoum State is dry with little rain in the daytime and it is necessary to consider the impact of scattered sand clouds. Ingates for the vehicles will be provided with shutters to prevent sand from getting into the vehicles and maintenance equipment during non-working hours.

(4) Wind Velocity

Khartoum State has a constant wind velocity all the year of about 15km/h (4.2m/s), but it is located in the dry area close to the desert zone, where sandstorms called *haboob* occur. Therefore, steel roof frames and steel sheet roofs will be appropriate in view of the *haboob* (20m/s or more) that hit this area in May 2006.

(5) Earthquakes

There is no earthquake record of Khartoum State. Therefore, horizontal seismic force will not be considered in structural calculations.

2-2-1-3 Policies for Social and Economic Conditions

The site for the Central Workshop is in the industrial area, and its boundary is decided. The site and surrounding areas are the open space owned by the government. Therefore, there is not a possibility of the impact on the industrial plants near the site. Moreover, there are not any public facilities, housing areas, and surface water in and around the site. However, the Project will be prepared with consideration of noise,

vibration, discharged water, and waste generation.

2-2-1-4 Policies for Construction / Procurement / Special Conditions and Business Practice

(1) Construction Conditions

In Khartoum State, there are many large-scale construction businesses and there are general construction companies that are engaged in construction works. A number of manufacturing plants and agents for construction material (including concrete, reinforcing bars and steel frames) operate in this state. Therefore, favorable construction circumstances will be guaranteed. However, some building construction works have been delayed, and their construction materials and equipment have been in the sites under inappropriate condition. In consideration of the circumstances, it is deemed difficult for local contractors to assure the quality of construction. Therefore, construction management by a Japanese construction company will be considered. In addition, high accuracy is required for the installation of the incidental facilities in the Central Workshop, including cubicles for power supply and overhead crane requiring high-precision installation work. Especially for overhead crane, it will be difficult for local operators to construct and manage the works because it requires high-precision installation work. So, Japanese engineers specializing in building facilities and special equipment will be dispatched.

The aggregates, cement and reinforcing bars for use in the construction works can be procured locally. To foster local industry, equipment and materials that can be procured in Sudan will be adopted as far as possible. However, the vehicle repair/maintenance plants owned by civil operators make use of much imported equipment and materials for repairs and maintenance. In view of the record of the introduced existing systems and equipment and the operation and maintenance capacity of the Sudanese side, procurement of such equipment and materials from Japan and/or a third country will be considered.

(2) Equipment Procurement Conditions

The vehicles for waste collection will be procured from Japan because of Sudan's enough experience in procurement of Japanese waste collection vehicles. For the heavy equipment for landfill management, bulldozers will be procured from a third country. In Khartoum State, there are several agent companies operating vehicles and heavy equipment for landfill management and operators with experience in handling products imported from Japan and third countries. Therefore, it is deemed that the vehicles and heavy equipment can be procured smoothly from Japan or a third country.

2-2-1-5 Policies for Local Contractor

(1) Local Consultants

In the city area of Khartoum, middle-/high-rise buildings are seen and there are local consultants who are experienced in design and supervision of construction projects, but many of them are small-scale companies with 5 to 20 or so engineers, which have to recruit specialized engineers for each project. They are experienced in the design and supervision of projects in accordance with Sudanese Standard Specifications (SDS), the industrial standards of Sudan, and British Standards (BS). Therefore, using them as assistants to the Japanese consultant and for the site supervision will be considered.

(2) Local Construction Companies

Insufficient workers, compared to scale of the construction work, are commonly engaged in some particular part of the construction works in the vicinity of the city area of Khartoum. In such projects, it is deemed that the planned construction stages and process control per work type are not satisfactorily executed. Some construction sites at which work has been suspended or abandoned for a long time are seen. It is a matter of concern that the local construction companies have weak technological, construction and financial capacity. In view of the limited capacity of the local construction companies, using them as subcontractors and a Japanese construction company as the main contractor will be considered.

2-2-1-6 Policies for Operation and Maintenance

(1) Operation of the Central Workshop

For the operation and maintenance of the vehicles for waste collection, importance will be attached to "preventive maintenance" at the Central Workshop. This means that maintenance of equipment is planned in a comprehensive checking program to overhaul or check the equipment to prevent equipment failure, so that the operation rate of the vehicles becomes higher and the life of the vehicles and equipment becomes longer. The staff of the Central Workshop will consist of 15 members who will be recruited by transferring officials from internal agencies and by recruiting new members from outside. The internal training system will be improved to train the staff members from time to time.

(2) Defining the Cost Shares of SACKS and LCAs

SACKS will be the agency that receives the provided equipment and materials. The cost of operation of the Central Workshop and the cost of repair parts will be shared by SACKS and each LCA. The cost of operation of the vehicles for waste collection (including the driver's salary and fuel cost) will be borne by each LCA.

(3) Inspection and Overhaul System for Vehicles for Waste Collection and Heavy Equipment

The "preventive maintenance" system will be introduced to guarantee longer service life of the vehicles and enhance their operation rate. In addition, inspection and overhaul will be executed to achieve preventive maintenance as follows:

- Drawing up of a list of parts and list of equipment and formulation of inspection standards (including replacement, repair and cleaning)
- Drawing up of a service life list of parts to determine their inspection time and replacement time
- Formulation of a replacement plan for parts and equipment
- Creation of maintenance records of vehicles

(4) Driver's Inspection System at Locality Workshop

At each Locality Workshop, the drivers will inspect their vehicles according to the following inspection items: (Refer to the Soft Components of Grant Aid Project.)

- Inspection before starting and after finishing of the work
- Washing of vehicles after finishing of the work and cleaning of containers every day
- Reporting of vehicle status to Locality Workshop Manager after finishing of the work

2-2-1-7 Policies for Grades of Facilities and Equipment in Central Workshop

Policies for grades of facilities and equipment in the Central Workshop are as the following:

- Construction of the Central Workshop to handle the new vehicles properly in order to maintain the operational status of the vehicle/engine in good condition by periodical vehicle inspection and minor repairs, guarantee longer service life of vehicles and reduce the maintenance cost
- Provision of 3 working bays for periodical inspection, maintenance and repair of 80 vehicles: one for inspection and repair of the understructure of each vehicle, one for long-time repair of vehicles, and one for washing
- Satisfactory examination of the specifications of the facilities according to the topographic, geologic and climatic conditions of the construction site
- Examination of the layout plan of the facilities with full consideration for the line of vehicle flow on adjacent paved roads and interference with neighboring facilities

- Study and examination of the procurement conditions and cost of finishing materials for easy maintenance

2-2-1-8 Policies for Construction and Procurement Method and Period

(1) Policies on Construction Method and Construction Period

In construction of the Central Workshop, a reinforced concrete structure that is generally used in Sudan will be adopted. An arch type steel structure will be adopted as a roof framework because the pole span is long. Lightweight galvalume steel sheet will be considered as the roof materials. The materials required for the frameworks, including reinforcing bars, concrete, concrete blocks and steel frames, can be procured easily in Khartoum because there are many manufacturing plants. Even though manufacturing and assembling of the arch-shaped steel structure of the H-section steel for roof frame is impossible in Sudan due to lack of facility, and it will be procured from Japan.

The finishing materials and equipment will be those that can be procured locally, but such materials with the durability and specifications to minimize facility maintenance will be adopted. In particular, as the atmosphere in Sudan is dry, mortar coating by a wet construction method causes abrupt drying shrinkage after construction, generating cracks. For this reason, this method will not be adopted. Instead of that method, tiling finish and face masonry for concrete blocks is adopted for finishing work.

The construction period will be fixed in view of the fact that work efficiency will largely decline during the Ramadan period. Operation support at workshops will be covered by the Technical Cooperation Project that will start at the same time as this Project. Therefore, the implementation schedule will also be taken into consideration.

(2) Policies on Procurement/Construction Period

The waste collection equipment and the equipment for landfill management will be procured from Japan as a rule, but the bulldozers will be procured from a third country (Europe) and the containers will be procured locally. For the construction period, full consideration will be given to marine transportation, especially as high volumes of equipment have to be procured and transported from Japan.

2-2-2 Basic Plan (Equipment Plan/ Construction Plan)

2-2-2-1 Equipment Plan for Waste Collection

In general, the existing equipment used for collection of municipal wastes comprises a lot of deteriorated equipment although there is also equipment less than five years old that is in relatively good condition. Accordingly, it is necessary to make use of the existing equipment taking the degree of the deterioration into account. Equipment plan should be formulated in accordance with the methodology shown in Figure 2-3.

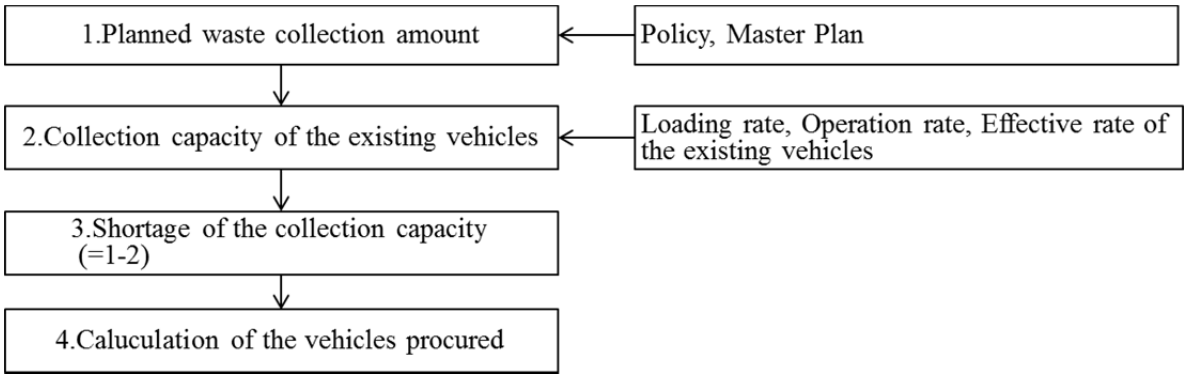


Figure 2-3 Methodology of Equipment Plan

Waste collection capacity of each collection vehicles is estimated as below:

Capacity = Vehicle volume (m^3) x No. of trips x Loading density (t/m^3) x Loading rate x Operation rate x

Efficiency rate

Loading rate, operation rate and effective rate of the Project are defined as follows:

Loading Rate: Actual loaded amount of waste in case that nominal capacity per trip per vehicle is set as 100%. In the Project , 90% of the loading rate will be applied.

Operation Rate: Actual working day in case that working day having no day-off, stand-by-day and repair day is set as 100%. In the Project, 97% (29 days per month) of the operation rate will be applied.

Effective Rate: It is considered as an indicator for equipment utilization. As the operation rate decreases through equipment asing, the effective rate also decreases. The following effective rate will be applied in the Project:

Equipment age in the target year	Effective rate
10 years or less	100%
11–15 years	75%
16–20 years	50%
21 years or older	0% (Scrapping)

Loading densities of the waste collection vehicles applied are as the following:

Table 2-6 Loading Density of Waste on Waste Collection Vehicles

	Density (t/m^3)
Compactor	0.50
Container carrier (arm type and lift type)	0.35
Tractor	0.30
Dump truck	0.35

Source: JICA Survey Team

(1) Waste Collection Plan

The target year of the Project is after three years of this survey, 2016. In consideration of present waste collection rate (65%) of Khartoum State and target collection rate (90% in 2028) stipulated in the M/P, the target waste collection rate in 2016 will be set as 80%. Planned generation and collection amount of wastes in 2016 are shown in Table 2-7. Population in 2016 projected by Sudan Central Bureau of Statistics is used. And the unit generation rates of the seven localities in 2016 are assumed the same as the current rates.

Table 2-7 Waste Collection Plan in 2016

	KHLCA	BLCA	LLCA	KLCA	OLCA	SLCA	ULCA	Total
Population (person)	893,604	849,293	1,321,943	996,996	716,360	1,218,551	1,388,411	7,385,158
Unit generation rate (kg/day/capita)	2.00	0.94	0.47	0.54	0.89	0.60	0.46	—
Generation amount (t/day)	1,787	798	621	538	638	731	639	5,752
Targeted waste collection rate (%)	80%							
Planned collection amount (t/day)	1,430	638	497	430	510	585	511	4,601

Source: Census 2008 and Official Projection, Sudan Central Bureau of Statistics

(2) Effective Collection Capacity of the Existing Vehicles in Target Year

Effective collection capacity of the existing vehicles in 2016 is shown in Table 2-8. Although number of trips

of each vehicle will be basically the same as the current ones, it should be more than two trips at least. At present, LCPs utilize dump trucks rented from other institutions with some fee for waste collection. Efficiency of dump truck for waste collection is lower than the other vehicles, and collection by dump trucks requires more workers than collection by other vehicles. Therefore, the existing rented dump trucks will not be utilized for waste collection after implementation of the Project. Consequently, the effective capacity of the existing vehicles excluding dump trucks will be 3,138 ton/day.

Table 2-8 Effective Collection Capacity of Existing Vehicles in 2016

Unit: ton/day

	KHLCA	BLCA	LLCA	KLCA	OLCA	SLCA	ULCA	Total
Compactor	732	283	363	322	331	300	407	2,738
Container Carrier Lift Type	0	0	0	0	0	0	0	0
Container Carrier (Arm Type)	115	10	18	0	0	35	0	178
Tractor	0	32	29	48	38	43	32	222
Sub-total	847	325	410	370	369	378	439	3,138
Dump truck (for reference)	172	81	0	0	121	120	0	494

In addition, a private company provides waste collection service in KHLCA and its collection amount is around 200 ton/day. It is assumed that the company will continue the service and collect same amount of the wastes in 2016.

(3) Procurement Plan of New Vehicles

As a result of comparison between the planned collection amount and the effective capacity of the existing vehicles, shortage of the capacity in 2016 will be 1,263 ton/day. Therefore, the new collection vehicles to be procured by the Project should collect more than 1,263 ton/day of wastes.

Table 2-9 Required Capacity of New Vehicles in 2016

Unit: ton/day

	KHLCA	BLCA	LLCA	KLCA	OLCA	SLCA	ULCA	Total
Planned collection amount	1,430	638	497	430	510	585	511	4,601
Existing vehicle	847	325	410	370	369	378	439	3,138
Private company	200	0	0	0	0	0	0	200
New vehicle (Shortage capacity)	383	313	87	60	141	207	72	1,263

Number of trips of new vehicles is set as shown in Table 2-10, considering trips of the existing vehicles. Trips of container carriers in KHLCA, BLCA and OLCA, where transfer stations locate, are set as five trips.

Table 2-10 Number of Trips of New Vehicles in 2016

Unit: trip/day

	KHLCA	BLCA	LLCA	KLCA	OLCA	SLCA	ULCA
Compactor	3	3	3	3	3	3	3
Container Carrier (Arm Type)	5	5	4	4	5	4	4

Based on the conditions mentioned above, the number of new vehicles to be procured by the Project is calculated as shown in Table 2-11.The total number of the new vehicles is 80 units. Even though two containers per container carrier (arm type) (40 vehicles x 2 containers) will be procured, additional 40 containers will be purchased by the Project because one container is standard equipment for the vehicle.

Table 2-11 Number of Vehicles Procured through the Project

Unit: vehicle

	KHLCA	BLCA	LLCA	KLCA	OLCA	SLCA	ULCA	Total
Compactor	11	10	3	2	5	7	2	40
Container Carrier (Arm Type)	12	9	3	2	4	7	3	40
Total	23	19	6	4	9	14	5	80

Planned collection amount for each type of vehicle is summarized in Table 2-12.

Table 2-12 Planned Collection Amount for Each Vehicle

Unit: ton/day

	KHLCA	BLCA	LLCA	KLCA	OLCA	SLCA	ULCA	Total
New vehicles								
Compactor	172	156	47	31	78	109	31	624
Container Carrier (Arm Type)	222	167	44	30	74	104	44	685
Sub-total	394	323	91	61	152	213	75	1,309
Existing vehicles								
Compactor	732	283	363	322	331	300	407	2,738
Container Carrier (Arm Type)	115	10	18	0	0	35	0	178
Tractor	0	32	29	48	38	43	32	222
Private	200	0	0	0	0	0	0	200
Sub-total	1,047	325	410	370	369	378	439	3,338
Total	1,441	648	501	431	521	591	514	4,647
Collection rate	81%	81%	81%	80%	82%	81%	80%	81%

(4) Technical Specification

a) Compactor

- Body Capacity: 12 m^3 class
- Container to be lifted: 1.5 m^3 class
- Container lifting device: Provided
- Hydraulic Operation: Mechanical lever manual operation
- Sewage Tank: Provided
- Chassis Operation: Left hand steering wheel, manual transmission
- Chassis drive system: 4 x 2

a) Container Carrier (Arm Type)

- Capacity of the Container: 12 m^3 class
- Container Type: Open Top with single swinging door
- Chassis Operation: Left hand steering wheel, manual transmission
- Chassis drive system: 4 x 2 rear drive

2-2-2-2 Equipment Plan for Landfill Management

(1) Operation Plan

In 2016, Khartoum Landfill Site (hereinafter referred to as “LFS”), Bahri LFS and Omdruman LFS will receive 501 ton/day, 1,239 ton/day and 2,907 ton/day of wastes, respectively. The operation plan of the landfill sites are as follows:

- Operation hours of the sites: 24 hours
- Working hours of the equipment: 8 hours x 2 shift (Actual working hours 6 hours x 2shift)
- Cover soil: 10% of incoming solid wastes. Every 2m of disposed wastes should be covered with 20

cm of soil.

- Bulldozer: For soil covering and compacting. Landfill loader may also be used as an alternative to the bulldozer.
- Excavator: To excavate the ground for acquiring cover soil and prepare the new dumping areas
- Wheel loader: At present, wheel loaders work for removing wastes scattered around the dumping areas, obtaining and transporting cover soils; however it is not suitable for obtaining cover soils due to firm ground of the sites. The existing wheel loaders will be replaced by excavators. Besides, the existing wheel loaders will be allocated to each landfill site for removing scattered waste around the site.
- Water tanker: Water tanker will provide water for drinking and other purposes to offices at the three landfill sites.

Required work volumes for the equipment are shown in Table 2-13.

Table 2-13 Planned Disposal Amount and Required Work Volume for Heavy Equipment

	Khartoum LFS	Bahri LFS	Omdurman LFS	Remark
a. Planned disposal amount (ton/day)	501	1,239	2,907	
b. Waste density before compacting	0.5	0.5	0.5	
c. Planned disposal amount before compacting (m^3/day)	1,002	2,478	5,814	
d. Waste density after compaction	1.0	1.0	1.0	
e. Planned disposal amount after compacting (m^3/day)	501	1239	2907	
f. Cover soil after compacting (m^3/day)	50	124	291	10% of planned disposal amount
g. Cover soil before compacting (m^3/day)	65	161	378	130%
Required work volume				
for Bulldozer (m^3/day)	1,067	2,639	6,192	=c+g
for Excavator (m^3/day)	65	161	378	=g

(2) Procurement Plan of New Heavy Equipment

SACKS has four bulldozers, one excavator and three wheel loaders, in the landfill sites whose effective operation volumes in 2016 are estimated as below. The landfill sites receive the wastes for 24 hours; however, heavy equipment will not operate at night time due to lack of lighting system. Operation time for the heavy equipment should be limited to two shifts (6 hours x 2 shifts = 12 hours).

Standard work volume of heavy equipment based on Japanese guidelines:

a) Bulldozer

Standard work volume of 21 ton class bulldozer is 600 m^3/day.

b) Excavator

Standard work volume of excavator is calculated by the formula below:

$Q = 3,600 \times q_0 \times K \times f \times E / C_m$

Q: Standard work volume (m^3/h), q_0: Bucket capacity (m^3), K: Bucket coefficient (0.8), f: Conversion factor of soil (1.0/1.3), E: operation efficiency (0.8), C_m: Cycle time (32 sec)

In case of 0.8 m^3 of bucket capacity, the standard work volume is calculated as 44 m^3/hour:

$Q= 3,600 \times 0.8 \times 0.8 \times (1/1.3) \times 0.8 / 32 = 44$ m^3/h

c) Wheel loader

Standard work volume of wheel loader is calculated by the same formula as excavator:

$Q = 3,600 \times q_0 \times K \times f \times E / C_m$

Q: Standard work volume (m^3/h), q_0: Bucket capacity (m^3), K: Bucket coefficient (0.7), f: Conversion factor of soil (1.0), E: operation efficiency (0.55), C_m: Cycle time (43 sec)

According to the methodology mentioned above, effective capacity of the existing heavy equipment in 2016 are estimated as shown Table 2-14.

Table 2-14 Effective Capacity of Existing Heavy Equipment

Equipment		Manufacture	Purchase year	Operating Weight or bucket capacity	Standard work volume (m^3/day)	Efficiency rate*	Working time	Effective capacity (m^3/day)
1	Bulldozer	CAT	2002	37 ton	900 m^3/shift	75%	2 shift	1,350
2	Bulldozer	CAT	2002	37 ton	900 m^3/shift	75%	2 shift	1,350
3	Bulldozer	XCMG	2012	39 ton	900 m^3/shift	100%	2 shift	1,800
4	Bulldozer	XCMG	2012	39 ton	900 m^3/shift	100%	2 shift	1,800
5	Excavator	CAT	2001	0.8 m^3	44 m^3/h	75%	6 hours	198
6	Wheel loader	CAT	2001	2.7 m^3	86 m^3/h	75%	6 hours	387
7	Wheel loader	XCMG	2012	3.0 m^3	96 m^3/h	100%	6 hours	576
8	Wheel loader	XCMG	2012	3.0 m^3	96 m^3/h	100%	6 hours	576

Note: *: same as collection vehicles

In comparison between required work volume and effective capacity of the existing bulldozers, three new bulldozers will be procured by the Project, as shown in Table 2-15. Existing four bulldozers should be re-allocated in consideration of the planned disposal amount.

Table 2-15 Procurement Plan for Bulldozer

	Required work volume (m^3/day)	Existing Bulldozer (m^3/day)	New bulldozer					Total (m^3/day)
			Unit	Operating Weight (ton)	Standard work volume (m^3/day)	No. of shift (shift)	Capacity (m^3/day)	
Khartoum LFS	1,067	1,350 (CAT)	0	-	-	-	-	1,350
Bahri LFS	2,639	1,350 (CAT)	1	21	600	2	1,200	2,550
Omdurman LFS	6,192	3,600 (CAT,XCMG)	2	21	600	2	2,400	6,000

At present, there is one excavator operating in Bahri LFS. A comparison between required work volume and effective capacity of existing one shows that two new excavators will be procured by the Project, as shown in Table 2-16.

Table 2-16 Procurement Plan for Excavator

	Required work volume (m^3/day)	Existing Excavator (m^3/day)	New Excavator					Total (m^3/day)
			Unit	Bucket (ton)	Standard work volume (m^3/day)	Operation time (hours)	Capacity (m^3/day)	
Khartoum LFS	65		1	0.8	44	2	88	88
Bahri LFS	161	198	-	-	-	-	-	198
Omdurman LFS	378		1	0.8	44	9	396	396

The offices at landfill sites are equipped with 2m^3 capacity water tanks. It is appropriate that one water tanker with 6m^3 of capacity will be procured by the Project.

(3) Technical Specification

a) Bulldozer or Landfill loader

(Bulldozer)

- Engine Max. Output: 240 HP
- Operating Weight: 24 ton class

(Landfill loader)

- Engine Max. Output: 260 HP

- Operating Weight: 21 ton class

b) Excavator

- Bucket Capacity: 0.8m^3 （SAE heaped）
- Engine Max. Output: 140 HP
- Operating Weight: 19 ton

c) Water Tanker

- Tank Capacity: 6m^3
- Chassis Operation: Left hand steering wheel, manual transmission
- Chassis drive system: 4 x 2 rear drive

2-2-2-3 Waste Management Flow and Equipment Plan for Target Year

The waste management flow and equipment plan for 2016 are shown in Figure 2-4. It is expected that 5,752 tons of waste a day will be generated throughout Khartoum State, of which 4,647 tons/day will be collected. The existing 249 collecting vehicles will collect 3,338 tons/day and the 80 new vehicles will collect 1,309 tons/day. Of the total collected volume, 4,059 tons/day will be transported through transfer stations and 663 tons/day will be transported directly to the landfill site. The volume to be transported to the Bahri transfer station (1,150 tons/day) will exceed the transportation capacity (819 tons/day) of the transfer vehicles (trailers). However, the number of trips made by the transfer vehicles is estimated at the maximum value at present. If the operating hours of the trailers are longer, a higher number of trips will be achieved. The final treatment volume in Khartoum State is estimated at 4,647 tons/day and 8 existing pieces of heavy equipment currently in operation and 5 new pieces of heavy equipment will be used for the treatment work.

Unit:t/d

Generation	Collection	Transfer Station	Landfill Site

Khartoum Locality

Generation	1,787
Households	715
Markets	1,072

Khartoum LCA — Collection rate: 81%

	Existing vehicles			New vehicles			Total
	No.	Trips	Amount	No.	Trips	Amount	t/d
Compactor	56	3	732	11	3	172	904
CC	3	12	115	12	5	222	337
Tractor	0	3	0	-	-	-	0
Open truck	-	-	-	-	-	-	0
Private vehicle	-	-	200	-	-	-	200
Total	59	-	1,047	23	-	394	1,441

Khartoum TS

Transported waste 1,441 t/d

Capacity

	No.	Trips	Amount
Trailer	9	5	1,820

Um Badda Locality

Generation	639
Households	454
Markets	185

Um Badda LCA — Collection rate: 80%

	Existing vehicles			New vehicles			Total
	No.	Trips	Amount	No.	Trips	Amount	t/d
Compactor	22	3	407	2	3	31	438
CC	-	-	0	3	4	44	44
Tractor	10	2	32	-	-	-	32
Open truck	-	-	-	-	-	-	0
Private vehicle	-	-	0	-	-	-	0
Total	32	-	439	5	-	75	514

Direct transportation 73

Omdurman Locality

Generation	638
Households	364
Markets	274

Omdurman LCA — Collection rate: 82%

	Existing vehicles			New vehicles			Total
	No.	Trips	Amount	No.	Trips	Amount	t/d
Compactor	20	3	331	5	3	78	409
CC	0	-	0	4	5	74	74
Tractor	8	3	38	-	-	-	38
Open truck	-	-	-	-	-	-	0
Private vehicle	-	-	0	-	-	-	0
Total	28	-	369	9	-	152	521

Omdurman TS

Transported waste 1,393 t/d

Capacity

	No.	Trips	Amount
Trailer	6	6	1,420

Karary Locality

Generation	538
Households	393
Markets	145

Karary LCA — Collection rate: 80%

	Existing vehicles			New vehicles			Total
	No.	Trips	Amount	No.	Trips	Amount	t/d
Compactor	24	2, 3	322	2	3	31	353
CC	0	-	0	2	4	30	30
Tractor	10	3	48	-	-	-	48
Open truck	-	-	-	-	-	-	0
Private vehicle	-	-	0	-	-	-	0
Total	34	-	370	4	-	61	431

Omdurman LFS

Disposed waste (t/d) 2,907

	Existing	New
Bulldozer	2	2
Wheel loader	1	0
Excavator	0	1

Bahri Locality

Generation	798
Households	630
Markets	168

Bahri LCA — Collection rate: 81%

	Existing vehicles			New vehicles			Total
	No.	Trips	Amount	No.	Trips	Amount	t/d
Compactor	19	3	283	10	3	156	439
CC	1	3	10	9	5	167	177
Tractor	7	3	32	-	-	-	32
Open truck	-	-	-	-	-	-	0
Private vehicle	-	-	0	-	-	-	0
Total	27	-	325	19	-	323	648

Bahri TS

Transported waste 1,150

Capacity

	No.	Trips	Amount
Trailer	4	6	819

Sharg En Nile Locality

Generation	731
Households	585
Markets	146

Sharg En Nile LCA — Collection rate: 81%

	Existing vehicles			New vehicles			Total
	No.	Trips	Amount	No.	Trips	Amount	t/d
Compactor	18	3	300	7	3	109	409
CC	1	11	35	7	4	104	139
Tractor	9	3	43	-	-	-	43
Open truck	-	-	-	-	-	-	0
Private vehicle	-	-	0	-	-	-	0
Total	28	-	378	14	-	213	591

Direct transportation 89

Bahri LFS

Disposed waste (t/d) 1,239

	Existing	New
Bulldozer	1	1
Wheel loader	1	0
Excavator	1	0

Jabal Aulia locality

Generation	621
Households	410
Markets	211

Jabal Aulia LCA — Collection rate: 81%

	Existing vehicles			New vehicles			Total
	No.	Trips	Amount	No.	Trips	Amount	t/d
Compactor	26	3	363	3	3	47	410
CC	1	3	18	3	4	44	62
Tractor	8	3	29	-	-	-	29
Open truck	-	-	-	-	-	-	0
Private vehicle	-	-	0	-	-	-	0
Total	35	-	410	6	-	91	501

Direct transportation 501

Khartoum LFS

Disposed waste (t/d) 501

	Existing	New
Bulldozer	1	0
Wheel loader	1	0
Excavator	0	1

Khartoum State

Generation	5,752
Households	3,551
Markets	2,201

Khartoum State — Collection rate: 81%

	Existing vehicles			New vehicles			Total
	No.	Trips	Amount	No.	Trips	Amount	t/d
Compactor	185	-	2738	40	-	624	3,362
CC	6	-	178	40	-	685	863
Tractor	52	-	222	0	-	0	222
Open truck	0	-	0	0	-	0	0
Private vehicle	0	-	200	0	-	0	200
Total	243	-	3,338	80	-	1,309	4,647

Transfer stations

Transported waste 3,984

Capacity

	No.	Trips	Amount
Trailer	19	-	4059

Direct transportation 663

Landfill sites

Disposed waste (t/d) 4,647

	Existing	New
Bulldozer	4	3
Wheel loader	3	0
Excavator	1	2

Proposed number of new equipment

Compactor	40
Container Carrier Arm Type	40
Bulldozer	3
Wheel loader	0
Excavator	2
Water tanker	1

Figure 2-4 Waste Management Flow including Equipment Plan

2-2-2-4 Construction Plan and Outline Design Drawings

For the planned construction site of the Central Workshop, construction land of sufficient area has been secured. The results of leveling have made clear that it is almost flat with no slopes and the ground has a constant hardness. The topographic and geologic conditions will hardly restrict the layout plan. Therefore, it is planned to set the flow line for vehicles to enter from the paved road on the east side, provide IN/OUT gates for vehicles to go to and from the plant working bays on the north side where there is little direct sunlight, and provide administration office space on the first floor on the south side. For the vehicle flow line and the facilities, the layout plan will provide an approach from the paved road on the east side. It is also planned to minimize the interference between adjacent facilities by considering the convenient use of neighboring facilities. The facility buildings will have a large span structure, in which the steel roof frame is designed to prevent deflections due to the large span and form an arch-type frame section to decrease their size. For the roof materials, lightweight galvalume steel sheets with a thickness of 0.8mm will be used and will be installed by a robust installation method so that they have sufficient durability against the sandstorms (*haboob* of 20m/s or more) peculiar to Sudan.

(1) Construction Plan for Central Workshop

1) Working Bays

For the construction of the Central Workshop in this Project, the number of working bays for periodical inspection, maintenance and repair of 80 vehicles to be newly introduced will be calculated as follows:

$$\text{Number of working bays} = \frac{\text{Yearly hours of periodical inspection/maintenance work}}{\text{Yearly work hours at workshop}}$$

$$= \frac{\text{(Standard working hours) x (number of vehicles) x (Number of inspections per year)}}{\text{(Number of working days per year) x (Daily working hours)}}$$

a) Setting parameters (Standard work hours)

For skilled workers working in the Middle East and Africa, the modification factor is 3.5 times the labor productivity per unit of Japan. In view of this, the standard working hours for periodical inspection/maintenance per vehicle in Sudan is deemed to be 4 hours, 2.0 times that in Japan, if 2hrs is assumed. The daily working hours for mechanics is estimated to be 5.5 hours by subtracting the hours for breaks and worship times from the 7 working hours per day in Sudan.

b) Number of vehicles

The vehicles estimated for inspection, maintenance and repair in this Project will be 80 new vehicles.

c) Number of periodical inspections per year

The periodical inspection will be made 12 times per year or once per month.

d) Daily working hours and yearly working days

$$\text{Number of working bays} = \frac{\text{Yearly hours for periodical inspection/maintenance work}}{\text{Yearly working hours at workshop}}$$

$$= \frac{\text{(4 hours) x (80 vehicles) x (12 times)}}{\text{(264 days) x (5.5 hours)}} = 2.64 \text{ bays} \Rightarrow 3 \text{ bays}$$

A total of 5 working bays is estimated necessary: 2 working bays for long-time repairs, and the 3 bays necessary for periodical inspection and maintenance at the Central Workshop as given by the above equation.

Each working bay is planned to occupy a space of 6m wide x 10m long x 5m high (equal to the operating height of a container carrier), to allow inspection and maintenance of 7-ton container carrier (arm type) vehicles.

2) Washing Area

Considering that periodical washing of vehicles enhances their maintainability, a washing area for a vehicle will be provided. In addition, it is planned to introduce a high pressure car wash for washing vehicles at high pressure.

3) Air Conditioning/Ventilation System

The planned construction site is expected to have sufficient air ventilation, and the working bays will be provided with a natural air ventilation system. The office will be equipped with an air conditioning and ventilation system to ensure indoor air conditioning.

4) Electrical Equipment

The electricity distribution network is provided up to around the planned construction site of the Central Workshop, but no power is supplied to the site yet. The new distribution network will be provided up to the Central Workshop area after the construction of new substation next to the construction site is finished. Due to the electricity situation in Sudan, a generator (50kVA) will be installed as a standby power supply system, so that the maintenance and repair works can be carried out even in case of power failure. The standby power supply system will allow operation of the lighting, ceiling fans and water supply pumps.

5) Maintenance Equipment and Tools for Central Workshop

It is planned to provide the maintenance equipment and tools necessary for the periodical inspection and maintenance works and a storage as administration space to prevent the possible loss of equipment and tools.

6) Administration Section

a) Office

It is planned to provide an office as space for vehicle maintenance by SACKS.

b) Toilets

Toilets for office staff and guests will be provided for men and women. Toilets for the mechanics in the workshop will be provided separately.

Table 2-17 Scale of Project Facilities (Central Workshop)

Item	Structure	Facilities	Total Building Floor Area (m^2)		
			1 Building	Number of Buildings	Total
Central Workshop	・Structure: Reinforced concrete ・Roof framework: Steel frame ・Roof: Hot-dip aluminum-zinc alloy-coated steel sheet (Galvalume Steel Sheet) 0.8mm ・Wall: Concrete masonry	5 Working Bays, Washing Area, Storage, Electrical & Mechanical Room, 1 Office,	708 m^2	1	708 m^2

Item	Structure	Facilities	Total Building Floor Area (m^2)		
			1 Building	Number of Buildings	Total
	・External wall: Concrete block masonry + Brick masonry ・Floor: Steel trowel finish mortar + Oil-resistant coating (Working Bay), tiled (Office) ・Hygienic equipment: Water supply system, Septic tank, Oil & water separator pit, Soak Pit, Water pump ・Electrical equipment: 50kVA generator,11kV/415-240V Power distribution panel	Open Area, Entrance Hall, Toilets, Kitchen			
Total				1	708 m^2

2-2-2-5 Equipment Maintenance Plan

The Project plans the equipment maintenance in the Central Workshop to include the equipment and tools necessary for general periodical inspection and maintenance works.

For the Locality Workshops in the seven LCAs in Khartoum State, it is planned to provide equipment and tools that require the minimum number and level of maintenance and can be procured locally.

Table 2-18 Planned Equipment for Vehicle Maintenance (Central Workshop)

No.	Workshop Equipment Items	Unit	Quantity
1	Air Compressor		
(1)	Air Compressor	unit	1
(2)	Air Reservoir Tank	unit	1
(3)	Air Hose Reel	pcs.	10
2	Hot Water High Pressure Washer	unit	1
3	Hydraulic Garage Jack		
(1)	Hydraulic Garage Jack 2t	unit	1
(2)	Hydraulic Garage Jack 5t	unit	1
4	Rigid Rack 3t	set	1
5	Drill, Grinder, Cutter and Abrasive Tool Set		
(1)	Bench Drill Press	unit	1
(2)	Electric Hand Drill	pcs.	2
(3)	Disc Grinder	pcs.	2
(4)	High-speed Abrasive Cutter	pc.	1
(5)	Bench Grinder	pc.	1
(6)	Cord Reel	pcs.	4
6	Tire Changer		
(1)	Tire Changer	unit	1
(2)	Wheel Dolly	pc.	1
(3)	Tire Lever Set	set	1
7	Diesel Engine Welder	unit	1
8	Oxygen Acetylene Gas Welder Set	set	1
9	Air Impact Wrench		
(1)	Air Impact Wrench (3/4”)	pc.	1
(2)	Air Impact Wrench (1”)	pc.	1
10	Air Blow Gun	pcs.	10
11	Gas Manifold Set for Air Conditioner	set	1
12	Mechanic Tool Set for Automobile	set	4
13	Mechanic Tool Set for Large Vehicle	set	4

No.	Workshop Equipment Items	Unit	Quantity
14	Electrician's Tool Set	set	1
15	Standard Measuring Tools	set	1
(1)	Vernier Caliper Gauge	pc.	1
(2)	Micrometer Set	set	1
(3)	Dial Indicator	pc.	1
(4)	Magnetic Base	pc.	1
(5)	Measuring Tape	pc.	1
(6)	Tachometer	pc.	1
(7)	Torque Wrench (1/2")	pc.	1
(8)	Torque Wrench (3/4")	pc.	1
16	Nozzle Tester	pc.	1
17	Electrical Test and Repair Set		
(1)	Digital Circuit Tester	pcs.	2
(2)	Solderless Terminal Kit	set	2
18	Battery Quick Charger	unit	1
19	Grease Supply Set		
(1)	Grease Pump	pc.	1
(2)	Grease Gun	pc.	1
20	Drain Pan (Cleaning Pan)	pcs.	3
21	Drum Can	pcs.	3
22	Work Bench Set		
(1)	Work Bench	pcs.	4
(2)	Mobile Work Bench	pcs.	4
(3)	Steel Cabinet	pcs.	2
23	Drum Pump	pcs.	2
24	Shop Press 15t	unit	1
25	Service Creeper	pcs.	4
26	Lift Materials	set	1
27	Parts Washing Stand	pc.	1
28	Paint Spray Gun with Container	pc.	1

Table 2-19 Planned Equipment for Vehicle Maintenance (Locality Workshop)

No.	Workshop Equipment Items	Unit	Quantity
1	Mechanic Tool Set		
(1)	3/4" Sq. Drive Socket Set	set	7
(2)	3/8" Sq. Drive Socket Set	set	7
(3)	Combination Spanner Set	set	7
(4)	Heavy Duty Combination Spanner Set	set	7
(5)	Adjustable Wrenches	set	7
(6)	Ratchet Torque Wrench	set	7
(7)	Adjustable Pipe Wrench	set	7
(8)	Adjustable Pipe Wrench	set	7
(9)	Strap Wrench	set	7
(10)	Angle Key Set	set	7
(11)	Angle Key Set	set	7
(12)	Long Pattern Hexagon Key Set	set	7
(13)	Driver Set	set	7
(14)	Fiberglass Shaft Club Hammers	set	7
(15)	Fiberglass Shaft Sledge Hammers	set	7
(16)	36" Utility Bar	set	7
(17)	Pry Nail Bar	set	7
(18)	Pliers Set	set	7
(19)	Crimping Tool	set	7

No.	Workshop Equipment Items	Unit	Quantity
(20)	Roller Cabinet	set	7
2	Drill, Grinder, Cutter and Abrasive Tool Set		
(1)	Steel Hacksaw Frame	set	7
(2)	Bench Vices	set	7
(3)	Chisel & Punch Set	set	7
(4)	Needle File Set	set	7
3	Standard Measuring Tools Set		
(1)	20 Blade Metric Feeler Gauge Set	set	7
(2)	Digital Multimeter	set	7
(3)	Vernier Caliper	set	7
(4)	Tap & Die Set	set	7

2-2-3 Outline Design Drawings

Outline design drawings are shown in Figure 2-5 to Figure 2-9.

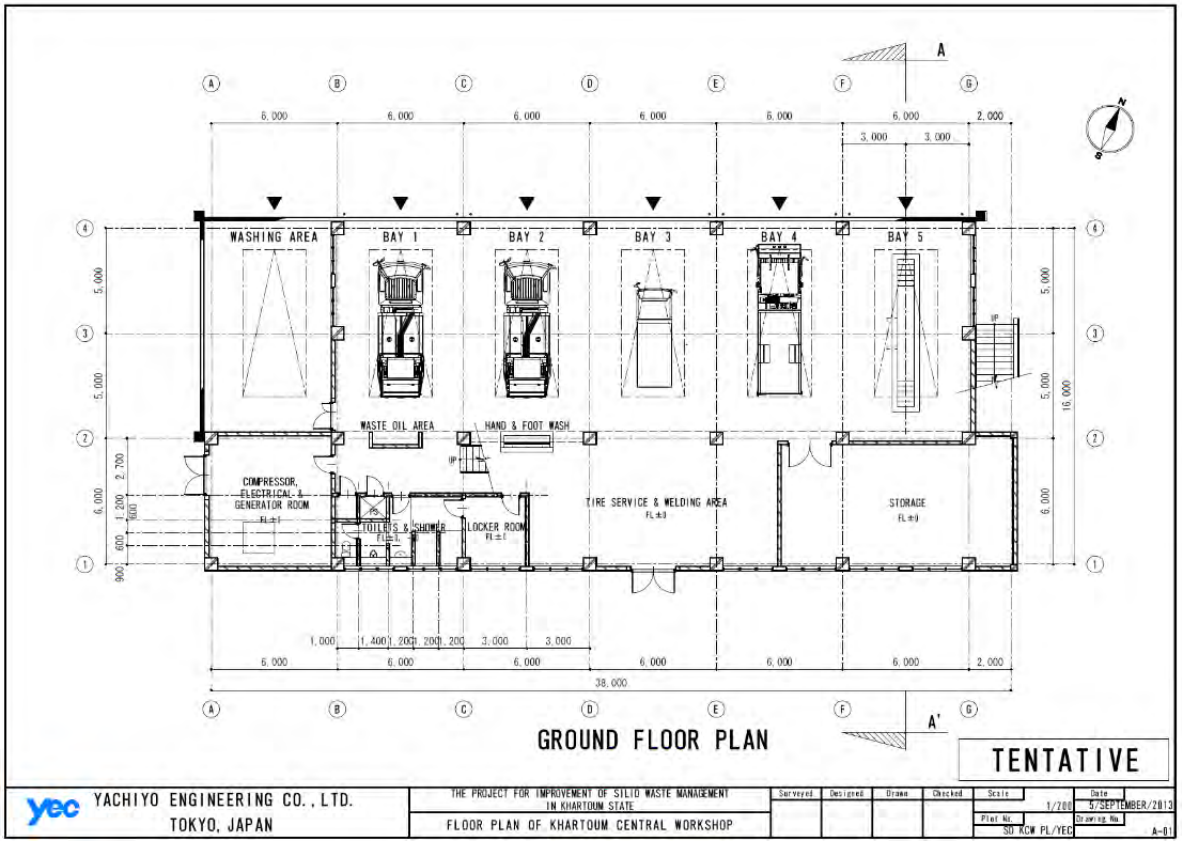


Figure 2-5 Ground Floor Plan

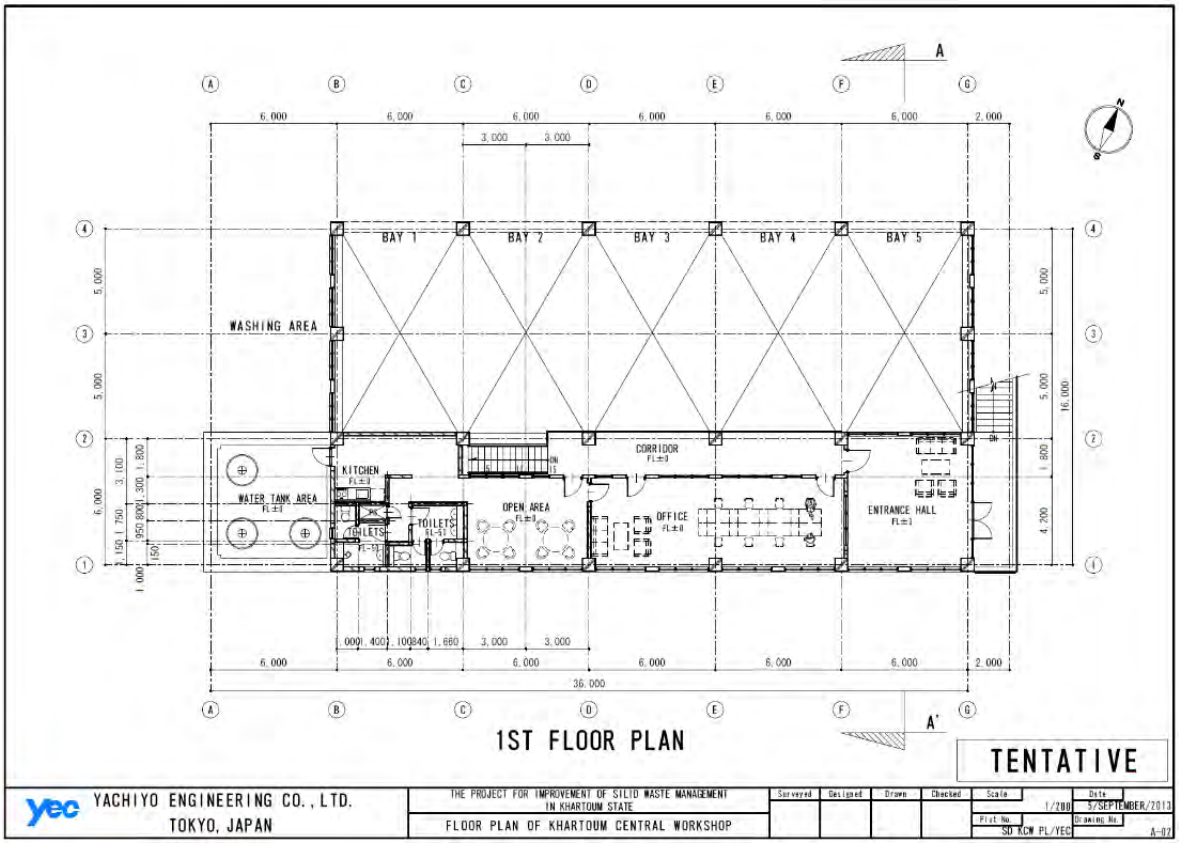


Figure 2-6 1st Floor Plans

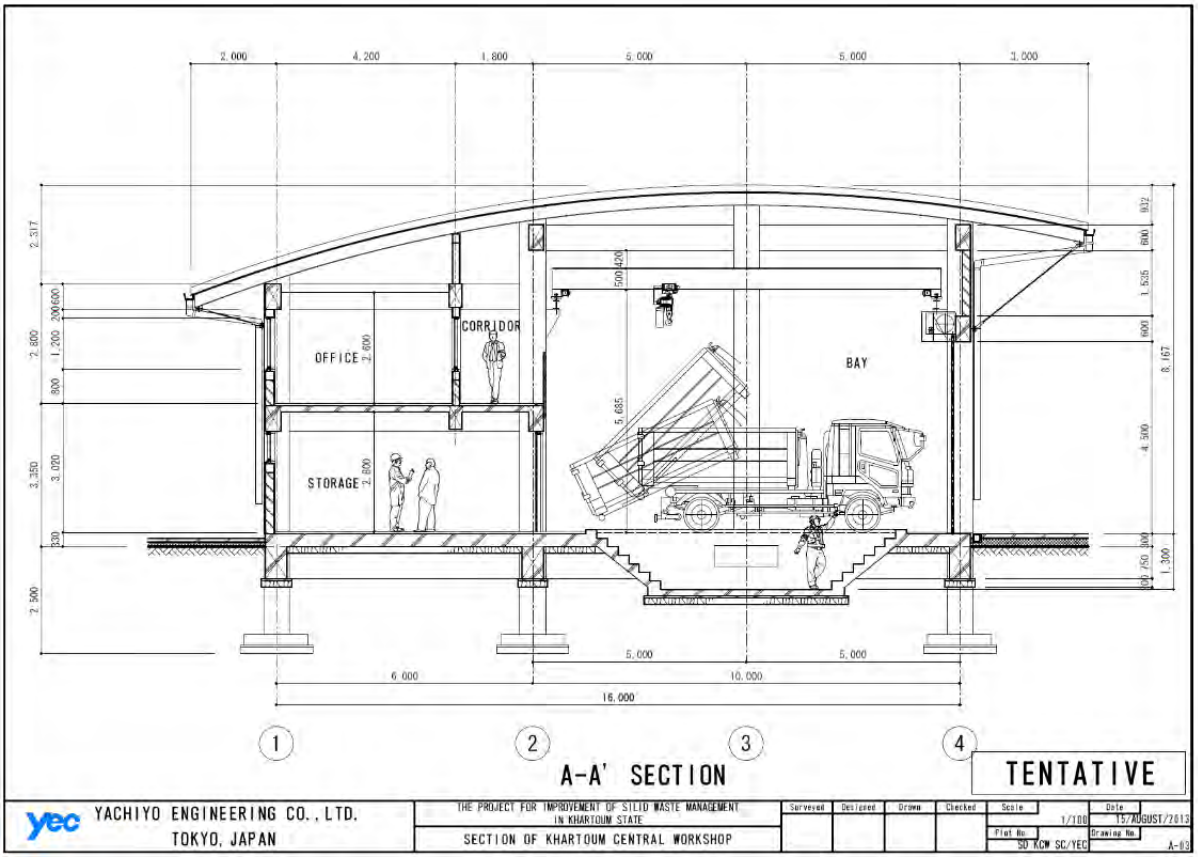


Figure 2-7 Sectional View

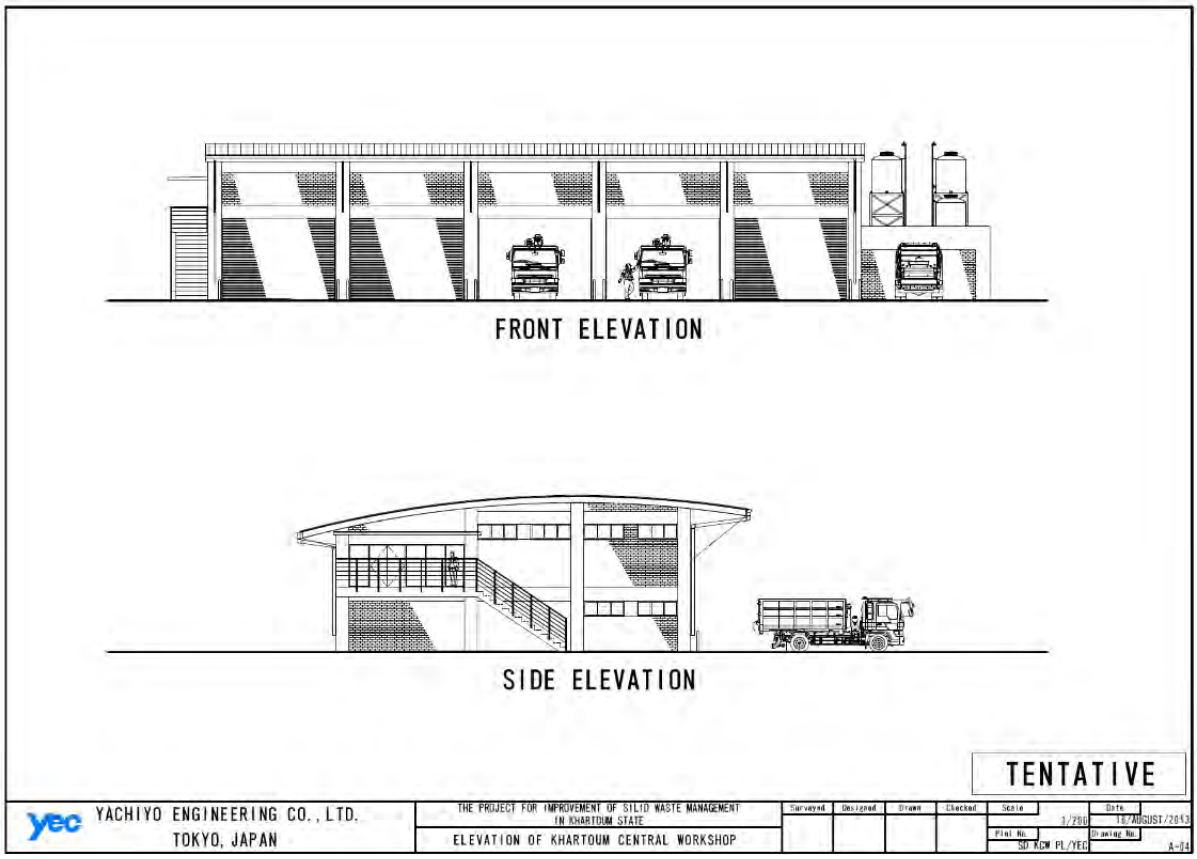


Figure 2-8 Elevation View

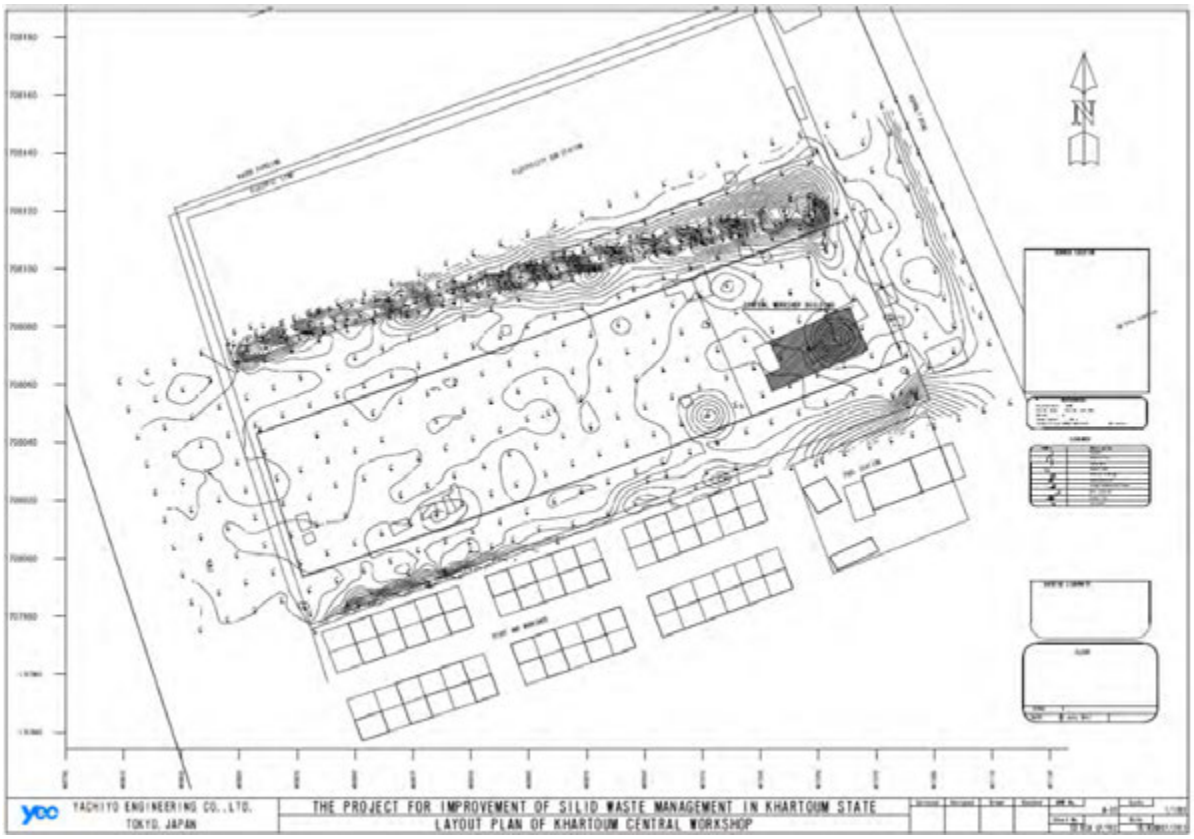


Figure 2-9 Layout Plan

Image of the Central Workshop is shown in Figure 2-10.

Figure 2-10 Image of Central Workshop

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

(1) Project Implementing Agency

The Government of Sudan will select the Consultant and the constructors and award the contracts after the conclusion of the Exchange of Notes (E/N) and Grant Agreement (G/A) for this Grant Aid Project. The organizational system to implement this Project in Sudan is described below.

a) Responsible Supervisory Body

The responsible supervisory body of this Project is MEFPD, under which the Department of Environmental Affairs will take charge of the actual activities in the Project.

b) Implementing Organization

The implementing organization of this Project is SACKS, under which the Department of Planning and research will take charge of the actual activities in the Project.

The Central Workshop and the equipment of this Project will be owned by SACKS, and the vehicles for waste collection will be operated and maintained by the 7 LCAs. To promote this Project smoothly, MEFPD and SACKS will be required to maintain close communications and hold discussions with the Japanese Consultant and contractors and to select a responsible person to be in charge of this Project.

(2) Consultant

To promote the facility construction works and procurement of equipment and materials in this Project, the Japanese Consultant will enter into a Design and Supervision Agreement with SACKS to implement the detailed design and procurement/construction supervision works in this Project. The Consultant will also prepare the tender document and undertake the tendering work on behalf of SACKS as the implementing entity of this Project. The consulting works to be performed in the implementing processes of this Project are described below.

a) Detailed design

The Consultant will make a detailed design based on the outline design of this Project and prepare the tender document. Furthermore, the Consultant will check the equipment specifications and evaluate the bidders and tender companies. The Consultant will also undertake technical questions and answers regarding the contents of the tender document and evaluate the technical proposals submitted by the bidders in an appropriate manner.

b) Procurement / Construction Supervision

The Consultant will undertake supervision of the equipment procurement and facility construction works. The Consultant will check the quality, functions and quantities of procured equipment and materials, supervise the construction quality, construction processes and safety in the construction of the facilities, and check any damage to such equipment and materials. If any defect is found in the checked items, the Consultant will report it promptly and discuss countermeasures with the related parties. The Consultant will also evaluate the finished works performed by the constructors.

(3) Contractor

The contractor will be a Japanese corporation which will be selected by the Sudanese side through open tendering within the grant aid framework of Japan, and the contractor will implement the equipment procurement, initial training in operation of the equipment and construction of the facilities. The contactor is also expected to undertake the supply of spare parts, and after-sale services such as actions against equipment failure. In response to these requirements, the contractor will have to give due consideration in coordination with the Sudanese side after the handover of the equipment / materials and facilities.

In the tendering for equipment procurement, Japanese products will be procured from Japanese vendors in principle, but the equipment specifications for tender should allow a wide range of procurers and manufacturers to participate in the tender and not biased toward limited manufacturers. However, as the number of Japanese manufacturers is very limited for the heavy equipment to be procured in the Project, tender competitiveness will be ensured by including procurement from third countries and defining a wide range of specifications. For the vehicles for waste collection to be procured in this Project, vehicles made in Japan have been imported to Sudan, and training in initial operation and detailed operation to the minimum necessary extent will be provided by the procurers (manufacturers). It is also planned to procure the equipment for vehicle maintenance in the Central Workshop and local workshops as one lot.

In the construction of the workshops, much of the equipment and materials and labor that are required for the construction of the workshops in this Project can be procured in Sudan. However, some of the equipment will be Japanese products and there are few field leaders in Sudan who can control all the work processes including work schedules, quality and finished work as well as safety management. Therefore, the construction work will be undertaken by a Japanese contractor as part of the equipment to be procured from Japan.

(4) Necessity for Dispatch of Engineers

For the vehicles and heavy equipment, it is necessary to provide technical training (OJT) in operation and maintenance under the guidance of Japanese engineers to be dispatched from the respective equipment manufacturers. In addition, it is also necessary to dispatch field leaders who understand the grant aid scheme of Japan, and can manage and guide the workers by supervising the work schedule, quality and finished work and implementing safety management through the entire work of the facility construction in this Project. However, field workers will be employed locally as a rule.

(5) Tendering Method

With regard to the tender method, the Project recommends that the construction of the Central Workshop, and the procurement of the equipment, including vehicles, heavy equipment and vehicle maintenance equipment, should be tendered separately. For each process of both the construction of the facilities and the procurement of equipment, transportation of the components will not be made in the same period, and it is desirable that

different contractors or suppliers be used. Therefore, it is expected that separated contractors or suppliers for the procurement and construction will be adopted.

2-2-4-2 Implementation Conditions

(1) Use of Local Contractors

Since large-scale construction projects have been implemented in Khartoum State and there are several general construction companies in the state, as mentioned above (see 2-2-1-4), local contraction companies are to be used for the procurement of workers, transportation vehicles, construction materials and construction equipment in Sudan and the employment of skilled worker and general workers for the construction work. However, as this Project is to be implemented as a Japanese Grant Aid Project and its implementation has to be coordinated with the implementation of related Technical Cooperation Project, it is essential for schedule, quality and safety control of the construction works that a Japanese engineer belonging to Japanese construction company will be in there and manage the works. Japanese supplier will conduct the implementation of OJT by the Japanese engineer to the Sudanese engineers (drivers of vehicles for waste collection and auto mechanics) after procurement of the equipment.

(2) Use of Locally Available Materials and Equipment

Aggregate, cement, reinforcement bars and steel frames for the construction work can be procured in Sudan. These materials have been used in many construction projects. Therefore, locally available materials and equipment shall be used as far as possible in the project for the development of the local industry. Meanwhile, most of the equipment for vehicle maintenance used in Sudan is imported. Therefore, the equipment for the maintenance of the vehicles in this Project shall be procured from Japan for their high quality. Special equipment, such as the crane to be installed in the incidental systems, shall be procured from Japan, because it is difficult to procure such equipment in Sudan.

(3) Safety Measures

It is believed that there are relatively few security problems, including general crime, in Sudan compared with neighboring countries. The planned facility construction site of this Project is located in Khartoum. The easily accessible location of the site will make monitoring of the construction easy. Nonetheless, since sufficient measures will have to be taken to prevent theft of materials and equipment and to ensure the safety of the people involved in the construction work, the Sudanese and Japanese sides shall prepare their own safety measures.

After the official announcement of the abolition of fuel subsidies provided by the Government of Sudan during this Survey, the Sudanese people organized protests against the abolition on various scales at various locations, mostly in Khartoum State but also in the rest of the country. These protest actions caused no visible damage to the planned facility construction site. However, as similar protests (e.g. against price rises) could occur in the future, the Japanese experts who will supervise the procurement and construction will have to take the necessary precautions to ensure their safety.

(4) Customs Clearance and Tax Exemption Procedures

The Sudanese side is responsible for the procedures required for tax exemption (including exemption from value added tax) for the materials and equipment to be procured in this Project. As the complex procedures may delay the progress of the work, the contractor will have to monitor the progress of the procedures. The Sudan Standards and Metrology Organization (SSMO) usually inspects imported goods for compliance with Sudanese standards before customs clearance. The Consultant shall study the documents obtained from the SSMO to learn the types of materials and equipment inspected and details of their inspection and prepare a procurement / consultant supervision plan incorporating the time required for and measures to be taken for the inspection.

(5) Countries of Origin of Equipment to be Procured

JICA Survey Team confirmed the existence of products procured from Japan and Europe and the presence of several local agents of major foreign manufacturing companies in Sudan. Therefore, for the procurement of equipment, third countries will be adopted as eligible source countries considering that spare parts for the equipment concerned can be procured easily after the completion of the Project.

2-2-4-3 Scope of Works

The division of the work between the Japanese and Sudanese sides is shown in "Table 2-29 Major Undertakings to be taken by Each Government" in this chapter.

2-2-4-4 Consultant Supervision

(1) Basic Policy on Consultant Supervision

The Consultant shall form a project team responsible for both the preparation of detailed designs and the supervision of the construction work and procurement for smooth implementation of the project activities within the framework of the grant aid cooperation system of the Government of Japan and with an understanding of the main points of the outline design. The Consultant shall dispatch engineers specialized in facility construction, inspection of equipment and materials and on-site initial training in operation, etc. to the project site in accordance with the progress of the Project and have them provide instruction to and supervise the contractor in order to make sure that the contractor implements the work schedule control, quality control, finished work control and safety control as planned. The major conditions to be satisfied in supervision of the procurement and construction are as follows:

a) Work schedule control

The Consultant shall demand that the contractor completes its work by the date explicitly described in the agreement without fail and shall monitor the weekly and monthly progress of the work. When a delay in the schedule is foreseen, the Consultant shall inform JICA and warn the contractor of the possible delay and request the contractor to submit a plan for countermeasures and implement them. The following shall be used as the main methods for comparison between the planned schedule and actual progress:

(i) Verification of the quantities of finished work (quantities of finished work manufactured at and shipped from the plants concerned)
(ii) Verification of the record of the materials and equipment delivered to the project site
(iii) Verification of the man-hours and actual number of engineers, skilled workers and general workers on the site

b) Quality and finished work control

The Consultant shall control the quality and quantities of finished work using the items mentioned below in order to ensure that the procured equipment and completed facilities satisfy the quality and forms of the finished works explicitly described in the contract documents. If the results of the verification and inspection raise concern over the work, the Consultant shall demand the contractor to review and modify the work procedures without delay.

(i) Inspection of the conformity of the equipment with the specifications
(ii) Inspection of the conformity of the equipment with production drawings and specifications
(iii) Participation in factory inspections or inspection of factory inspection results
(iv) Inspection of the initial guidance in equipment operation / training in adjustment and operation of the equipment and the conformity of the inspection manual
(v) Inspection of the conformity of the facilities with the working drawings and specifications
(vi) Inspection of the completed work for conformity with the required specifications at the time of construction supervision

c) Labor management

The Consultant shall hold due discussions with the persons in charge of safety management in the contractor company to prevent the occurrence of industrial accidents and injuries and accidents involving third parties at the site during the period of the construction work. The following are the conditions to be satisfied for safety management at the site:

(i) Establishment of rules on safety management and selection of persons in charge of safety management
(ii) Establishment of traffic routes for the construction vehicles and transport equipment and strict adherence to safe driving
(iii) Implementation of welfare programs for workers and mandatory days off

(2) Basic Policy on Supervision of Equipment Procurement

A large quantity of equipment is to be procured in this Project. The equipment is expected to be procured in Japan, Sudan and third countries. As this Project will be implemented simultaneously with a Technical Cooperation Project, the Consultant shall conduct a study on the number of days required for the transportation of materials and equipment and the time required for obtaining the required permits and approvals from the Sudanese authorities concerned so that supervision of the work schedule and quality of the work can be implemented without problem. The Consultant shall inspect all the equipment to be procured from various countries without fail and shall verify its conformity with the required specifications.

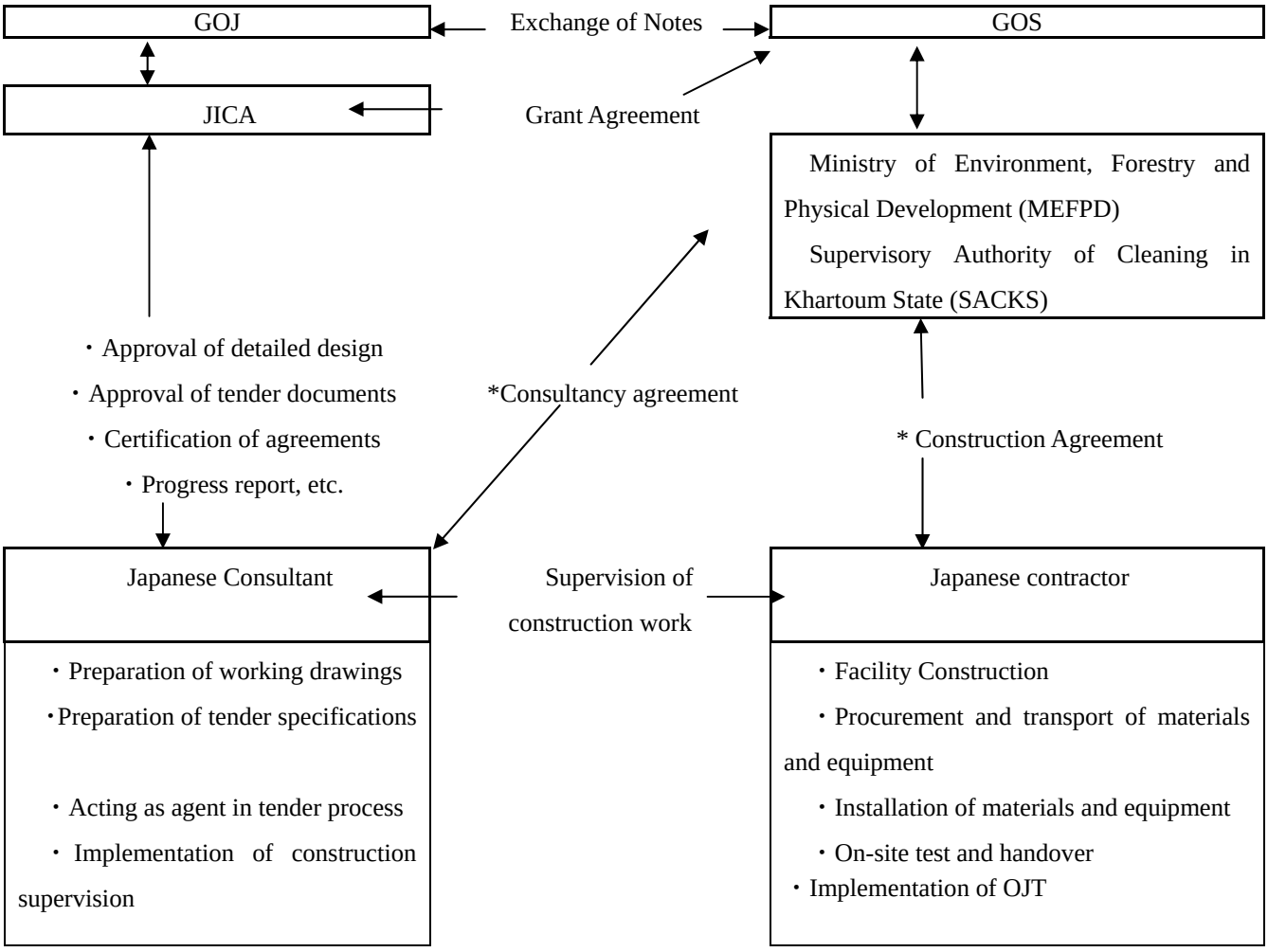
(3) Basic Policy on Supervision of Construction Work

As the basic policy on supervision of the construction work, the Consultant shall monitor the progress of the construction work to ensure that it is completed within the predetermined period, ensure that the procured equipment and completed facilities have the qualities and forms provided in the contract documents and that the procured equipment is delivered as planned. Moreover, the Contractor shall supervise and advise the contractor so that the construction work is implemented safely.

The planned facility construction site is in the Soba area, a newly-developed large-scale industrial zone, where infrastructure is being developed. The traffic conditions in the area are good enough for large vehicles to easily access the site by trunk road. The existence of a concrete plant and other plants near the site will make it relatively easy to procure some of the materials and transport them to the site. However, since external factors may delay the progress of the Project, the price rises mentioned in “2-4-2 Procurement and Construction Conditions (3) Safety measures” might make it difficult to procure the construction equipment, the Consultant shall monitor such external factors while monitoring the progress of the Project.

(4) Relationships between All the Parties involved in the Project Implementation

Figure 2-11 shows the relationships between the parties involved in the implementation of this Project, including the stage of implementation supervision.



Note: The consultancy agreement and the construction agreement require certification by JICA.

Figure 2-11 Relationships between the Parties involved in Project Implementation

2-2-4-5 Quality Control Plan

Quality control will be implemented concurrently with the Consultant supervision mentioned above (in 2-4-4). The Consultant shall verify whether the manufactured / delivered materials and equipment and constructed facilities satisfy the quality and forms specified in the contract documents, using the items mentioned below. The "Sudanese Standard Specifications (SDS)" based on British Standards are used as the standards for industrial products in Sudan. The Consultant shall examine the SDS for specifications applicable to this Project and the relevance of such specifications to the Project while preparing a quality control plan.

a) Inspection of working drawings for facility construction and specifications for the materials to be used

The Consultant shall require the Contractor to submit working drawings of the construction work that the Contractor is about to commence and examine the details. The Consultant shall also require the Contractor to submit the specifications and certificates of procurement of the materials that the Contractor intends to bring to the site. These measures are to maintain the quality of the work and materials.

b) On-site inspection of manufacture and production of materials and equipment or verification of the inspection results

The Consultant shall visit the plants manufacturing and assembling the construction materials to be procured in this Project to inspect the manufacturing and assembling work at the plants, to verify the quality of the raw

materials and to examine the product inspection certificates, as the need arises.

c) Monitoring and verification of the forms and finish of the finished work

The Consultant shall provide technical guidance to the Contractor and inspect the work on site at each stage of the construction work and the Contractor shall repair completely any defects detected in the inspection. The Consultant shall also inspect the form of the finished work for conformity with the working drawings.

d) Inspection records

The Consultant shall provide a locally-employed consultant with instructions regarding management guidelines and mandate the local consultant to keep inspection records of each construction material and work at each stage of the construction work for efficient and accurate work supervision. Table 2-20 shows the main items of quality control in facility construction.

Table 2-20 Quality Control Items (Facility Construction)

Type of work	Control item	Test (inspection) method	Time and location of test
Foundation work	Bearing capacity of ground	Plate bearing test	Two locations on spread foundation
Earthwork	Degree of compaction	Visual inspection	On entire bottom surface of foundation
	Analysis of quality of borrow soil (where necessary)	Grain size analysis	One place in borrow pit
Formwork	Form of finished work	Inspection of dimensions and photographs	All members
	Inspection of materials	Thickness, material and deformation of boards	All members
	Inspection of assembly	Visual inspection (of spaces, reinforcers and spacers)	All members
	Inspection of reinforcement arrangement	Number and diameter of reinforcement bars, interval between bars, length of splices, embedment length and cover thickness	Before every concrete casting at every site
Concrete work	Aggregate grading	Sieving test	Once
	Trial mix	Mixture, water-cement ratio, compressive strength, slump and salinity	Once
	Compressive strength	Compressive strength test	Once for each part
	Slump	Slump test	Once for each part
	Water quality analysis	Turbidity and salinity	Once
Reinforcement work	Tensile strength	Test for tensile strength	Once for each size
	Quality in general	Mill sheets	Once per manufacturing lot
Masonry work	Quality of bricks	Factory inspection	Once
	Quality of concrete blocks	Compressive strength test	Once per each size
Joinery work	Quality of fitting	Visual inspection and measurement	At time of delivery
Tools for vehicle maintenance	Quality in general and quantities	Visual inspection, commissioning, etc.	At time of delivery

The Consultant shall prepare a quality control plan for the maintenance equipment for the new and existing workshops using the outcome of the discussions with the staff members and engineers of SACKS as the basis for the plan. The Consultant will not conduct initial training in operation of Equipment for Vehicle Maintenance to be provided by the Contractor as the Consultant is planning to implement a soft component at

the new workshop.

2-2-4-6 Procurement Plan

(1) Equipment Procurement Plan

Procurement of equipment for waste collection, landfill management and vehicle maintenance for the existing workshops shall be included in the equipment procurement plan. Customs clearance for the equipment procured in Japan or third countries after its arrival at Port Sudan will be carried out either in the port or Gali Free Zone (bonded area) in Khartoum City. In the former case, the equipment will be transported to Khartoum City by trucks after customs clearance in general. In the latter case, uncleared equipment will be transported from Port Sudan to Khartoum by rail. Whichever method is used in this Project, the Contractor shall be responsible for transportation of the equipment until it is handed over to the Sudanese side in Khartoum State. Table 2-21 shows the countries from which equipment is to be procured in this Project.

a) Equipment for waste collection

The plan for the procurement of equipment for waste collection will be prepared on the assumption that all the equipment, with the exception of the containers which are to be procured in Sudan, shall be procured in Japan. Some of the waste collection vehicles currently in use in Sudan are Japanese made. Some Japanese automakers provide good repair and maintenance services in Sudan through their local agents. As different makers have different views on the types and quantities of spare parts required for vehicle maintenance, the Consultant will prepare a procurement plan using the following minimum pre-conditions derived from the past procurement records of similar projects:

- There should be a guarantee of maintenance and replacement of parts for one year after procurement.
- Spare parts for both chassis, which are manufactured by automakers, and bodies which are manufactured by body makers, shall be procured.

b) Equipment for landfill management

The equipment for landfill management to be procured in the Project includes bulldozers and excavators. Because of the economic sanctions against Sudan by the U.S.A., bulldozers can only be procured from a limited number of manufacturers. Therefore, the Consultant shall consider procurement from third countries. It is similarly difficult to procure excavators from major manufacturers. Nonetheless, the Consultant has concluded that the products of Japanese manufacturers satisfy the specifications required by this Project and that there are enough Japanese manufacturers ensuring sufficient competitiveness in the tender. Therefore, the Consultant shall prepare the procurement plan on the assumption that equipment manufactured in Japan will be procured in this Project. Several Japanese manufacturers of such heavy equipment also provide good repair and maintenance services in Sudan through their local agents. The Consultant shall use the same conditions as those used for the procurement of spare parts for the equipment for waste collection in the preparation of the procurement plan for landfill equipment.

c) Maintenance equipment for Central Workshop

The Consultant has decided the types and quantities of the maintenance tools and equipment which are to be procured in this Project as they will be required for the maintenance work to be performed in the Central Workshop, i.e. periodical inspections and pre-turnaround, taking into consideration the matters discussed in the meetings with SACKS. Since the main work at the Central Workshop will be maintenance and inspection of the Japanese-made vehicles to be procured in this Project, which is different from the main work at the existing workshops, Japanese products shall be procured for the Central Workshop, in principle.

d) Maintenance equipment for the Locality Workshops

All the maintenance equipment to be delivered to the Locality Workshops in each LCA shall be procured in

Sudan. Since the equipment concerned is general-purpose equipment readily available from the local agents of three or more manufacturers, the implementing organization shall be able to procure replacement or additional equipment after the completion of this Project. Therefore, the Consultant has decided to procure the equipment in the smallest quantities required for the implementation of this Project.

Table 2-21 Scope of Work (Equipment Procurement)

Item	Country of procurement			Remarks
	Sudan	Japan	Third country	
Vehicles for waste collection (with set of spare parts)	○	○		
Heavy equipment for disposal site (with set of spare parts)		○	○	For some types of equipment, Japanese products are not available in Sudan. Therefore, such equipment shall be procured from third countries (such as Germany).
Maintenance equipment for new workshop		○		
Maintenance equipment for existing workshops	○			* Since the equipment concerned is general-purpose equipment, it can be procured from local agents of foreign manufacturers.
Percentage (%)	3.8%	83.4%	12.4%	

(2) Construction Material/Equipment Procurement Plan

The Consultant shall prepare a procurement plan, which includes procurement of construction materials, facilities and rental of construction machinery as mentioned below. Along with procurement of the equipment mentioned above, the Contractor shall be responsible for transportation of the equipment until it is handed over to the Sudanese side at the planned construction site. Table 2-22 shows the countries from which the equipment concerned shall be procured.

Table 2-22 Scope of Work (Facility Construction)

Item	Country of procurement			Remarks
	Sudan	Japan	Third country	
[Materials]				* Some of these materials are imported. However, they are available from local agents.
Portland cement	○			
Aggregate for concrete	○			
Reinforcement bars	○			
Concrete blocks	○			
Timber and form members	○			
General steel materials	○			
General metal materials	○	○		
Steel fittings	○			
Paint	○			
Materials for temporary structures	○			
[Equipment]				
Crane		○		
Power distribution panel		○		
Generator	○			Made in Japan
[Construction machinery]				
Vehicles	○			
Dump trucks	○			
Concrete mixers	○			
Concrete plant	○			
Percentage (%)	71%	29%		

Materials and equipment required for the facility construction in this Project include those for the foundation and structural parts of the building, water supply and sewerage, air conditioner and ventilation and electric

facilities. Most of them can be procured in Sudan, while some special facilities shall be procured in Japan.

2-2-4-7 Operational Guidance Plan

Explanation of the operation and maintenance of the procured equipment shall be provided to the counterparts when the equipment is handed over to them. A total of three engineers, one from each of the manufacturers of the vehicles, bulldozers and excavators, are scheduled to provide the explanations.

2-2-4-8 Soft Component (Technical Assistance) Plan

(1) Background to Planning the Soft Component

Establishment of a system for comprehensive maintenance of all the vehicles for waste collection is an essential precondition for the provision of the new vehicles in this Project. As mentioned above, measures shall be taken to ensure that the concept of "preventive maintenance" is strictly followed in the Central Workshop. The training for the workers at the workshops and the drivers shall include technical assistance in maintenance work at the Central Workshop based on the concept of "preventive maintenance," in addition to the initial training in manipulation and operation (OJT) to be provided by the engineers from the equipment manufacturers. Implementation of a separate Technical Cooperation Project on waste management is planned. The Consultant shall prepare the soft component in this Survey in such a way that it is consistent with and complementary to the Technical Cooperation Project.

(2) Soft Component related to Maintenance at the Workshops

1) Establishment of a system and rules governing vehicle maintenance

Appropriate maintenance of vehicles requires awareness by the mechanics and drivers of the importance of preventive maintenance, or maintenance before the development of defects, creation of rules (manual) and training of mechanics with reliable technical capacity. Therefore, rules (manual) for comprehensive vehicle maintenance including inventory management and procurement planning of spare parts shall be prepared at the beginning of the soft component. In order to establish a sustainable maintenance system, an in-house training system for mechanics shall be established and used for technology transfer in the form of OJT later in the soft component.

In the in-house training, trainees shall report the inspection results in accordance with the rules (manual) and enter the inspection results into the vehicle maintenance records, which have not been managed appropriately, without fail. The records shall be used for the identification of causes of repeated repair and mistakes in the maintenance work. The record keeping system shall be improved so that the records can be used for prevention of the development of defects. Table 2-23 and Table 2-24 show the outline and subjects of the in-house training courses.

Table 2-23 Outline and Subjects of In-house Training (for administrators)

Trainees	Administrators
Objectives	To establish an in-house training system for mechanics and use the system as the main tool to realize appropriate maintenance practices
Teaching materials	Teaching materials for in-house training, check lists (in English)
Contents	An in-house training system shall be established and mechanics shall be trained as lecturers in the in-house training. The in-house training system shall be used to turn young mechanics into reliable mechanics and maintain the technical capacity of skilled mechanics

Table 2-24 Outline and Subjects of In-house Training (for mechanics and drivers)

Trainees	Mechanics	Drivers
Objective	To master the inspection methods provided in the Periodical Inspection Manual	To teach drivers how to conduct routine inspections (before and after driving) before the new vehicles are procured

Trainees	Mechanics	Drivers
Teaching materials	Periodical Inspection Manual, Periodical Inspection Record (in English and Arabic)	Manual for routine inspections (before and after driving) (in English and Arabic)
Practice	・Practice in periodical inspection ・Entry in Periodical Inspection Record	・Fuel consumption control (to reduce fuel waste by showing the trainees contaminated engine oil and energy consumption by an idling engine) ・Points to be noted when washing vehicles ・Implementation of routine inspections (before and after driving)
Lectures	・Review of the overview of engine and chassis structures ・Lecture on basic maintenance work and comparison of work procedures with photographs ・Lecture on periodical inspection of vehicles	・Review of the overview of engine and chassis structures ・Lecture on safe driving ・Lecture on energy saving driving ・Lecture on routine inspections (before and after driving)

2) Activities in the soft component (Input Plan)

a) Workshop management consultant

Workshop management consultant will be dispatched for 1 month from August 2015 in order to formulate management system, working system, maintenance system and reporting system at the Central Workshop. In addition, the consultant will proved technical guidelines on daily inspection to mechanics at the existing Locality Workshops.

b) Collection vehicle maintenance consultant

Collection vehicle maintenance consultant will be dispatched for 2 months in order to instruct and train mechanics on collection vehicle maintenance at Central Workshop.

Input of the soft component is summarizing in Table 2-25.

Table 2-25 Input of Soft Component

Input			Objectives
Consultants by Japanese side	Assistants counterparts by Sudanese side	Other input	
•Workshop management consultant (Japanese): 1 person, 1 MM (field) + 1 MM (preparation in Japan) •Local assistant: 1 person, 1 MM (field)	•Workshop management: 1 person, 1 MM •Workshop system establishment: 1 person, 1 MM •Workshop administration establishment: 1 person 1 MM	•One Car rental for 1 month •Copy	To establish workshop management system so as to do good and effective collection vehicle maintenance.
•Collection vehicle maintenance consultant (Japanese) : 1 person, 2 MM (field) + 1 MM (preparation in Japan) •Local assistant: 1 person, 2 MM (field)	•Management of mechanics: 1 person, 2 MM •Management of drivers: 1 person, 2 MM •Workshop equipment /spare parts management & inventory control maintenance: 1 person, 2 MM •Training plan/preparation & training: 1 person, 2 MM	•One Car rental for 2 months •Copy	To establish workshop management system and working system so as to do good and effective collection vehicle maintenance.

c) Outputs

The Consultant shall prepare the documents shown in Table 2-26 below and submit them to the implementing organization and the JICA offices as the outputs of the soft component.

Table 2-26 List of Outputs

Target of consultant	August 2015	Submission	September 2015	Submission
Workshop management	• Workshop Management Manual • Final Report	Five copies each to JICA HQs and in Sudan 20 copies each to implementing organization	—	—
Vehicle maintenance	• Periodical Inspection Manual • Progress Report	Five copies each to JICA HQs and in Sudan 20 copies each to implementing organization	• Teaching materials and check list for in-house training • Final Report • Final editions of various manuals (including check lists)	Five copies each to JICA HQs and in Sudan 20 copies each to implementing organization

(3) Outputs of the Soft Component

The expected outputs of the soft component are as follows:

(i) Maintenance work is implemented appropriately in accordance with the maintenance manuals.

(ii) The target of preventive maintenance, *i.e.* a high operating rate/low failure rate (large MTBF), continues to be achieved for the vehicles procured in this Project and their service life is extended by appropriate maintenance.

(4) Methods to Verify Progress in Achieving the Outputs

Table 2-27 shows the indicators and verification methods which can be used to verify the progress in achieving the outputs.

Table 2-27 Methods to Verify Progress in Achieving the Outputs

	Output	Indicator	Verification Method
Workshop Management	• To establish the working system in Central Workshop (working management system, safety and sanitation management and in-house training)	• To prepare the working manual • To hold lectures for workers	• Working manual • Record of lectures
Vehicle Maintenance	• To establish the maintenance management system for vehicles and equipment	• To prepare the manuals for daily and periodical inspections • To implement in-house training for mechanics	• manuals for daily and periodical inspections • Record of in-house trainings

(5) Obligations of the Implementing Organization

The implementing organization shall assign a person to be in charge of the soft component, appoint counterparts in the three sectors and bear the administrative and transport expenses required for the implementation of the soft component. The implementing organization shall also take responsibility for establishing, improving and sustainably operating the organizational structures in these sectors. Table 2-28 shows the obligations in each sector.

Table 2-28 Obligations of the Implementing Organization in Each Sector

	Workshop Management Sector	Vehicle Maintenance Sector
Assistant counterparts	・Workshop management: 1 ・Establishment of organizational structure in workshop/personnel management: 1 ・Administrative work, accounting and document control: 1	・Person in charge of mechanics: 1 ・Person in charge of drivers: 1 ・Accessory building facilities, accessory maintenance equipment, management of consumables and maintenance of the workshop facilities: 1 ・Inventory management, maintenance management planning, training for mechanics, implementation of training of trainers: 1
Obligations	・Overall control and coordination ・Acquisition of budget ・Preparation of activity space ・Establishment of organizational structures ・Maintenance work ・Training for mechanics ・Implementation of the training of trainers ・Record keeping ・Improvement and sustainable management	・Preparation and enforcement of various manuals ・Implementation of maintenance work ・Implementation of the training for mechanics ・Implementation of the training of trainers ・Record keeping ・Implementation of monitoring ・Establishment of a work structure and improvement of the work procedures

2-2-4-9 Implementation Schedule

The Consultant has prepared the project implementation schedule shown in Figure 2-12 in compliance with the Grant Aid Cooperation System of Japan.

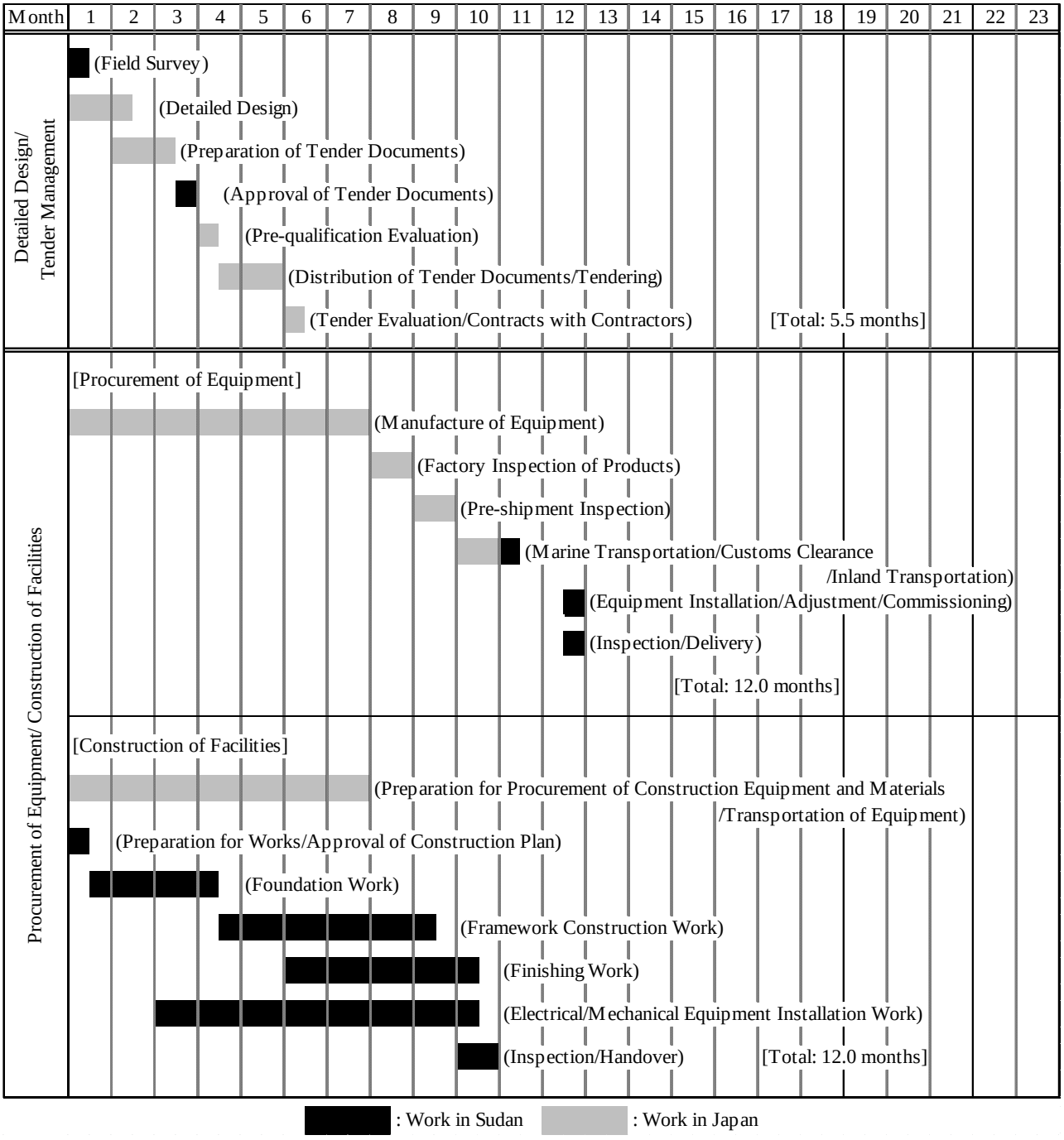


Figure 2-12 Project Implementation Schedule

2-3 Obligations of the Sudanese Side

2-3-1 Special Items

(1) Clearance of EIA Requirements

Approval of EIA is required for the construction of the Central Workshop. SACKS should hire a consultant, prepare EIA Study Report, and receive the EIA approval letter from MEFPD before the preparation to construct the Central Workshop starts. As a result of the discussion with SACKS, SACKS and JICA Survey Team confirmed that SACKS would submit the copy of the EIA approval letter to JICA Survey Team by the beginning of June 2014.

(2) Preparation of Necessary Infrastructures, Water and Electricity at Central Workshop

Sudanese side should prepare the following infrastructures for smooth operation of the Central Workshop constructed by the Project:

- Electrical power distribution and electricity to the Construction site and connection to the Central Workshop.
- City water supply to the Construction site and connection to the New Central Workshop.
- Landline telephone connection to the site and wiring in the New Central Workshop.
- Rain water drainage construction in the Construction site and connection to the outside main public drainage.
- Main and sub gates, Fence and Security and/or reception box construction in/around the construction site.
- Entry and exit road construction from the main road to the construction site.

(3) Removal of Abandoned Tankers, Shed, Small Workshop, and Other Unofficial Structures inside the Boundary of Central Workshop

Sudanese side should remove abandoned oil tankers, shed, small workshops and other unofficial structures inside the boundary of the Construction site of the Central Workshop before the end of March 2014.

(4) Allocation of Necessary Budget and Staffs for Operation of Equipment and Central Workshop

Sudanese side should secure and allocate necessary budget and staffs for proper operation of the equipment and Central Workshop as described in this report until July 2015.

(5) Procedure for Banking Arrangement and Authorization to Pay

Sudanese side should take necessary procedures for issue of A/P (Authorization to pay) required for payments to the Japanese Consultant and/or Contractor(s) and to bear the following commissions to a bank in Japan for the banking services based upon the Banking Arrangement at the time of commencement of the Project (April 2014):

- Advising commission of A/P
- Payment commission

(6) Additional Procurement of Waste Containers for Container Carrier (Arm Type)

Although 80 containers for Container Carrier (Arm Type) (2 containers for each vehicle) will be procured by the Project, the number of containers is not sufficient. Sudanese side should procure necessary number of containers until September 2015.

2-3-2 Others

Table 2-29 shows the obligation of the recipient country. The main points are as follows:

1) To accord Japanese nationals whose services may be required in connection with the supply of products and services under the verified contract(s) such facilities as may be necessary for their entry into Sudan and stay therein for the performance of their works

2) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies that may be imposed on them with respect to the supply for the products and services under the verified contract(s), and to take necessary measures for such tax exemption

3) To use and maintain properly and effectively all the facilities constructed, and equipment and materials provided under the Japan's Grand Aid

4) To bear all the expenses, other than to be borne by the Grant Aid, necessary for construction of the facilities as well as for the transportation and installation of the equipment including installation of fence, gates, outdoor lighting, guard house, etc.

Table 2-29 Major Undertakings to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side	Comments
1	To secure lots of land necessary for the implementation of the Project and to clear the sites		●	Land acquisition of Central Workshop
2	To construct the following facilities:			
	1) The building	●		Central Workshop
	2) The gates and fences in and around the site		●	
	3) The parking lot	●		
	4) The road within the site	●		
	5) The road outside the site		●	
3	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project outside the sites			
	1)Electricity			
	a. The distributing power line to the site		●	
	b. The drop wiring and internal wiring within the site	●		
	c. The main circuit breaker and transformer	●		
	2) Water Supply			
	a. The city water distribution main to the site		●	
	b. The supply system within the site (receiving and elevated tanks)	●		
	3) Drainage			
	a. The city drainage main (for storm sewer and others to the site)		●	
	b. The drainage system (for toilet sewer, common waste, storm drainage and others) within the site	●		
	4) Gas Supply			
	a. The city gas main to the site	—	—	
	b. The gas supply system within the site	—	—	
	5) Telephone System			
	a. The telephone trunk line to the main distribution frame/panel (MDF) of the building		●	
	b. The MDF and the extension after the frame/panel		●	
	6) Furniture and Equipment			
	a. General furniture		●	
	b. Project equipment	●		

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side	Comments
4	To ensure prompt unloading and customs clearance of the products at ports of disembarkation in the recipient country and to assist internal transportation of the products			
	1) Marine (Air) transportation of the Products from Japan to the recipient country	●		
	2) Tax exemption and custom clearance of the Products at the port of disembarkation		●	
	3) Internal transportation from the port of disembarkation to the project site	●		
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services be exempted		●	
6	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●	
7	To ensure that the facilities and equipment be maintained and used properly and effectively for the implementation of the Project		●	
8	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		●	
9	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A:			
	1) Advising commission of A/P		●	
	2) Payment commission		●	
10	To give due environmental and social consideration in the implementation of the Project.		●	1) EIA for the workshop construction according to the Sudanese regulation before the commencement of construction 2) Assessment for the workshop construction according to JICA procedure

Note) B/A : Banking Arrangement, A/P : Authorization to pay

2-4 Project Operation Plan

2-4-1 Operation and Maintenance Plan for Waste Collection Equipment

The operation and maintenance of the waste collection equipment will mainly consist of the following two works:

- Planning, management and operation work for collection and transportation
- Inspection and maintenance work for collection and transportation equipment

(1) Planning, Management and Operation Work for Collection and Transportation

The number of vehicles in operation in 2016 will be 323 units as shown in Table 2-30. In 2016, the operation of 58 of the existing dump trucks chartered at present will cease, but 80 new trucks will be procured by this Project, thereby increasing the existing number of vehicles by 22. Therefore, each LCA will be required to secure the drivers and workers necessary for collection work. The personnel necessary for collection and transportation will include workers for collecting and loading waste into the compactors in addition to the drivers. It will also be necessary to consider standby personnel for such work.

It is considered necessary that the collection and transportation works are done in a planned, systematic way by not only securing drivers and workers, but also by managing daily collection and transportation work and implementing accurate data management including waste disposal quantity. The data, including collection volume, transportation volume and treated volume, should be accurately managed. However, only at Omdurman landfill site has a weighing machine been installed. At Khartoum landfill site and Bahri landfill site, data management has just started by estimating the transportation volume from the load capacity of the carry-in vehicles and number of trips. On the other hand, even the number of trips is not checked at the transfer stations and the collected volume cannot be acquired. From this point of view, it is necessary to install weighing machines. In the future, weighing machines will be required at transfer stations and landfill sites in order to measure the transported volume of all the collection and transportation vehicles and to analyze and collate the measurement data for effective use in formulating collection and transportation plans.

Based on such actual data, it will be necessary to make up a yearly work schedule for collection and transportation. In planning the schedule, the operational status of the equipment and any surplus and shortage of equipment in each area should be monitored, and if necessary, deployment should be changed flexibly to implement efficient operation of the collection and transportation equipment.

Table 2-30 Numbers of Collection Vehicles in Operation at Present and in 2016

	Existing Equipment					Equipment to be Procured in this Project (c)			Equipment to be Operated in 2016 (a) + (c)			
	Number of Operable Vehicles (a)				Number of Vehicles whose operation will cease (b) *1							
	Compactor	CC	Tractor	Subtotal		Compactor	CC	Subtotal	Compactor	CC	Tractor	Subtotal
KHLCA	56	3	0	59	19	11	12	23	67	15	0	82
BLCA	19	1	7	27	9	10	9	19	29	10	7	46
JLCA	26	1	8	35	0	3	3	6	29	4	8	41
KLCA	24	0	10	34	0	2	2	4	26	2	10	38
OLCA	20	0	8	28	13	5	4	9	25	4	8	37
SLCA	18	1	9	28	17	7	7	14	25	8	9	42
ULCA	22	0	10	32	0	2	3	5	24	3	10	37
Total	185	6	52	243	58	40	40	80	225	46	52	323

*1: The equipment whose operation will cease is chartered trucks.

CC: Container carrier (arm type)

(2) Inspection and Maintenance Work for Collection and Transportation Equipment

The inspection and maintenance of the waste collection equipment to be procured in this Project will consist of routine inspections (before driving) at the existing Locality Workshops and monthly inspections and maintenance at the Central Workshop to be built in this Project. It is planned to reinforce the workshop management and maintenance work at the Central Workshop as a soft component.

2-4-2 Maintenance Plan for Equipment for Landfill Management

In this Project, 5 units of heavy equipment for landfill management and one water tanker will be procured. The 5 heavy equipment units will be deployed to landfill sites, and their maintenance will be carried out at the individual landfill sites as a rule. For repairs, engineers will be dispatched from the agent to the landfill sites as a rule. For repairs that cannot be dealt with at the landfill sites, the equipment to be repaired will be transported to the agent's repair shop. On the other hand, the inspection and maintenance of the water tanker will be carried out at the Central Workshop to be built by this Project.

2-4-3 Central Workshop Operation and Maintenance Plan

It is planned that 15 staff members will be stationed at the Central Workshop. Such staff will be composed of mechanics transferred from the existing Locality Workshops and staff members from SACKS, and new staff members recruited from external organizations. However, the positions of "Head" and "Financial Manager taking charge of financial management" will preferably be held by SACKS staff members.

- Head of the Central Workshop: 1 person
- Administrative Manager responsible for labor and personal management: 1 person
- Financial Manager taking charge of financial management: 1 person
- Leader of mechanics: 1 person
- Deputy leader of mechanics: 1 person
- Mechanics: 10 persons (2 mechanics assigned to each bay)

The operational costs of the Central Workshop will be borne by SACKS in principle, and the actual expenses for replacement of parts and others will be billed to each LCA.

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

(1) Cost to be borne by the Japanese Side through the Grant Aid

This part is closed due to the confidentiality.

(2) Cost to be borne by the Sudanese Side

Incidental construction work (gates, fence and others) and Commission fees to the Japanese Bank
: 651,000 SDG (Approximately 14.6 million JPY)

Item	Amount (SDG)	Cost Equivalent to JPY (million JPY)
Construction of gates, fences and others for the workshop	446,000	Approx. 10.0
Commission fees to the Japanese Bank	205,000	Approx. 4.6
Total	651,000	Approx. 14.6

(3) Estimation Condition

Estimation Time: October 2013

Exchange Rate: 1 SDG=22.401 JPY

1 US$=99.93 JPY

1 EUR=132.49 JPY

Construction / Procurement Period: As described in Figure 2-12

Others: The Project shall be implemented under the Japan's Grant Aid scheme.

2-5-2 Operation and Maintenance Cost

The budgets for LCAs and SACKS are largely categorized into personnel costs, goods and service purchasing costs, and others, but they are not classified by work such as collection and transportation, or final disposal. The budget by work such as waste collection, final disposal, and repair and maintenance cannot be summarized. Therefore, only operation and maintenance of the equipment and facilities to be procured in this Project will be estimated to confirm the financial sustainability of the LCAs and SACKS.

2-5-2-1 Operation and Maintenance Costs for Waste Collection Equipment

For waste collection, 80 vehicles will be procured in this Project, while operation of the 58 existing vehicles will cease. Therefore, the operation and maintenance costs for the 58 vehicles will be deducted from the increased cost of operation and maintenance of the 80 new vehicles.

(1) Increase in Operation and Maintenance Costs for New Vehicles to be Procured

The drivers and collection workers that will be required due to the procurement of 80 new vehicles are shown in Table 2-31. The standard personnel will be one driver per vehicle and two collection workers per compactor. No collection workers are required for the container carriers (arm type). The number of personnel will be 1.4 times the standard personnel under the five-day working week system.

Table 2-31 Drivers and Collection Workers Necessary for New Vehicles to be Procured

Unit: person

	KHLCA	BLCA	LLCA	KLCA	OLCA	SLCA	ULCA	Total
Driver	32	27	8	6	13	20	7	113
1) Compactor	15	14	4	3	7	10	3	56
2) CC	17	13	4	3	6	10	4	57
Collection Worker	31	28	8	6	14	20	6	113
1) Compactor	31	28	8	6	14	20	6	113
2) CC	0	0	0	0	0	0	0	0
Total	63	55	16	12	27	40	13	226

Note) CC: Container carrier (arm type)

The personnel costs for drivers and collection workers are as shown in Table 2-32. The unit cost is estimated at 900 SDG/month for drivers and 650 SDG/month for collection workers based on the results of hearing surveys in Sudan.

Table 2-32 Personnel Costs for Drivers and Collection Workers (Yearly)

Unit: 1,000 SDG/Year

	KHLCA	BLCA	LLCA	KLCA	OLCA	SLCA	ULCA	Total
Driver	346	291	86	64	141	216	75	1,219
1) Compactor	162	151	43	32	76	108	32	604
2) CC	184	140	43	32	65	108	43	615

	KHLCA	BLCA	LLCA	KLCA	OLCA	SLCA	ULCA	Total
Collection Worker	242	218	62	47	109	156	47	881
1) Compactor	242	218	62	47	109	156	47	881
2) CC	0	0	0	0	0	0	0	0
Total	588	509	148	111	250	372	122	2,100

Note) CC: Container carrier (arm type)

The fuel costs for the 80 new vehicles to be procured are as shown in Table 2-33. For the fuel costs, fuel efficiency is set at 2km/L for the compactor trucks and 4km/L for the container carriers (arm type). The unit fuel cost is set at 3.7 SDG/L.

Table 2-33 Fuel Costs for New Vehicles to be Procured (Yearly)

	Unit	KHLCA	BLCA	LLCA	KLCA	OLCA	SLCA	ULCA	Total
Distance per Trip	(km)	16	18	32	19	22	75	25	-
Number of Trips									
1) Compactor	(trip)	3	3	3	3	3	3	3	-
2) CC	(trip)	5	5	4	4	5	4	4	-
Distance per Day		128	144	224	133	176	525	175	1,505
1) Compactor	(km/unit/day)	48	54	96	57	66	225	75	621
2) CC	(km/unit/day)	80	90	128	76	110	300	100	884
Fuel		44	50	80	48	61	188	63	534
1) Compactor	(L/unit/day)	24	27	48	29	33	113	38	312
2) CC	(L/unit/day)	20	23	32	19	28	75	25	222
Fuel Cost		649	615	309	124	356	1,694	195	3,942
1) Compactor	(1,000SDG/year)	340	348	185	75	212	1,018	98	2,276
2) CC	(1,000SDG/year)	309	267	124	49	144	676	97	1,666

Note: Number of working days per year is 348 days
CC: Container carrier (arm type)

Repair and maintenance of the 80 new vehicles to be procured will be executed at the Central Workshop to be constructed by this Project. The operation costs of the Central Workshop will be borne by SACKS as mentioned above, but the actual expenses for parts and others will be borne by each LCA. The yearly actual expenses necessary for parts and others are estimated at 2% of the vehicle base price (FOB price). The yearly costs to be borne by each LCA are shown in Table 2-34.

Table 2-34 Repair/Maintenance Costs for New Vehicles to be Procured

Unit: 1,000 SDG/Year

	KHLCA	BLCA	LLCA	KLCA	OLCA	SLCA	ULCA	Total
Compactor	103	94	28	19	47	66	19	376
CC	110	82	27	18	37	64	27	365
Total	213	176	55	37	84	130	46	741

Note) CC: Container carrier (arm type)

The increase in the operation and maintenance costs for the new vehicles to be procured is shown in Table 2-35.

Table 2-35 Increase in Operation and Maintenance Costs for New Vehicles

Unit: 1,000 SDG/Year

	KHLCA	BLCA	LLCA	KLCA	OLCA	SLCA	ULCA	Total
Personnel Costs	588	509	148	111	250	372	122	2,100
Fuel Costs	649	615	309	124	356	1,694	195	3,942
Maintenance Costs	213	176	55	37	84	130	46	741
Total	1,450	1,300	512	272	690	2,196	363	6,783

(2) Reduction in Operational Administration Costs of Vehicles whose Operation will cease

The 58 collection vehicles whose operation will cease are dump trucks chartered from other organizations. The chartering cost is 150 SDG/vehicle/day including the driver in the case of OLCA. The fuel cost is borne by OLCA. The chartering costs estimated on this basis are shown in Table 2-36.

Table 2-36 Cost of Chartering Dump Trucks

Unit: 1,000 SDG/Year

	KHLCA	BLCA	LLCA	KLCA	OLCA	SLCA	ULCA	Total
Cost of Chartering Dump Trucks	992	470	0	0	679	887	0	3,028

Note: Number of working days per year is 348 days

The fuel costs for the 58 vehicles are shown in Table 2-37. The fuel efficiency of each dump truck is set at 4km/L and the fuel unit price is set at 3.7 SDG/L.

Table 2-37 Fuel Costs of Dump Trucks

	Unit	KHLCP	BLCP	LLCP	KLCP	OLCP	SLCP	ULCT	Total
Number of Trips	(trip/vehicle)	3	3			3	3		
Distance per Trip	(km/trip)	16	18			22	75		
Yearly Distance	(km/vehicle/ Year)	16,704	18,792	0	0	22,968	78,300	0	136,764
Fuel	(L/vehicle /Year)	4176	4698	0	0	5742	19575	0	34,191
Dump Truck to be scrapped	(vehicle)	19	9	0	0	13	17	0	58
Fuel Cost	(1,000 SDG/Year)	294	156	0	0	276	1,231	0	1,957

The dump trucks are chartered with drivers, so the personnel required for each LCA will be only the collection workers. The required number of collection workers will be 1.4 times the standard 2 workers per vehicle under the five-day working week system, the same as for the new vehicles. The personnel costs of the collection workers are shown in Table 2-38.

Table 2-38 Personnel Costs for Dump Truck Collection Workers

Unit: 1,000 SDG/Year

	KHLCA	BLCA	LLCA	KLCA	OLCA	SLCA	ULCA	Total
Number of Collection Workers	53	25	0	0	36	48	0	162
Personnel Costs	413	195	0	0	281	374	0	1,263

The reduction in the operational administration costs of the vehicles whose operation will cease is shown in

Table 2-39.

Table 2-39 Reduction in Operational Administration Costs for Vehicles to be Scrapped

Unit: 1,000 SDG/Year

	KHLCA	BLCA	LLCA	KLCA	OLCA	SLCA	ULCA	Total
Chartering Costs	992	470	0	0	679	887	0	3,028
Fuel Costs	294	156	0	0	276	1,231	0	1,957
Personnel Costs	413	195	0	0	281	374	0	1,263
Total	1,699	821	0	0	1,236	2,492	0	6,248

2-5-2-2 Operation and Maintenance Costs for Equipment for Landfill Management

The operation and maintenance costs for the equipment for landfill management to be procured in this Project are shown in Table 2-40. For heavy equipment, it is planned to operate the bulldozers in 2 shifts per day (6 hours x 2 shifts) and the excavators in one shift (6 hours). Therefore, 8 operators will be required for operation of the bulldozers and excavators, and 11 operators will be required because of the addition of standby operators. The fuel efficiency is set at 27L/h for the bulldozers and 18L/h for the excavators. The number of operating days per year is 348 days. The operation and maintenance costs are set at 2% of the vehicle base price (FOB price).

For the water tanker, operation under the 3-day week system of 50km per day, and fuel efficiency of 4km/L are used. The operation and maintenance costs are set at 2% of the vehicle base price (FOB price).

Table 2-40 Operation and Maintenance Costs for Equipment for Landfill Management

Unit: 1,000 SDG/Year

	Quantity	Personnel Costs	Fuel Costs	Operation & Maintenance Costs	Total
Bulldozer	3	132	1,529	139	1,800
Excavator	2				
Water Tanker	1	11	7	7	25
Total	6	143	1,536	146	1,825

2-5-2-3 Operation and Maintenance Costs for Central Workshop

The operation and maintenance costs for the Central Workshop will consist of personnel costs (15 persons), electricity charges (15kW x 8h/day), water charges (2.5m3/day) and repair costs of the facilities (including oil-resistant coating, steel rail coating, power sub-station, and generator), as shown in Table 2-41. The actual expenses for parts for the waste collection equipment are included in Table 2-34 and excluded from this table.

Table 2-41 Operation and Maintenance Costs for Central Workshop

Unit: 1,000SDG/Year

	Personnel Costs	Electricity Charges	Water Charges	Facility Repair Costs*	Total
Operation and Maintenance Costs	195	10	20	84	309

Note) * Facility repair costs: 50% of the initial construction costs for 30 years

2-5-2-4 Summary of Operation and Maintenance Costs

After implementation of this Project, the whole of Khartoum State will show an increase in expenditure amounting to 2,669,000 SDG per year from the present amount (535,000 SDG for waste collection equipment, 1,825,000 SDG for final treatment operation equipment and 309,000 SDG for the Central Workshop), as shown in Table 2-42, is within the allowable range.

On other hand, the actual expenditure in 2012 of LCAs and SACKS was 64,884,000 SDG as shown in Table 2-43. The increase of 2,669,000 SDG per year is equal to 4% of the actual expenditure in 2012. Each LCA is

working to increase the collection rate of waste treatment charges from residents and it is deemed that the increase of 4% in costs shared throughout Khartoum State is within the allowable range.

Table 2-42 Summary of Operation and Maintenance Costs

1,000 SDG/Year

		KHLCA	BLCA	LLCA	KLCA	OLCA	SLCA	ULCA	SACKS	Total
Waste Collection Equipment	Increase	1,450	1,300	512	272	690	2,196	363	-	6,783
	Decrease	1,699	821	0	0	1,236	2,492	0	-	6,248
	Actual Increase	-249	479	512	272	-546	-296	363	-	535
Equipment for Landfill Management		1,825								1,825
Central Workshop		-	-	-	-	-	-	-	309	309
Total										2,669

Table 2-43 Actual Expenditure of LCAs and SACKS in 2012

1,000 SDG/Year

	KHLCA	BLCA	LLCA	KLCA	OLCA	SLCA	ULCA	SACKS	Total
Actual Expenditure in 2012	17,640	10,256	4,355	7,179	10,200	4,950	9,504	800	64,884

CHAPTER 3

PROJECT EVALUATION

Chapter 3 Project Evaluation

3-1 Preconditions

Preconditions for the Project are that the Sudanese side shall receive the approval letters of the land acquisition and EIA for the Central Workshop, and conduct tax exemption, custom clearance, and other obligations of the Sudanese side.

3-2 Necessary Inputs by the Sudanese Side

In order to obtain and keep the effectiveness of the Project, the Sudanese side shall carry out the following activities:

i) To secure the budget and the human resources (drivers, mechanics, engineers, and other workers) in order to operate and maintain the procured collection vehicles and heavy equipment, and constructed Central Workshop

ii) To allocate the procured collection vehicles and heavy equipment, which will be utilized in each Locality, appropriately

iii) To manage and record the use of spare parts, and supply the stock periodically in order to keep the appropriate number and type of spare parts

iv) To monitor the necessary items related to environmental and social considerations for operation of Central Workshop

v) To revise the M/P according to the actual situation, implement the stable collection and disposal services following the M/P, and renovate necessary facility and equipment, such as the transfer station

vi) To develop (educate and train) the human resources necessary for operation and maintenance of waste management in Khartoum State continuously

Technical Cooperation Project for Capacity Development on Solid Waste Management in Khartoum related to the Project, in which the main counterpart agencies are MEFPD and SACKS, is under preparation to start in 2014. This technical cooperation project will complement and reinforce the development of the necessary human resources mentioned the above vi).

3-3 Important Assumptions

External conditions required for achievement of the overall plan includes that there is no political instability in Khartoum State and in whole Sudan, and that there are no major natural disasters. And it is necessary to pay attention to the impact on the detailed design and bidding by the unstable exchange rate of the currency.

3-4 Project Evaluation

3-4-1 Relevance

(1) Beneficiaries

The direct beneficiaries will be 6.27 million people living in Khartoum State (Khartoum Locality: 0.76 million people, Bahri Locality: 0.72 million people, Jabal Aulia Locality: 1.12 million people, Karary Locality: 0.85 million people, Omdurman Locality: 0.61 million people, Sharg En Nile Locality: 1.03 million people, and Um Badda Locality: 1.18 million people).

(2) Urgency

In Khartoum State, which has the capital city of Sudan, population increases by the rapid urban development, and by incoming of refugee. Consequently the waste generation increases, but they are not collected and

deposed appropriately. This is deteriorating the living environment in Khartoum State. Khartoum State should collect and dispose wastes with the limited number of equipment because there is not any national subsidy system, or other donor's supports. The collection rate to the generation is only 65% and some areas do not receive the collection service at all. Especially low-income people live in these areas without the collection service. Therefore, the urgent improvement by the Project is required.

(3) Contribution to the mid and long term development plans in Sudan

Khartoum State has the M/P and plans to procure equipment and construct facility for waste management, to optimize collection and transportation, to promote reduction of waste generation, to maintain the sanitary working environment, and so on. One of the targets of this M/P is to raise the collection rate up to 90% by 2028.

The Project targets the improvement the waste collection and disposal capacity of Khartoum State by procurement of collection vehicles and equipment for landfill operation, and by construction of Central Workshop. Therefore, this Project contributes to realize the M/P mentioned above.

(4) Consistency with Japan's assistance plan

According to the Japan's country assistance policy for Sudan (December, 2012), the priority areas of assistance (Sub Goals) were (1) Consolidation of Peace, (2) Basic Human Needs (hereinafter referred to as "BHN"), and (3) Agricultural Development. Waste management was categorized in (2) BHN. And the policy indicated that "Japan's continuous assistance to health care and water and sanitation sectors will contribute to the achievement of Millennium Development Goals in Sudan". Therefore, the Project follows Japan's assistance plan.

3-4-2 Effectiveness

(1) Quantitative effects

Table 3-1 shows the indicators, reference values and target values of the quantitative effects of the Project.

Table 3-1 Quantitative Effects by the Project

Indicator	Baseline (2013)	Target Value (2016)
Sum of collection amounts by each Locality cleaning project	3,200 ton/day	4,601 ton/day
Collection rate in Khartoum State	65%	80%

Note:
Collection Rate = Collection amount / Generation amount
Generation amount in 2012 = 4,890 ton
Estimation of generation amount in 2016 = 5,752 ton

(2) Qualitative effects

The following qualitative effects are expected:

1) Expansion of collection areas and improvement of living environment

It is expected that the collection service will expand into the areas without the collection service and the frequency of collection will increase. Consequently, the living environment will be improved by reduction of the scattered wastes around the cities and the negative effects by the uncollected wastes, such as odors and harmful insects.

2) Upgrading final disposal work and improvement of surrounding environment

It will be possible to change the existing landfills, which are almost open dumping sites, into controlled dumping sites. The detailed disposal plan can be prepared, and the appropriate final disposal will be realized

according to the plan. Finally, the capacity of the landfills will increase and the illegal dumping around the landfills will decrease. Also the working environment of landfill workers and sanitary situation of waste pickers will be improved by the periodical water supply by the water tanker procured by the Project.

3) Optimization of O&M for collection vehicles

At present, the collection vehicles are maintained only after the troubles happen. Construction and operation of the Central Workshop will make the periodical preventive maintenance possible. Therefore, it is expected that the Sudanese side can prepare the detailed O&M plan and implement effective O&M for collection vehicles.

APPENDICES

APPENDIX – 1

MEMBER LIST OF THE SURVEY TEAM

Appendix 1 Member List of the Survey Team

Name	Title	Affiliation
Dr. Mitsuo YOSHIDA	Leader (Preparatory Survey)	Senior Advisor, JICA
Mr. Ichiro ADACHI	Leader (Draft Final Report Explanation Survey)	Director, Environment Management Division 2, Global Environment Department, JICA
Mr. Hideaki MATSUOKA	Project Management/Waste Management Planning	Environment Management Division 2, Global Environment Department, JICA
Ms. Rina KURUMISAWA	Cooperation Planning	Environment Management Division 2, Global Environment Department, JICA
Mr. Akio ISHII	Chief Consultant/ Waste Management Planning/ Environmental and Social Considerations	Yachiyo Engineering Co., Ltd.
Mr. Takatoshi ARAI	Assistant Chief Consultant/ Waste Collection Equipment Planning 1	Yachiyo Engineering Co., Ltd.
Ms. Hiromi MATSUBARA	Waste Collection Equipment Planning 2/ GHGs Reduction	Yachiyo Engineering Co., Ltd.
Mr. Koji ODA	Facility Design/Survey of Natural Conditions	Yachiyo Engineering Co., Ltd.
Mr. Daichi KANAZASHI	Procurement Planning/Cost Estimation	Yachiyo Engineering Co., Ltd.

APPENDIX – 2

SURVEY SCHEDULE

Appendix 2 Survey Schedule

(First Preparatory Survey)

Date			JICA		Consultant				
			Yoshida	Matsuoka	Ishii	Arai	Matsubara	Oda	Kanazashi
1	14-Jun-13	Fri.	Travel						
2	15-Jun-13	Sat.	Arrival in Khartoum						
3	16-Jun-13	Sun.	Visits to JICA Office, Ministry of Finance and National Economy, MEFPD and SACKS						
4	17-Jun-13	Mon.	Visits to the locality offices (in Khartoum and Bahri Localities)						
5	18-Jun-13	Tue.	Field inspection: Inspection of the landfill sites (in Khartoum and Bahri Localities), (fixed-location fixed- time) waste collection sites, the automobile workshop and waste reloading stations						
6	19-Jun-13	Wed.	Discussion on the minutes (with MEFPD and SACKS)					Site survey (confirmation of the locations of the planned construction site, etc.)	
7	20-Jun-13	Thu.	Signing of the minutes, visits to relevant organisations					Preparation for the local sub-contracting/meeting with local companies	
8	21-Jun-13	Fri.							
9	22-Jun-13	Sat.							
10	23-Jun-13	Sun.	Day for supplementary work, visits to the embassy and JICA Office, and departure of Matsuoka from Khartoum					Survey on the local construction industry, standard specifications and application for licenses and permits	
11	24-Jun-13	Mon.	Departure of Yoshida from Khartoum		Omdurman Locality/Survey at the Omdurman Landfill site			Survey on meteorological conditions and natural disasters	
12	25-Jun-13	Tue.			Site survey in Umbaddah and Karari Localities			Supervision and guidance at land surveying and topographic and geological surveys	
13	26-Jun-13	Wed.			Re-survey in Sharq al-Nil and Jabel Aulia Localities			Survey on the availability of equipment and procurement conditions	
14	27-Jun-13	Thu.			Site survey in Khartoum and Bahri Localities			Survey on the availability of equipment and procurement conditions	
15	28-Jun-13	Fri.							
16	29-Jun-13	Sat.							
17	30-Jun-13	Sun.			Verification of governing policies and plans and necessity and urgency of the project	Survey for the selection of equipment	Survey on the availability of equipment and procurement conditions	Survey on the availability of equipment and procurement conditions	
18	01-Jul-13	Mon.			Survey on similar projects and donors	Survey for the selection of equipment	Survey on the availability of equipment and procurement conditions	Discussion on the facility plan	
19	02-Jul-13	Tue.			Survey for environmental and social considerations	Survey for the selection of equipment	Survey on the availability of equipment and procurement conditions	Discussion on the facility plan	
20	03-Jul-13	Wed.			Preparation of the report				
21	04-Jul-13	Thu.			Preparation of the report/reporting at JICA Office				
22	05-Jul-13	Fri.			Departure from Khartoum				
23	06-Jul-13	Sat.			Arrival in Narita				

(Second Preparatory Survey)

Date			Consultant				
			Ishii	Arai	Mastubara	Oda	Kanazashi
1	28-Aug-13	Wed	Departure from Narita				
2	29-Aug-13	Thu	Arrival in Khartoum				
3	30-Aug-13	Fri					
4	31-Aug-13	Sat					
5	01-Sep-13	Sun	Survey at each Locality (Existing equipment, O&M system, etc.)			Confirmation of results of topographic and geological surveys (at site)	
6	02-Sep-13	Mon	ditto			ditto	
7	03-Sep-13	Tue	ditto			ditto	
8	04-Sep-13	Wed	ditto			Survey on the availability of equipment	

Date			Consultant				
			Ishii	Arai	Mastubara	Oda	Kanazashi
						procurement and construction conditions	
9	05-Sep-13	Thu	ditto			ditto	
10	06-Sep-13	Fri					
11	07-Sep-13	Sat					
12	08-Sep-13	Sun	Survey at each Locality (Existing equipment, O&M system, etc.)			Survey on the availability of equipment procurement and construction conditions	
13	09-Sep-13	Mon	ditto			ditto	
14	10-Sep-13	Tue	Survey at each Locality (present conditions)	Survey on the availability of equipment and procurement conditions		ditto	
15	11-Sep-13	Wed	ditto	ditto		ditto	
16	12-Sep-13	Thu	Prepration for draft plan of Project components				
17	13-Sep-13	Fri					
18	14-Sep-13	Sat					
19	15-Sep-13	Sun	Meeting on the draft plan of Project components				
20	16-Sep-13	Mon	Survey for environmental and social considerations	Survey on the availability of equipment and procurement conditions		Discussion on plans for facility, design and construction	
21	17-Sep-13	Tue	Examination for O&M system	Examination of equipment specification	Examination of procurement amount	Discussion on plans for facility, design and construction	
22	18-Sep-13	Wed	ditto	ditto	ditto	Discussion on plans for facility, design and construction	
23	19-Sep-13	Thu	ditto	ditto	ditto	Acquisition of estimations for equipment costs and personnel expenses	
24	20-Sep-13	Fri					
25	21-Sep-13	Sat					
26	22-Sep-13	Sun	Survey for environmental and social considerations	Examination of equipment specification	Examination of procurement amount	Acquisition of estimations for equipment costs and personnel expenses	
27	23-Sep-13	Mon	ditto	ditto	ditto	ditto	
28	24-Sep-13	Tue	Examination for O&M system, and estimation of direct and indirect impacts			Discussion on plans for facility, design and construction	
29	25-Sep-13	Wed	ditto			ditto	
30	26-Sep-13	Thu	Preparationi of Field Report				
31	27-Sep-13	Fri					
32	28-Sep-13	Sat					
33	29-Sep-13	Sun	Preparationi of Field Report				
34	30-Sep-13	Mon	Explanation and Discussion on Field Report				
35	01-Oct-13	Tue	Explanation and Discussion on Field Report				
36	02-Oct-13	Wed	Survey at each Locality (present conditions)	Survey on the availability of equipment and procurement conditions		Survey on the availability of equipment procurement and construction conditions	
37	03-Oct-13	Thu	Report at JICA Sudan Office and Embassy, departure from Khartoum				
38	04-Oct-13	Fri	Arrival in Narita				

(Draft Final Report Explanation)

Date			JICA			Consultant		
			Adachi	Matsuoka	Kurumisawa	Ishii	Arai	Kanazashi
1	09-Dec-13	Mon		Departure from Narita				
2	10-Dec-13	Tue		Arrival in Kartoum, Meeting with JICA office and Embassy on explanation of Draft Final Report (DFR)				
3	11-Dec-13	Wed		Meeting with Ministry of Finance on explanation of DFR				
4	12-Dec-13	Thu		Discussion on the minutes				
5	13-Dec-13	Fri	Departure from Narita					
6	14-Dec-13	Sat	Arrival in Khartoum					
7	15-Dec-13	Sun	Site Survey				Supplement Survey	
8	16-Dec-13	Mon	Discussion on the minutes for Technical Cooperation			Supplement Survey		

Date			JICA			Consultant		
			Adachi	Matsuoka	Kurumisawa	Ishii	Arai	Kanazashi
			Project					
9	17-Dec-13	Tue	Signing on the minutes, Report to JICA Office and Embassy					
10	18-Dec-13	Wed	Report to Khartoum State Government and Ministry of Finance, departure of JICA members			Supplement Survey		
11	19-Dec-13	Thu	Travel			Supplement Survey, departure from Khartoum		
12	20-Dec-13	Fri	Travel			Arrival in Japan		

Appendix 2 Survey Schedule

(First Preparatory Survey)

Date			JICA		Consultant				
			Yoshida	Matsuoka	Ishii	Arai	Matsubara	Oda	Kanazashi
1	14-Jun-13	Fri.	Travel						
2	15-Jun-13	Sat.	Arrival in Khartoum						
3	16-Jun-13	Sun.	Visits to JICA Office, Ministry of Finance and National Economy, MEFPD and SACKS						
4	17-Jun-13	Mon.	Visits to the locality offices (in Khartoum and Bahri Localities)						
5	18-Jun-13	Tue.	Field inspection: Inspection of the landfill sites (in Khartoum and Bahri Localities), (fixed-location fixed- time) waste collection sites, the automobile workshop and waste reloading stations						
6	19-Jun-13	Wed.	Discussion on the minutes (with MEFPD and SACKS)					Site survey (confirmation of the locations of the planned construction site, etc.)	
7	20-Jun-13	Thu.	Signing of the minutes, visits to relevant organisations					Preparation for the local sub-contracting/meeting with local companies	
8	21-Jun-13	Fri.							
9	22-Jun-13	Sat.							
10	23-Jun-13	Sun.	Day for supplementary work, visits to the embassy and JICA Office, and departure of Matsuoka from Khartoum					Survey on the local construction industry, standard specifications and application for licenses and permits	
11	24-Jun-13	Mon.	Departure of Yoshida from Khartoum		Omdurman Locality/Survey at the Omdurman Landfill site			Survey on meteorological conditions and natural disasters	
12	25-Jun-13	Tue.			Site survey in Umbaddah and Karari Localities			Supervision and guidance at land surveying and topographic and geological surveys	
13	26-Jun-13	Wed.			Re-survey in Sharq al-Nil and Jabel Aulia Localities			Survey on the availability of equipment and procurement conditions	
14	27-Jun-13	Thu.			Site survey in Khartoum and Bahri Localities			Survey on the availability of equipment and procurement conditions	
15	28-Jun-13	Fri.							
16	29-Jun-13	Sat.							
17	30-Jun-13	Sun.			Verification of governing policies and plans and necessity and urgency of the project	Survey for the selection of equipment	Survey on the availability of equipment and procurement conditions	Survey on the availability of equipment and procurement conditions	
18	01-Jul-13	Mon.			Survey on similar projects and donors	Survey for the selection of equipment	Survey on the availability of equipment and procurement conditions	Discussion on the facility plan	
19	02-Jul-13	Tue.			Survey for environmental and social considerations	Survey for the selection of equipment	Survey on the availability of equipment and procurement conditions	Discussion on the facility plan	
20	03-Jul-13	Wed.			Preparation of the report				
21	04-Jul-13	Thu.			Preparation of the report/reporting at JICA Office				
22	05-Jul-13	Fri.			Departure from Khartoum				
23	06-Jul-13	Sat.			Arrival in Narita				

(Second Preparatory Survey)

Date			Consultant				
			Ishii	Arai	Mastubara	Oda	Kanazashi
1	28-Aug-13	Wed	Departure from Narita				
2	29-Aug-13	Thu	Arrival in Khartoum				
3	30-Aug-13	Fri					
4	31-Aug-13	Sat					
5	01-Sep-13	Sun	Survey at each Locality (Existing equipment, O&M system, etc.)			Confirmation of results of topographic and geological surveys (at site)	
6	02-Sep-13	Mon	ditto			ditto	
7	03-Sep-13	Tue	ditto			ditto	
8	04-Sep-13	Wed	ditto			Survey on the availability of equipment	

Date			Consultant				
			Ishii	Arai	Mastubara	Oda	Kanazashi
						procurement and construction conditions	
9	05-Sep-13	Thu	ditto			ditto	
10	06-Sep-13	Fri					
11	07-Sep-13	Sat					
12	08-Sep-13	Sun	Survey at each Locality (Existing equipment, O&M system, etc.)			Survey on the availability of equipment procurement and construction conditions	
13	09-Sep-13	Mon	ditto			ditto	
14	10-Sep-13	Tue	Survey at each Locality (present conditions)	Survey on the availability of equipment and procurement conditions		ditto	
15	11-Sep-13	Wed	ditto	ditto		ditto	
16	12-Sep-13	Thu	Prepration for draft plan of Project components				
17	13-Sep-13	Fri					
18	14-Sep-13	Sat					
19	15-Sep-13	Sun	Meeting on the draft plan of Project components				
20	16-Sep-13	Mon	Survey for environmental and social considerations	Survey on the availability of equipment and procurement conditions		Discussion on plans for facility, design and construction	
21	17-Sep-13	Tue	Examination for O&M system	Examination of equipment specification	Examination of procurement amount	Discussion on plans for facility, design and construction	
22	18-Sep-13	Wed	ditto	ditto	ditto	Discussion on plans for facility, design and construction	
23	19-Sep-13	Thu	ditto	ditto	ditto	Acquisition of estimations for equipment costs and personnel expenses	
24	20-Sep-13	Fri					
25	21-Sep-13	Sat					
26	22-Sep-13	Sun	Survey for environmental and social considerations	Examination of equipment specification	Examination of procurement amount	Acquisition of estimations for equipment costs and personnel expenses	
27	23-Sep-13	Mon	ditto	ditto	ditto	ditto	
28	24-Sep-13	Tue	Examination for O&M system, and estimation of direct and indirect impacts			Discussion on plans for facility, design and construction	
29	25-Sep-13	Wed	ditto			ditto	
30	26-Sep-13	Thu	Preparationi of Field Report				
31	27-Sep-13	Fri					
32	28-Sep-13	Sat					
33	29-Sep-13	Sun	Preparationi of Field Report				
34	30-Sep-13	Mon	Explanation and Discussion on Field Report				
35	01-Oct-13	Tue	Explanation and Discussion on Field Report				
36	02-Oct-13	Wed	Survey at each Locality (present conditions)	Survey on the availability of equipment and procurement conditions		Survey on the availability of equipment procurement and construction conditions	
37	03-Oct-13	Thu	Report at JICA Sudan Office and Embassy, departure from Khartoum				
38	04-Oct-13	Fri	Arrival in Narita				

(Draft Final Report Explanation)

Date			JICA			Consultant		
			Adachi	Matsuoka	Kurumisawa	Ishii	Arai	Kanazashi
1	09-Dec-13	Mon		Departure from Narita				
2	10-Dec-13	Tue		Arrival in Kartoum, Meeting with JICA office and Embassy on explanation of Draft Final Report (DFR)				
3	11-Dec-13	Wed		Meeting with Ministry of Finance on explanation of DFR				
4	12-Dec-13	Thu		Discussion on the minutes				
5	13-Dec-13	Fri	Departure from Narita					
6	14-Dec-13	Sat	Arrival in Khartoum					
7	15-Dec-13	Sun	Site Survey				Supplement Survey	
8	16-Dec-13	Mon	Discussion on the minutes for Technical Cooperation			Supplement Survey		

Date			JICA			Consultant		
			Adachi	Matsuoka	Kurumisawa	Ishii	Arai	Kanazashi
			Project					
9	17-Dec-13	Tue	Signing on the minutes, Report to JICA Office and Embassy					
10	18-Dec-13	Wed	Report to Khartoum State Government and Ministry of Finance, departure of JICA members			Supplement Survey		
11	19-Dec-13	Thu	Travel			Supplement Survey, departure from Khartoum		
12	20-Dec-13	Fri	Travel			Arrival in Japan		

APPENDIX – 3

LIST OF PARTIES CONCERNED IN SUDAN

Appendix 3 List of Parties Concerned in Sudan

Agency and Name	Title
Ministry of Finance and National Economy (MOFNE)	
Musa Makin	Director of Bilateral Financing Department
Faiga Mirghani	Deputy Director of Bilateral Financing Department
Ministry of Environment, Forestry and Physical Development (MEFPD)	
Babiker Abdalla Ibrahimu	Under secretary
Mubarak Gmawic	Director General of Environment Affairs Department
Abubaker H.A. Yahya	Environment Inspector
Gosai Ahmed Mohammed Hamed Alla	Environment Inspector
Supervisory Authority for Cleaning, Khartoum State (SACKS)	
Malik Bashier Mohamed	General Manager
Bushra Hamed Ahmed	Director of Planning and Research
Washid Alamim Osman Mohammed	Operating department
Abdelrhim Abelalla	Mechanical Engineer
Ibrahim Omer	Mechanical Engineer
Osman Mohammed	Mechanical Engineer
Zahair Adil	Engineer, (General Manager's office)
Mozaffer Salih	Engineer, (General Manager's office)
Almataz Suhiya	Workshop Manager
Khartoum Locality Cleaning Affiliate	
Sanosi Saliman	General Manager
Mohamed Mushrif	Public Health Advisor
Wail Rafar Elrahman	Director General of Cleaning Division
Jaafar Musa Mohammed	Mechanical Engineer

Bahri Locality Cleaning Affiliate

Mohamed Ahmad Elhaj	Director General of Cleaning Division
	Public Health Inspector of Cleaning Division
Mohamed Ibrahim Sabb	Operation Manager of Cleaning Division

Jabal Aulia Locality Cleaning Affiliate

Mustuafa Elswad	Administrative Officer of Clean Division
Isam Ahmed Mohemecl	Health Officer of Clean Division
Moheyed Hassan	Mechanical Engineer of Clean Division
Yousif Iderahim Toto	Mechanical Engineer of Clean Division

Karary Locality Cleaning Affiliate

Osam Elamin Abdulhamid	Manager of Cleaning Corporation
Elshazili Ebed Mohammed Ahmed	Operation Manager of Cleaning Corporation

Omdurman Locality Cleaning Affiliate

Omer Osman Ali	Administrative Officer
Sirag Abed Egur	Electrical Engineer
Elqily Abdelpagg Hattalla	Mechanical Engineer

Sharg En Nile Locality Cleaning Affiliate

Nugoom Garass Tomssah	Manager of Cleaning Project
El Samani Bdam Fadlallah	Operation Manager of Cleaning Project

Um Badda Locality Cleaning Affiliate

Ahmed Elnouk Hassan Abdella	General Manager of Clean Project

Embassy of Japan in Sudan

Ryoichi HORIE	Ambassador
Hiroyuki ORIKASA	Deputy Chief of Mission and Counsellor
Masayuki SORIMACHI	Economic Cooperation Secretary

JICA Sudan Office

Hiroyuki MORI	Chief Representative
Fumio IMAI	Senior Representative (until October 2013)
Shigeru OTAKE	Senior Representative (from November 2013)
Kyoko MINAMI	Project Formulation Advisor
Takeshi HAYAKAWA	Procurement Advisor
Halima Abdeen	Programme Officer
Ali Marzoug	Procurement Officer

APPENDIX – 4

MINUTES OF DISCUSSIONS

Appendix 4 Minutes of Discussions

(First Preparatory Survey)

MINUTES OF DISCUSSIONS
FOR
THE PREPARATORY SURVEY ON THE PROJECT FOR IMPROVEMENT OF SOLID WASTE MANAGEMENT IN KHARTOUM STATE IN THE REPUBLIC OF THE SUDAN

In response to the request from the Government of Sudan, the Government of Japan decided to conduct a Preparatory Survey (hereinafter referred to as "the Survey") on the Project for Improvement of Solid Waste Management in Khartoum State (hereinafter referred to as "the Project") and entrusted the study to Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Sudan the Preparatory Survey Team (hereinafter referred to as "the Team"), which is headed by Dr. Mitsuo YOSHIDA, Senior Advisor, JICA, and is scheduled to stay in the country from 15th to 23rd June, 2013.

The Team held a series of discussions with the concerned officials of Sudan and conducted a field survey.

In the course of the discussions and the field survey, both sides confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Preparatory Survey Report.

Khartoum, 20th June, 2013

Dr. Mitsuo Yoshida
Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Dr. Babiker Abdalla Ibrahim
Undersecretary
Ministry of Environment, Forestry and Physical Development
Sudan

ATTACHMENT

1. Objective of the Project

The objective of the Project is that solid waste management (SWM) including collection and disposal is improved in Khartoum State.

2. Project Site

The Project site is the whole Khartoum state tentatively. The map of Khartoum is shown in Annex-1. However, the more specific areas may be identified based on the results of the Survey.

3. Responsible and Implementing Agency

The responsible agency is the Ministry of Environment, Forestry and Physical Development (hereinafter referred to as "MOEFPD"), and the implementing agency is Supervisory Authority for Cleaning in Khartoum State (hereinafter referred to as "the Supervisory Authority").

MOEFPD bears the full responsibility including administration, coordination and supervision of the Project.

The Supervisory Authority is responsible to support the Team in conducting the survey and implementation of the Project. The Supervisory Authority is also responsible to acquire necessary budget and coordinate with the relating locality offices for the operation and maintenance of the facilities and equipment provided under the Project. Organization chart of the Supervisory Authority is shown in Annex-2.

4. Items Requested by the Government of Sudan

Following the discussions with the Team, the items described in Annex-3 were finally requested by the Government of Sudan. Both sides confirmed that the appropriateness of the final components of the Project would be decided by the Japanese side.

Sudanese side understood that some of the items may be procured in Japan as a result of the Survey.

5. Japan's Grant Aid Scheme

(1) The Sudanese side understood the Japan's Program Grant Aid Schemes explained by the Team, as described from Annex-4 to 6.

(2) The Team explained that the sub-scheme of the Project will be "Grant Aid for Environment and Climate Change (hereinafter referred to as "GAEC")" based on the result of the Survey.

(3) The Sudanese side will take necessary measures, as described in Annex-6 for Japan's Grant Aid for General Projects for smooth implementation of the Project, as the condition of the Japan's Grant Aid to be implemented.

(4) JICA will report to the Sudanese side if there are any other undertakings based on the result of the Survey.

6. Objective of the Survey

The Team explained that the objective of the Survey is to collect information to ensure the appropriateness of the Project.

7. Schedule of the Survey

(1) The consultant members of the Team will continue the 1st Survey in Sudan until the early

July, 2013.

(2) The Team explained that the schedule of the Survey as follows. However, it is subjected to change based on the progress of the Survey.

August to September 2013: the 2nd Survey
December 2013: the 3rd Survey to explain the draft Preparatory Survey Report
March 2014: Submission of the final report

(3) The Team explained that the implementation of the Preparatory Survey is not the commitment of the approval of the Project.

8. Other Relevant Issues

(1) Inception Report

The contents of Inception Report that the Team explained was understood and accepted in principle by the Sudanese side.

(2) Arrangements for the Survey

As a response to the request by the Team, the Sudanese side agreed to assign necessary number of counterpart personnel for the Survey and provide all the data and information relevant to the Project for the smooth implementation of the Survey. The Sudanese side (i.e. MOEFPD also agreed to provide an appropriate office space for the Team.

(3) Responsibility of each Agency Concerned with the Project

MOEFPD and the Supervisory Authority in Khartoum State will collaborate with the relevant organizations to support the implementation of the Survey.

(4) Priority of the Project Component

The Sudanese side agreed that the Scope of the Project may be changed based on the financial reasons, and thus, the Project components will be identified in priority order.

(5) Budget Allocation for the Project by the Sudanese side

The budget necessary for the Project including operation and maintenance cost will be assessed in the Survey. The Sudanese side assures that appropriate budget will be put in place, and the Supervisory Authority is responsible for the operation and maintenance of the facilities and equipment provided under the Project.

(6) Improvement of the Transfer Stations and Landfills

Both sides agreed that the improvement of the transfer stations and landfills will be discussed in the technical cooperation planned in future.

(7) Undertakings of the Sudanese side

Although general undertakings of both sides are shown in Annex-6, the Team emphasized the responsibilities of the Sudanese side to execute following matters and the Sudanese side agreed to it.

1) Tax Exemption

Both sides confirmed that import tax, customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services will be exempted. The Sudanese side will take necessary measures for tax exemption, if any.

2) Securing the necessary lands

The Sudanese side will make sure to secure the necessary land for the implementation of the Project. These lands include the area of the workshop, if it is newly constructed, and the parking lots for the procured vehicles and equipment. The Sudanese side agreed to decide the candidate land for the workshop and notify the Team in writing by the end of June 2013. The Sudanese side will also confirm the land availability by providing a copy of certified document to the Team.

3) Necessary measures for Operation and Maintenance of the facilities and equipment
The Sudanese side will take any necessary measures and allocate the necessary budget, if any, to operate and maintain the facilities and equipment which would be provided by the Project.

(8) Avoidance of Duplication with Other Projects

Both sides agreed that any component of the Project will not be duplicated with any other project supported by other donor agencies, NGOs, and Sudanese official organization(s).

(9) Safety and Security

The Sudanese side agreed to take measures to secure the safety of the members of the Team.

(10) Careful Handling of the Survey Reports

The Team explained that certain information in both the draft and the final reports of the Survey should be dealt with confidentially until the tender is closed when the Project proceeds to actual implementation stage, since disclosure of the information would affect fairness of tender procedure. The Sudanese side understood the sensitivity in dealing with the Survey reports and agreed on careful handling of the reports for achieving fair tendering.

(11) Environmental and Social Considerations

Both sides agreed that the Sudanese side will take necessary measures regarding environmental impacts for implementation of the Project according to the relative laws and acts in Sudan.

(12) Master Plan

The Sudanese side expressed sincere appreciation to the Japanese side on the continuous technical cooperation in SWM. The Sudanese side explained that the Project is a part of implementation of the Master Plan of the SWM in Khartoum State while remaining part of implementation will be realized under self-reliant efforts of the Sudanese side.

ANNEXES

Annex-1	Map of Khartoum
Annex-2	Organization Chart of Supervisory Authority of Cleaning in Khartoum State
Annex-3	Requested Components of the Project
Annex-4 and 5	Japan's Grant Aid Scheme for General Projects
Annex-6	Major Undertakings by Each Government for General Projects

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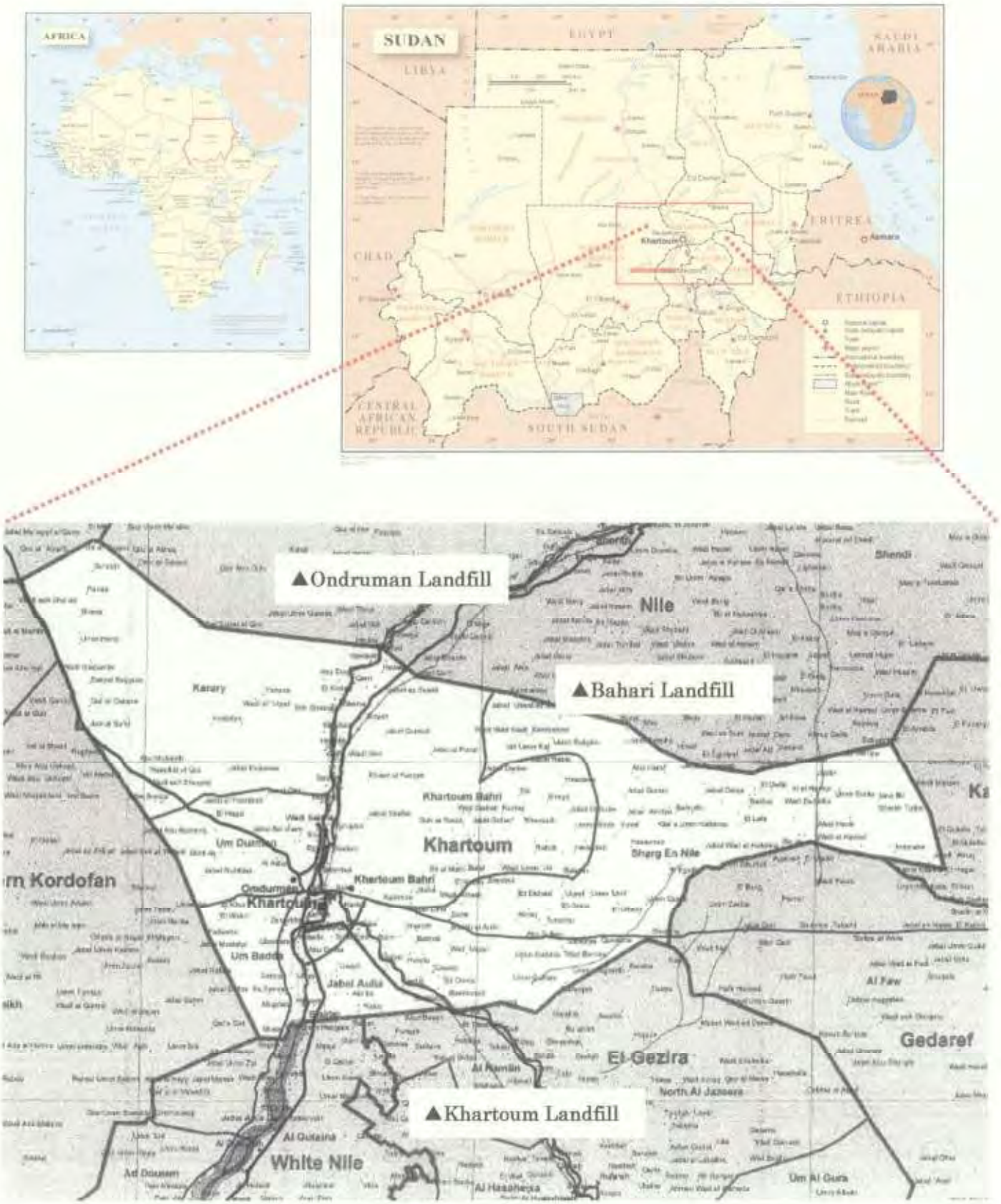
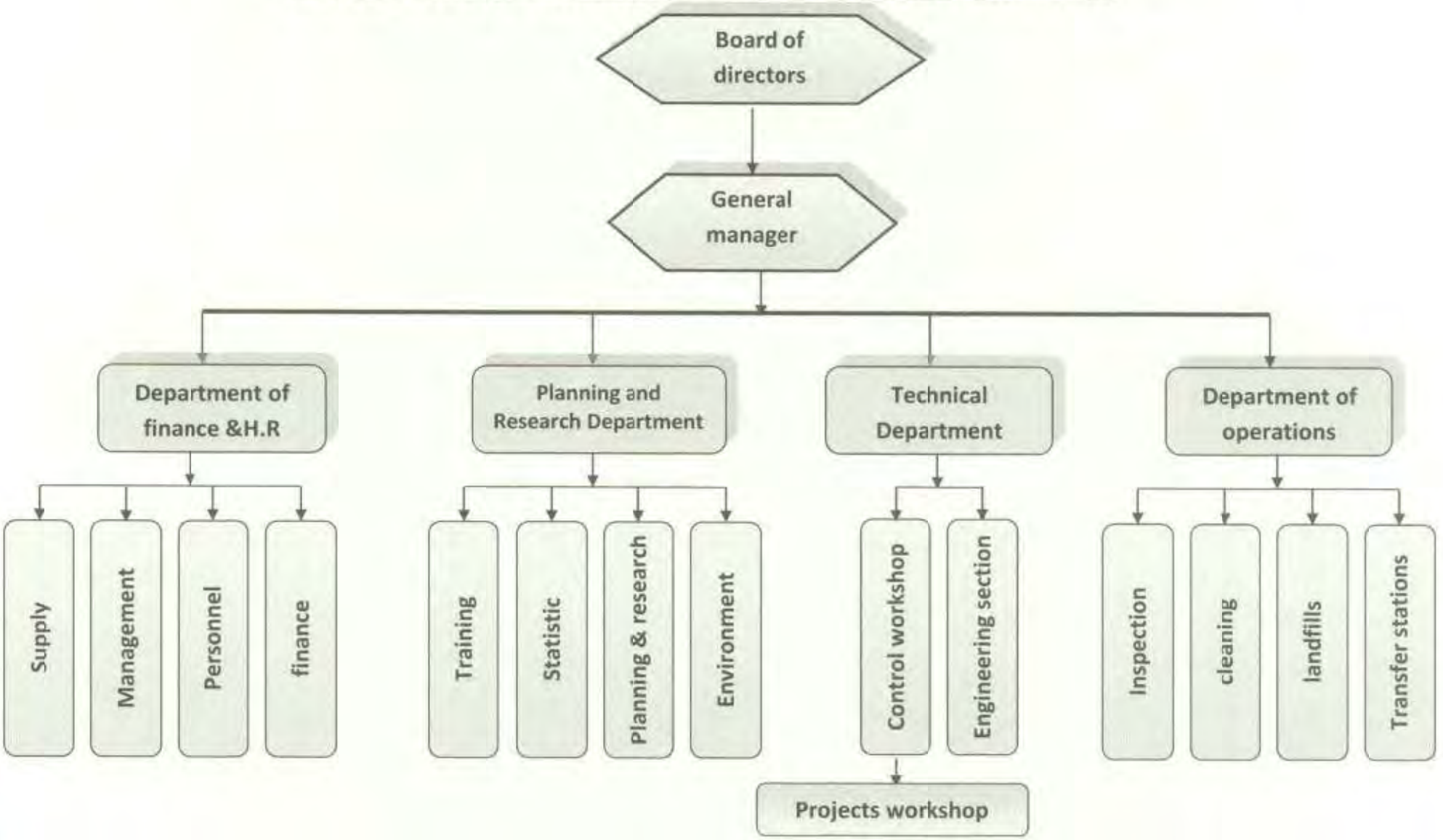
Annex-1

Map of Khartoum



Annex-2

Organizational Structure of Supervisory Authority for Cleaning, Khartoum State



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Annex-3

Requested Components of the Project

	Items	Q'ty
1	Construction of a workshop*	1 set
2	Vehicles for waste collection and containers	100 sets
3	Heavy equipment for landfill management	To be decided
4	Spare parts	To be decided
5	Equipment for maintenance	To be decided
6	Training of the community and government members for operation and maintenance	To be decided

These items are subject to change based on the Survey results.
*) Construction of a workshop may be replaced by renovation of the existing workshop.

JAPAN'S GRANT AID for General Projects

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on this law and the decision of the GOJ, JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures

The Japanese Grant Aid is supplied through following procedures :

- Preparatory Survey
  - The Survey conducted by JICA
- Appraisal &Approval
  - Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- Authority for Determining Implementation
  - The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as "the G/A")
  - Agreement concluded between JICA and a recipient country
- Implementation
  - Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the Preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Outline Design of the Project is confirmed based on the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA employs (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

3. Japan's Grant Aid Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes (hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use properly and

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effectively the facilities constructed and the equipment purchased under the Grant Aid, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

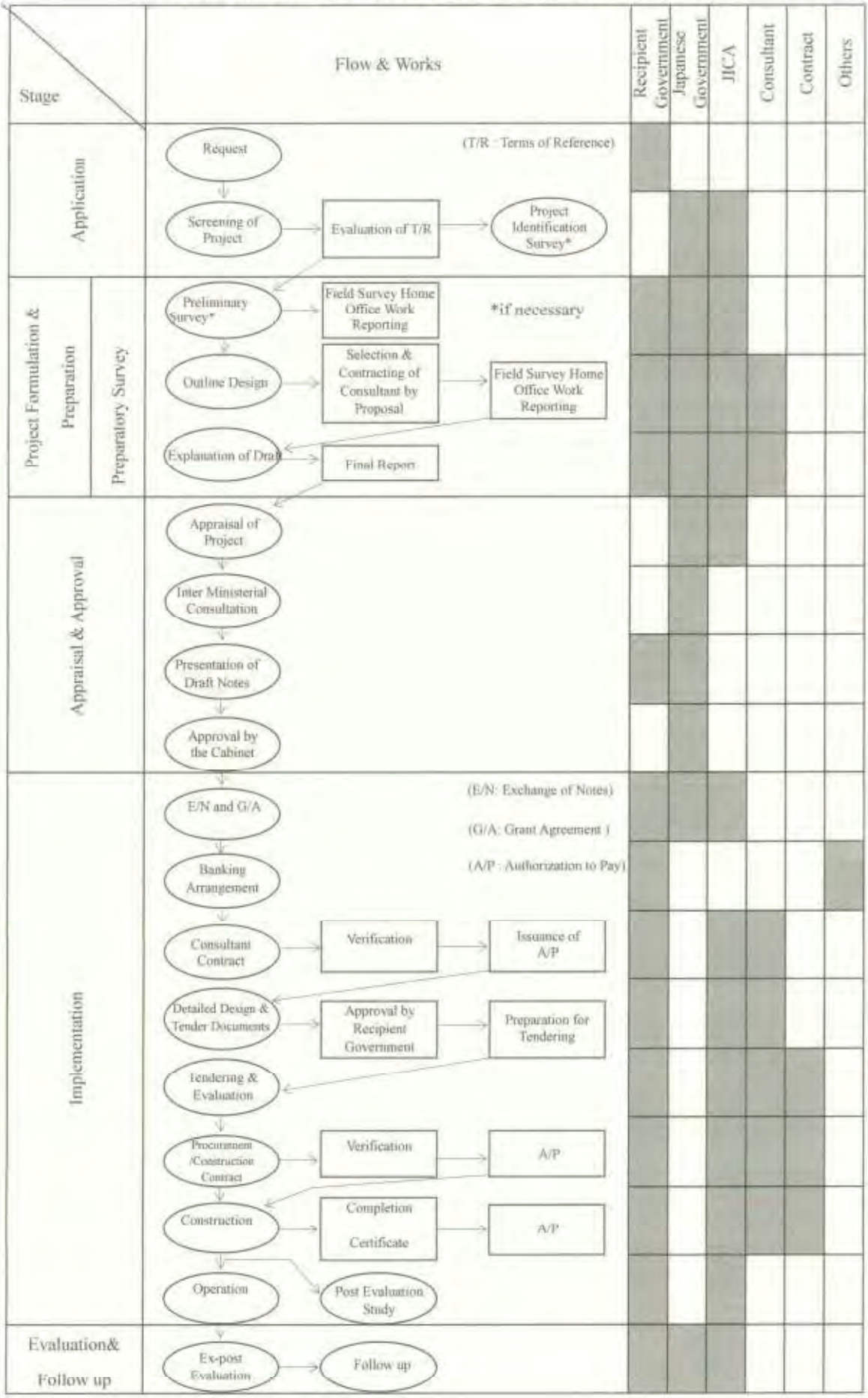
(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

(10) Social and Environmental Considerations

A recipient country must carefully consider social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and JICA socio-environmental guidelines.

FLOW CHART OF JAPAN's GRANT AID PROCEDURES



Japan's Grant Aid for General Projects

Major Undertakings to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	to secure [a lot] /[lots] of land necessary for the implementation of the Project and to clear the [site]/[sites].		●
2	To construct the following facilities		
	1) The building	●	
	2) The gates and fences in and around the site		●
	3) The parking lot	●	
	4) The road within the site	●	
	5) The road outside the site		●
3	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project outside the [site]/[sites]		
	1) Electricity		
	a. The distributing power line to the site		●
	b. The drop wiring and internal wiring within the site	●	
	c. The main circuit breaker and transformer	●	
	2) Water Supply		
	a. The city water distribution main to the site		●
	b. The supply system within the site (receiving and elevated tanks)	●	
	3) Drainage		
	a. The city drainage main (for storm sewer and others to the site)		●
	b. The drainage system (for toilet sewer, common waste, storm drainage and others) within the site	●	
	4) Gas Supply		
	a. The city gas main to the site		●
	b. The gas supply system within the site	●	
	5) Telephone System		
	a. The telephone trunk line to the main distribution frame/panel (MDF) of the building		●
	b. The MDF and the extension after the frame/panel	●	
	6) Furniture and Equipment		
	a. General furniture		●
	b. Project equipment	●	
4	To ensure prompt [unloading and customs clearance of the products at ports of disembarkation in the recipient country and to assist internal transportation of the products] / [customs clearance of the products and to assist internal transportation of the products in the recipient country]		
	1) Marine (Air) transportation of the Products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the Products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	(●)	(●)
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services [be exempted] / [be borne by the Authority without using the Grant]		●
6	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.		●
7	To ensure that [the Facilities and the products] /[the Facilities] / [the products] be maintained and used properly and effectively for the implementation of the Project.		●
8	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project.		●
9	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
10	To give due environmental and social consideration in the implementation of the Project.		●

(B/A : Banking Arrangement, A/P : Authorization to pay)

(Draft Final Report Explanation)

MINUTES OF DISCUSSIONS
FOR
THE PREPARATORY SURVEY ON THE PROJECT FOR IMPROVEMENT OF SOLID WASTE MANAGEMENT IN KHARTOUM STATE IN THE REPUBLIC OF THE SUDAN
(EXPLANATION OF DRAFT REPORT)

From June to July and August to October, 2013, Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a preparatory survey team on the Project for Improvement of Solid Waste Management in Khartoum State (hereinafter referred to as "the Project") to the Republic of the Sudan (hereinafter referred to as "Sudan"), and through discussions, field surveys, and technical examination of the results, JICA prepared the Draft Preparatory Survey Report (hereinafter referred to as "Draft Report").

In order to explain the contents of the Draft Report and to consult with the officials concerned of the Government of Sudan (hereinafter referred to as "the GOS"), JICA sent the Draft Report Explanation Team (hereinafter referred to as "the Team") to Sudan, which is headed by Mr. Ichiro Adachi, the Director of the Environmental Management Division 2, Global Environment Department, JICA, from 10th to 18th December, 2013.

As a result of the discussions, both parties confirmed the main items described in the attached sheets.

Khartoum, 17th December, 2013

Mr. Ichiro Adachi
Leader
Draft Report Explanation Team
Japan International Cooperation Agency
Japan

Dr. Babiker Abdalla Ibrahim
Undersecretary
Ministry of Environment, Forestry and Physical Development
Sudan

Witnessed by:

Mr. Omer Elhag
Director General
International Cooperation Directorate
Ministry of Finance and National Economy
Sudan

Eng. Malik Bashier
General Manager
Supervisory Authority for Cleaning in Khartoum State
Sudan

ATTACHMENT

1. Contents of the Draft Report

The Sudanese side agreed and accepted in principle the contents of the Draft Report explained by the Team. The outline of the Draft Report is attached in Annex 4.

2. Japan's Grant Aid Scheme

The Team explained that this Project will be implemented under the sub-scheme of Grant Aid for Environment for Climate Change (hereinafter referred to as "GAEC").

The Sudanese side understood the Japan's Grant Aid Scheme, as attached in Annex 1 to 3, and will take the necessary measures as described in the Annexes. The Sudanese side will also allocate necessary budget for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

3. Tentative Schedule of the Project and the Survey

JICA will complete the Final Report in accordance with the confirmed items and send it to the Government of the Sudan by April, 2014.

4. Confidentiality of the Project

(1) Detailed Specifications

Both sides confirmed all the information related to the Project including detailed specifications of the facilities, equipment and other technical information shall not be released to any other party(ies) before the signing of all the contract(s) for the Project.

(2) Project Cost Estimate

The Team explained to the Sudanese side the estimated project cost to be borne by the Government of Japan (hereinafter referred to as "the GOJ") and the GOS in Annex 5. The Team also explained that it is a provisional estimate and would be further examined by the GOJ for the approval of the Grant. The Sudanese side understood that the project cost estimate is subjected to be modified.

Both sides agreed that the project cost estimate should never be duplicated in any form nor disclosed to any other party(ies) before the signing of all the contract(s) for the Project. This confidentiality of the estimated project cost is necessary to ensure fairness of the tender procedure.

5. Other Relevant Issues

(1) Responsible and Implementing Agency

The responsible agency of the Project is the Ministry of Environment, Forestry and Physical Development (hereinafter referred to as "MEFPD"), and the implementing agency is Supervisory Authority for Cleaning in Khartoum State (hereinafter referred to as "SACKS").

MEFPD bears the full responsibility including administration, coordination and supervision of the Project.

SACKS will be the owner of the facilities and equipment provided under the Project and be responsible to operate and maintain them. SACKS is also responsible to acquire necessary budget and coordinate with the relating locality offices to ensure the operation and maintenance of the facilities and equipment.

(2) Undertakings of the Sudanese Side

Both sides confirmed that the GOS would carry out the issues shown in Annex 3 and 4 in accordance with the implementation schedule of the Project in addition to the previous minutes.

Main undertakings by the Sudanese side are as follows.

a. Clearance of EIA Requirements

Approval of EIA is required for construction of the Central Workshop. SACKS should prepare an EIA Study Report, and obtain the EIA approval letter from MEFPD before construction work of the Central Workshop is commenced. SACKS agreed to submit a copy of EIA approval letter to JICA Study Team by the beginning of June, 2014.

b. Preparation of necessary infrastructures, water and electricity at the central workshop

The Sudanese side agreed to prepare the following infrastructure for smooth operation of the central workshop constructed by the Project:

- Electrical power distribution and electrify to the construction site and connection to the new central workshop.
- City water supply to the construction site and connection to the new central workshop.
- Landline telephone connection to the site and wiring in the new central workshop.
- Rain water drainage construction in the construction site and connection to the outside main public drainage.
- Main and sub gates, fences and security and/or reception box construction in/around the construction site.
- Entry and exit road construction from main road to the construction site.

c. Removal of abandoned tankers, shed, small workshop, and other unofficial structures inside the boundary of the central workshop

The Sudanese side agreed to remove abandoned oil tankers, shed, small workshops and other unofficial structures inside the boundary of the construction site of new central workshop before the end of March 2014.

d. Allocation of necessary budget and staffs for the operation of the equipment and the central workshop

The Sudanese side agreed to secure and allocate necessary budget and staffs for proper operation of the equipment and the central workshop as described in Annex 4 until July 2015.

e. Procedure for Banking Arrangement and Authorization to Pay

The Sudanese side agreed to take necessary procedures for issuing A/P (Authorization to pay) required for payments to the Japanese consultant and/or contractor(s) and to bear the following commission fees to a bank in Japan for the banking services based upon the Banking Arrangement (B/A) at the time of commencement of the Project (April 2014).

- Advising commission of A/P
- Payment commission

f. Tax exemption

The Sudanese side agreed to ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the Republic of the Sudan with respect to the

(3)

purchase of the products and the services arising from the Project activities be exempted.

For smooth process of tax exemption, the Sudanese side suggested the Japanese side submission of the list of local procurement (describing items and their quantities) before the procedure, and the Team understood it.

g. Additional procurement of waste containers for the container carriers (arm type)

Although 80 containers for container carriers (arm type) (2 containers for one vehicle) will be procured under the Project, the number of containers may not be sufficient. Sudanese side agreed to procure necessary number of containers until September 2015, as the need arises.

(3) Strengthening Operation and Maintenance

According to the results of the Preparatory Survey, the Team requested the Sudanese side to take necessary actions which were proposed in the Draft Report, such as allocation of adequate budget and qualified personnel for proper, effective and sustainable operation and maintenance of the facilities and equipment, even after the Project completion.

The Team also requested that the necessary actions for recruitment of staffs and operators of the vehicles and the central workshop be taken in time, so that proper staff members are trained in the training programme.

(4) The Contents of the Supplied Items and Constructed Facilities

The Team explained that the total Project cost has not been finalized and is subjected to change. In case of any change of the Project cost, the contents of the supplied items and constructed facilities may also be changed. The Sudanese side understood it.

(5) Technical Assistance

The Team explained that the contents of the technical assistance as "Soft Component" would focus on the subjects as described in Annex 4, and the Sudanese side agreed on it.

The Sudanese side committed to assign responsible staff and operators before the Soft Component starts as described in the Draft Report.

(6) Technical Cooperation Project

The Team also explained that a Technical Cooperation project is planned to strengthen the capacity of solid waste management in Khartoum State, and requested the Sudanese side to make efforts to achieve the synergy effects of these Grant Aid and Technical Cooperation projects. The Sudanese side agreed on it.

ANNEXES

Annex-1 to 3	Japan's Grant Aid Scheme
Annex-4	Draft Preparatory Survey (Draft Report)
Annex-5	Project Cost Estimate (This page is closed due to the confidentiality.)

JAPAN'S GRANT AID for General Projects

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of ODA operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on this law and the decision of the GOJ, JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures

The Japanese Grant Aid is supplied through following procedures :

- Preparatory Survey
  - The Survey conducted by JICA
- Appraisal &Approval
  - Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- Authority for Determining Implementation
  - The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as "the G/A")
  - Agreement concluded between JICA and a recipient country
- Implementation
  - Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the Preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Outline Design of the Project is confirmed based on the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA employs (a) registered consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

3. Japan's Grant Aid Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes (hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use properly and

effectively the facilities constructed and the equipment purchased under the Grant Aid, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

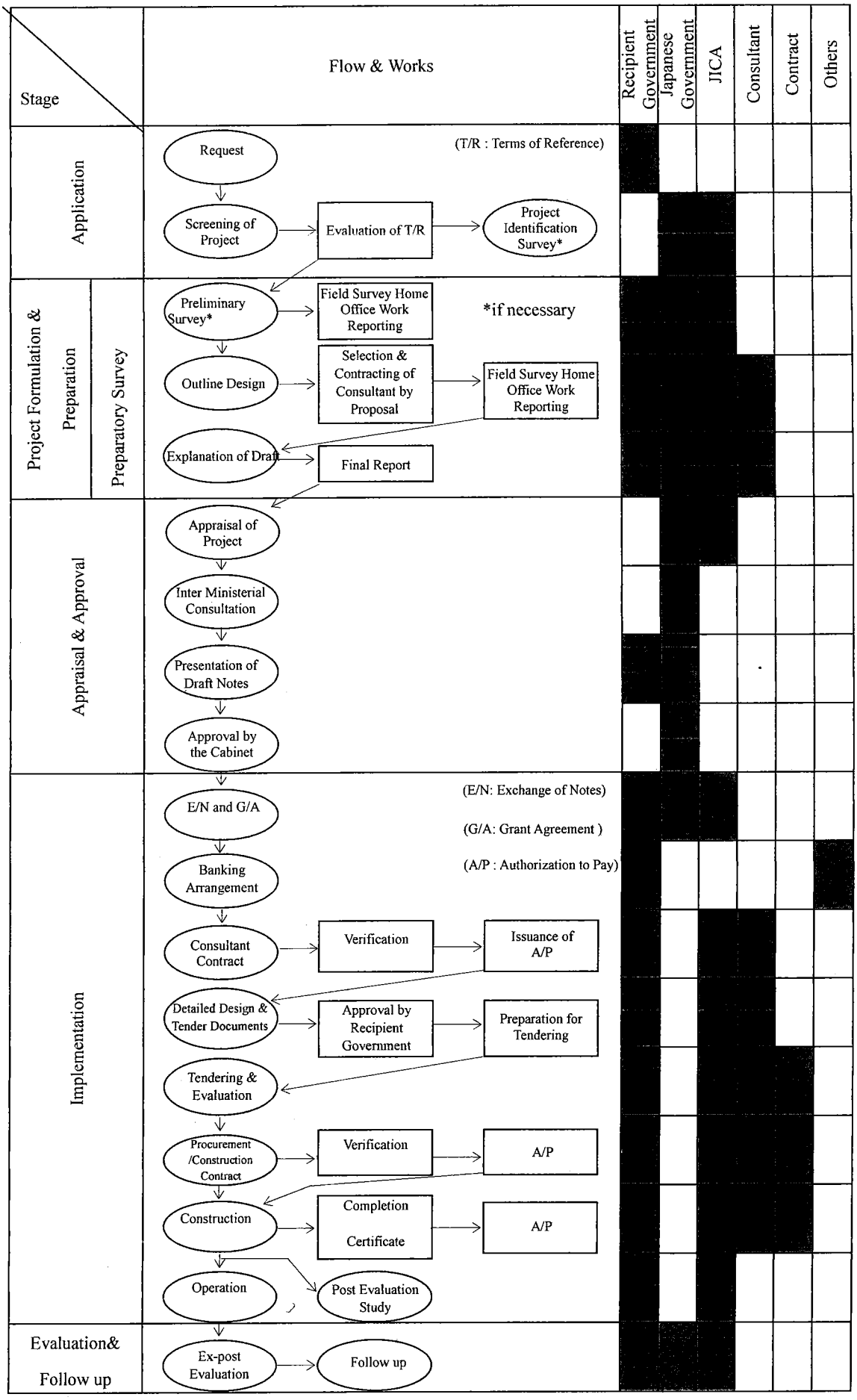
(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

(10) Social and Environmental Considerations

A recipient country must carefully consider social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and JICA socio-environmental guidelines.

FLOW CHART OF JAPAN's GRANT AID PROCEDURES



Japan's Grant Aid for General Projects

Major Undertakings to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To secure lots of land necessary for the implementation of the Project and to clear the sites		●
2	To construct the following facilities		
	1) The building	●	
	2) The gates and fences in and around the sites		●
	3) The parking lots	●	
	4) The road within the site	●	
	5) The road outside the site		●
3	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project in or outside the sites		
	1) Electricity		
	a. The distributing power line to the sites		●
	b. The drop wiring and internal wiring within the sites	●	
	c. The main circuit breaker and transformer	●	
	2) Water Supply		
	a. The city water distribution main to the site		●
	b. The supply system within the site (receiving and elevated tanks)	●	
	3) Drainage		
	a. The city drainage main (for storm sewer and others to the site)		●
	b. The drainage system (for toilet sewer, common waste, storm drainage and others) within the site	●	
	4) Gas Supply		
	a. The city gas main to the site	NA	NA
	b. The gas supply system within the site	NA	NA
	5) Telephone System		
	a. The telephone trunk line to the main distribution frame/panel (MDF) of the building		●
	b. The MDF and the extension after the frame/panel		●
	6) Furniture and Equipment		
	a. General furniture		●
	b. Project equipment	●	
4	To ensure prompt unloading and customs clearance of the products at ports of disembarkation in the recipient country and to assist internal transportation of the products		
	1) Marine (Air) transportation of the Products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the Products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	●	
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services be exempted		●
6	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
7	To ensure that the facilities and equipment be maintained and used properly and effectively for the implementation of the Project		●
8	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		●
9	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
10	To give due environmental and social consideration in the implementation of the Project.		●

(B/A : Banking Arrangement, A/P : Authorization to pay)

(3)

APPENDIX – 5

SOFT COMPONENT PLAN OF GRANT AID PROJECT

Appendix 5 Soft Component Plan of Grant Aid Project

1. Background for Planning Soft Component

In the Republic of Sudan (hereinafter referred to as “Sudan”), the urban development has proceeded rapidly and population has been increased along with the recent economic growth. Consequently Khartoum State, which has the capital city of Sudan, has faced the serious situation of environment, hygiene and living safety deterioration. Sudan revised Environmental Protection Act with support from UNEP, however, there are not any legalized documents on water and air pollution protection and waste management. Ministry of Environment, Forestry and Physical Development (hereinafter referred to as “MEFPD”) has tried to legalize these documents although they do not have enough budgets.

Khartoum State has a land area of 20,000km^2, and its population is 6,270,000 people. The daily waste generation in Khartoum State is about 5,000 ton. Under the supervision of MEFPD, Supervisory Authority for Cleaning in Khartoum State (hereinafter referred to as “SACKS”) and Local Cleaning Affiliate (hereinafter referred to as “LCA”) in each Locality implement waste management together. The collected wastes are transferred to three landfill sites through three transfer stations in Khartoum State. SACKS and LCAs collect and transport wastes with old vehicles and equipment because the financial situation of Khartoum State is not enough and there are not any subsidy systems for waste management from the Government of Sudan (hereinafter referred to as “GOS”). Therefore, the collection ratio is only 65%. And the areas, where low-income people live, do not have the waste collection service. The total area of three landfill sites is 1,000 ha and they receive wastes for 24 hours. However, soil covering is not implemented in all landfills because of the lack of heavy equipment.

Under such circumstances, Japan International Cooperation Agency (hereinafter referred to as “JICA”) dispatched an environmental management advisor to Sudan between fiscal 2010 and fiscal 2013 in order to support for multiple capacity development in the waste management field. Through supporting the pilot projects on waste collection and final disposal implemented by the Sudanese side, the advisor successfully achieved to develop the capacity on solid waste management in GOS to some extent. And he suppoted MEFPD and SACKS to prepare Master Plan for waste management prepared in 2013 (hereinafter referred to as “M/P”) in order to solve the issues on waste management comprehensively in Khartoum State by 2028.

As a result of the advisor’s activities, GOS submitted another request for grant aid assistance to the Government of Japan (hereinafter referred to as “GOJ”) for the procurement of equipment and construction of facilities to improve the waste management system. Based on this request, GOJ decided to implement the Preparatory Survey for Outline Design of this Project. In this Survey, JICA Survey Team confirmed the background, purpose and the contents of the request, and examined the necessity, effects, technical and financial relevance of the Project. And JICA Survey Team prepared the outline design and cost estimation based on the necessary contents and scale of the Project.

One of the expected results of the Project is to strengthen waste collection and transportation capacity of Khartoum State by operating equipment/facility procured/constructed in the Project appropriately. In order to realize the sustainability of the Project result, the Soft Component of the Project is necessary and takes an important role.

2. Targets of Soft Component

The Project aims to improve the waste collection, transportation and disposal in Khartoum State. In order to achive it, the targets of the Soft Component are to operate and management the equipment procured in the Project appropriately and to implement the waste collection work effectively.

3. Outputs from Soft Component

(1) Current Issues

In the existing workshops, there are not any clear system and rules for Operation and Maintenance (hereinafter referred to as "O&M"). Mechanics and drivers do not have enough knowledge of O&M for collection vehicles, and not work actively. They tend to operate vehicles until the vehicles suffer heavy damage. It causes to increase the replacement parts, necessary time and cost for repair. Workers make record for the spare parts, but they order only when they use up the spare parts becaeuse they do not have any plans to procure the spare parts. It also causes the longer repair time, the lower operating rate, and other negative effects on waste collection works. If such situation is not improved, workers would not catch the condition of newly procured vehicles in the Project, and these vehicles would be operated without enough maintenance. As a result, the life span of the vehicles would be shortened. Regarding to the training system, the experiences and technical skills of senior mechanics seem not to be transferred to junior mechanics.

(2) Outputs

Appropriate maintenance of vehicles requires awareness by the mechanics and drivers of the importance of preventive maintenance, or maintenance before the development of defects, creation of rules (manual) and training of mechanics with reliable technical capacity. Main activities of Soft Component of the Project are the training for daily inspection by drivers, and instruction for periodical inspection by mechanics. These components will lead awareness raising of mechanics and drivers for the vehicle O&M. The recording system is also improved in Soft Component to make complete O&M records. Workers will utilize these records to find the reasons for re-repair and maintenance mistakes, and to prevent failures. In the Soft Component, there are several lectures to improve and share the technical skills, and to prevent the deterioration of technical skill quality from experiences and lack of moral. As a result of the Soft Component, Khartoum State can develop the capacity to operate and maintain the newly procured vehicles in the Project appropriately.

4. Methods to Comfirm Achievement of Outputs

Table 1 shows the methods to comfirm the achievement of outputs.

Table 1 Verification Methods for Achievement of Outputs

	Output	Indicator	Verification Method
Workshop Management	• To establish the working system in Central Workshop (working management system, safety and sanitation management and	• To prepare the working manual • To hold lectures for workers	• Working manual • Record of lectures

	Output	Indicator	Verification Method
	in-house training)		
Vehicle Maintenance	• To establish the maintenance management system for vehicles and equipment	• To prepare the manuals for daily and periodical inspections • To implement in-house training for mechanics	• manuals for daily and periodical inspections • Record of in-house trainings

5. Soft Component Activities (Input Plan)

In order to implement the technical assistance, one person of Workshop Management Consultant (hereinafter referred to as "WMC") and one person of Vehicle Maintenance Consultant (hereinafter referred to as "VMC") are dispatched. WMC establishes and trains the working and management systems of Central Workshop, and VMC instructs the technical parts for O&M of vehicles. WMC and VMC works from August 2015 to September 2015 when the procured equipment arrives at Khartoum State and construction of Central Workshop is completed by the Project.

In order to maximize the impact by the Soft Component, all related activities are implemented complehensively as one package.

The basic policy of the Soft Component is that Khartoum State will have an ownership and each worker will have a responsibility to learn the technical skills and rules from WMC and VMC for sustainability.

WMC assists to establish the whole management plan for Central Workshop, and assist to establish the systems for human resource, budget, and so on. The whole management plan includes the equipment O&M plan. After preparing the worker assignment, WMC summarizes the responsibility of each worker, working shift, and budget management, and others. WMC also assists to establish management systems as shown in Table 2. WMC holds several lectures for workers to make these management systems stable.

Table 2 WMC's Works to Assist Establishment Management Systems

System	Contents	Timing to establish
Working management	Working time, break time, working shift	During the dispatch of WMC in Khartoum State
Safety and sanitation management	Safety gears, safe working environment, committee for safety and sanitation management	During the dispatch of WMC in Khartoum State (SACKS will continue after the dispatch of WMC)
In-house training	Learning new maintenance and repair skills, training for O&M	During the dispatch of WMC in Khartoum State (SACKS will continue after the dispatch of WMC)

The detailed works of WMC are as follows;

(1) For effective management of Central Workshop, WMC prepares the whole management plan with SACKS. The whole management plan includes working shift, working management, safety management, in-house training plan and equipment O&M plan (freaquencey and items of periodical inspection for equipment procured in the Project).

(2) Based on the whole management plan, WMC sets the necessary assignment and work items for each worker, and prepares the working plan and manual which regulates working management, safety and sanitation management, and so on.

(3) Considering the financial situation of the Sudanese side, WMC assists to prepare the budget plan for O&M of Central Workshop including the salary of workers.
(4) WMC holds the lectures for workers on working management, safety and technical skills.

For sustainable O&M of Central Workshop, the Project selects one Japanese consultant, who fully understands the background and conditions of the Project and have technical skills, as WMC. For WMC, the Project employes one local assistant having the experience of human resource management because the language at the site and official documents are mostly in Arabic, and WMC needs to collect basic information for management of Central Workshop. The employment period is during the dispatch of WMC in Khartoum State.

VMC instructs for sustainable equipment O&M by assisting to establish the systems for vehicle maintenance, spare parts management and driver working; to instruct maintenance work; to prepare the manuals for daily and periodical inspections; to prepare the list and manuals for equipment; to prepare the check sheets and instruct how to use; to inplement the in-house training for the mechanics (including trainer's training), to instruct how to make and save documents; to establish the monitoring system.
Furthermore, VMC suggests the improvement method for O&M to secure the sustainability of O&M by SACKS. The Project selects one Japanese consultant, who fully understands the background and conditions of the Project and have technical skills, as VMC. For VMC, the Project employes one local assistant having the experience of mechanic and technical fields because the language at the site and official documents are mostly in Arabic, and VMC needs to collect basic information for workers of Central Workshop. The employment period is during the dispatch of VMC in Khartoum State.

The detailed works of VMC are as follows;
(1) Improvement of O&M System
In order to maintain the equipment efficiently, VMC prepares the manuals for daily inspection (before and after operation) and for periodical inspection (English and Arabic). VMC changes the existing manual O&M system into the computerized system with the computers, which are prepared by the Sudanese side, to record the vehicle O&M; the stock and use of spare parts; and other O&M information. Finally, VMC instructs workers how to summarize and analyze the recorded data mentioned above.

(2) Training of Daily and Periodical Inspections for Mechanics and Drivers
Based on the manuals mentioned in the above (1), VMC implements the trainings as shown in Table 3. These trainings do not overlap with the primary instruction by the Contractor for the basic mechanical operation.

Table 3 Training for Daily and Periodical Inspections

Trainees	Mechanics	Drivers
Objective	To master the inspection methods provided in the Periodical Inspection Manual	To teach drivers how to conduct daily inspection (before and after operation) before the commencement of the new vehicles operation
Teaching materials	Periodical Inspection Manual, Periodical Inspection Record (in	Manual for routine inspections (before and after driving) (in English and Arabic)

Trainees	Mechanics	Drivers
	English and Arabic)	
Practice	・Practice in periodical inspection ・Entry in Periodical Inspection Record	・Fuel consumption control (to reduce fuel waste by showing the trainees contaminated engine oil and energy consumption by an idling engine) ・Points to be noted when washing vehicles ・Implementation of daily inspections (before and after operation)
Lectures	・Review of the overview of engine and chassis structures ・Lecture on basic maintenance work and comparison of work procedures with photographs ・Lecture on periodical inspection of vehicles	・Review of the overview of engine and chassis structures ・Lecture on safe driving ・Lecture on energy saving driving ・Lecture on daily inspection (before and after operation)

(3) Support for In-house Training System for Mechanics

For the appropriate equipment O&M, it should be promoted that Mechanics learn and keep their technical skills and accurate knowledge. Especially, junior mechanics need to learn the skills for safety management, equipment management and maintenance. Therefore, VMC supports to introduce the in-house training system for mechanics as shown in Table 4. After leaning the necessary knowlegds and skills, senior mechanics are trained as teachers, and educates the junior mechanics. VMC prepares the training components including the experiences and skills of senior mechanics. And VMC supports to prepare the rules to hold the lectures according to the level of damages.

Table 4 Outline of In-house Trainig for Mechanics

Trainees	Mechanics
Objectives	To establish an in-house training system for mechanics and use the system as the main tool to realize appropriate maintenance practices
Teaching materials	Teaching materials for in-house training, check lists (in English)
Contents	The in-house training system shall be established and mechanics shall be trained as lecturers in the in-house training. The in-house training system shall be used to turn junior mechanics into senior mechanics and maintain the technical capacity of skilled mechanics

(4) Practical Instruction of Peridical Inspection, Maintenance and Repair

VMC keeps the manintenance equipment list and manual, and implements the practical instruction as shown in Table 5. VMC and the local assistant monitor the trainings to check whether the mechanics follow the manual mentioned in the above (1). If the mechanics do not follow the manual, VMC and the local assistant implement the follow-up instruction. VMC measures and calculate Mean Time Between Failures (MTBF), which is the predicted elapsed time between inherent failures of a system during operation. Based on the calculation results, VMC extracts the issues on equipment O&M, and examines the improvement measures.

Table 5 Outline of Practical Training on Periodical Inspection and Maintenance

Trainees	Mechanics
Objectives	To understand how to use the maintenance equipment procured in the Project for Central Workshop, and to maintein them appropreately
Teaching materials	Manintenance equipment list and manual (in English and Arabic)
Contents	Using the maintenance equipment procured in the Project for Central Workshop, VMC

Trainees	Mechanics
	instructs the practical inspection and maintenance for the maintenance equipment.

To sum up, Table 6 shows the contents of works and MM for WMC and VMC.

Table 6 Contents of Works and MM for WMC and VMC

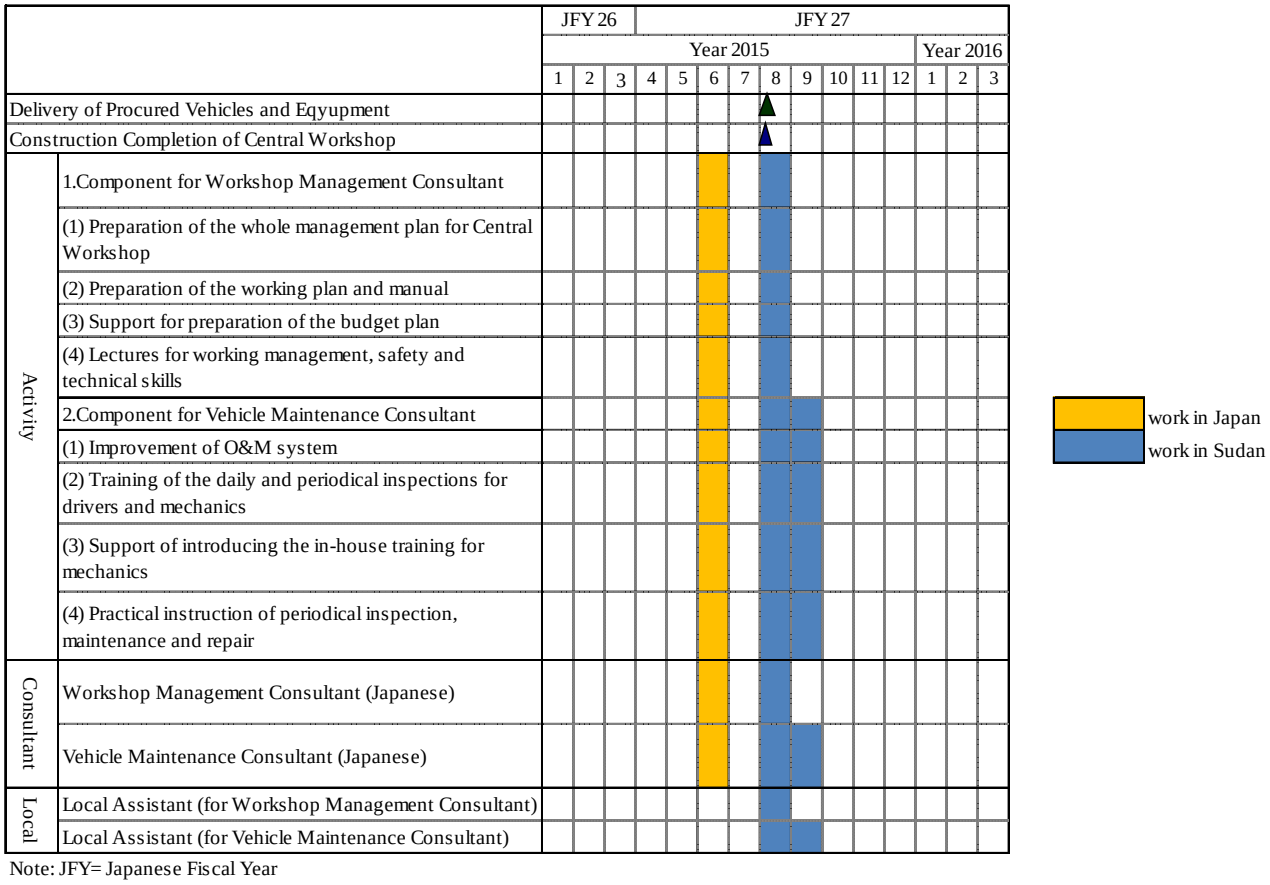
WMC: 1 person			
Work in Sudan	1.0MM	Work in Japan	1.0MM
Preparation and implementation of the whole management plan	0.3	Preparation for the whole management plan	0.3
Preparation and implementation of the budget plan	0.2	Preparation for the budget plan	0.2
Preparation and implementation of the working plan and manual	0.2	Preparation for the working plan and manual	0.2
Preparation and implementation of the lectures for workers on working management, safety and technical skills	0.2	Plan for the lectures on working management, safety and technical skills	0.2
Preparation and record of lectures	0.1	Preparation of the recording form and the management plan of the records	0.1
VMC: 1 person			
Work in Sudan	2.0MM	Work in Japan	1.0MM
Preparation of the manuals for daily and periodical inspections	0.3	Preparation for each manual	0.3
		Plan for the instruction how to manage equipment and maintenance	0.2
Implementation of trainings for daily and periodical inspections	0.3	Plan for the lectures and instructions for mechanics	0.2
		Plan for the trainer's training and its contents	0.1
Instruction how to manage the record of equipment and maintenance	0.4	Preparation of the recording form	0.1
Implementation of in-house training for mechanics	0.4	Preparation of the monitoring form	0.1
Support for trainer's training	0.2		
Preparation and instruction on the manintenance equipment list and manual	0.2		
Monitoring and recording	0.2		

6. Procurement of Execution Resources of Soft Components

The Consultant, who enters into Detailed Design and Supervision Agreement with SACKS, dispatches WMC and VMC. Soft Component plans to establish not only the maintenance system, but also the system in which workers can learn the practical skills for maintenance and management. Therefore, WMC needs to be a person who has the esperiences of organizational management, and VMC needs to be a person who has the experiences of O&M for vehicle and other equipment in practice for more than 10 years. The Project employs local assistants for WMC and VMC by public advertisement. Although JICA Technical Cooperation Project will start in pallarell with this Grant Aid Project, the Soft Component of this Project will produce the results independently. However, the mutual coordination should be arranged between these two projects in order to prevent overlapping on the activities each other.

7. Implementation Schedule of Soft Component

Figure 1 shows the implementation schedule of Soft Component. All activities in Khartoum State start from August 2015.



Note: JFY= Japanese Fiscal Year

Figure 1 Implementation Schedule of Soft Component

8. Documents to be Prepared in Soft Component

WMC and VMC submit the output documents shown in Table 7 to SACKS, JICA HQ and JICA Sudan office.

Table 7 List of Output Documents

Consultant	August 2015	Submission	September 2015	Submission
WMC	• Workshop Management Manual • Final Report	Five copies each to JICA 20 copies to SACKS	—	—
VMC	• Periodical Inspection Manual • Progress Report	Five copies each to JICA 20 copies to SACKS	• Teaching materials and check list for in-house training • Final Report • Final editions of various manuals (including check lists)	Five copies each to JICA 20 copies to SACKS

9. Responsibilities of the Implemention Agency

SACKS, which is the implementation agency of the Project, selects the Counterpart (hereinafter referred to as "C/P") for Soft Component. SACKS gives the assignments of one person as a coordinator for overall activities in Soft component, and several persons for each WMC and VMC. SACKS bears saraly, administration fee,

transportation fee and other necessary costs for the C/P members. With WMC and VMC, SACKS needs to have a responsibility to establish the management system, improve and implement the O&M works sustainably.

In order to keep the maintenance quality, SACKS holds the maintenance improvement meeting every week. In this meeting, SACKS interviews with mechanics using the check sheet, and confirms the maintenance situation. With VMC, SACKS calculates MTBF, examine the results, and implement the improvement measurements.

Table 9 shows the obligations of SACKS for Soft Component.

Table 9 Obligations of SACKS for Soft Component

	Workshop Management	Vehicle Maintenance
Assignment	Coordinator : 1 person	
	• Workshop management: 1 person • Establishment of organizational structure in workshop/personnel management: 1 person • Administrative work, accounting and document control: 1 person	• Person in charge of mechanics: 1 person • Person in charge of drivers: 1 person • Accessory building facilities, accessory maintenance equipment, management of consumables and maintenance of the workshop facilities: 1 person • Inventory management, maintenance management planning, training for mechanics, implementation of training of trainers: 1 person
Obligation	• Overall control and coordination • Acquisition of budget • Preparation of activity space • Establishment of organizational structures • Record keeping • Improvement and sustainable management	• Preparation and enforcement of various manuals • Implementation of maintenance work • Implementation of the training for mechanics • Implementation of the training of trainers • Record keeping • Implementation of monitoring • Establishment of a work structure and improvement of the work procedures

APPENDIX – 6

REFERENCES

Appendix 6 References

Name of Survey: The Preparatory Survey on the Project for Improvement of Solid Waste Management in Khartoum State in the Republic of the Sudan

No.	Name of reference	Form book, video, map, photo, etc.	Original/ Copy	Name of government office to be approached or name of issuing government office	Year of publication
1	Post-Conflict Environmental Assessment	Book	Orginal	United Nations Environment Programme (UNDP)	2007
2	National Plan for Environmental Management in Post-Conflict Sudan	Soft data	Copy	Ministry of Environment and Physical Development, Sudan	2009
3					
4					
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APPENDIX – 7

ENVIRONMENTAL CHECKLIST

Appendix 7 Environmental Check List

2nd October, 2013

Dr. Mitsuo YOSHIDA
Leader
Preparatory Survey Team
Japan International Cooperation Agency (JICA)

Subject: Submission of Environmental Checklist
Project: Preparatory Study on The Project for Improvement of Solid Waste Management in Khartoum State

In response to a request from Japan International Cooperation Agency (JICA) through the Preparatory Survey Team, we, Supervisory Authority for Cleaning in Khartoum State (SACKS), would like to submit the Environmental Checklist as attached for the Project for Improvement of Solid Waste Management in Khartoum State in the Republic of the Sudan under the Japan's grant aid.

Best Regards,

Malik Bashier Mohamed
General Manager
Supervisory Authority for Cleaning in Khartoum State

Environmental Checklist for Construction and Operation of Central Workshop

Category	Environmental Item	Main Check Items	Yes: Y No: N	Confirmation of Environmental Considerations (Reasons, Mitigation Measures)
1 Permits and Explanation	(1) EIA and Environmental Permits	(a) Have EIA reports been already prepared in official process? (b) Have EIA reports been approved by authorities of the host country's government? (c) Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a)N (b)N (c)N (d)N	(a)SACKS will make EIA Report and plan to receive the approval by April 2014. (b)ditto. (c)There are not any conditions for EIA approval. (d)There are not any additional approval.
	(2) Explanation to the Local Stakeholders	(a) Have contents of the project and the potential impacts been adequately explained to the Local stakeholders based on appropriate procedures, including information disclosure? Is understanding obtained from the Local stakeholders? (b) Have the comment from the stakeholders (such as local residents) been reflected to the project design?	(a)N (b)N	(a) For this Project, execution of public consultation meeting is not required to Environmental Protection Act 2001. However, if necessary, SACKS will arrange and conduct the explanation to the public about the Project, construction schedule and method before the commencement of the Project for the smooth implementation of the Project. (b) In case that SACKS receives any comments from the public and regulatory authorities, SACKS is willing to discuss and arrange any necessary procedure to implement the Project appropriately.
	(3) Examination of Alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a)Y	(a)SACKS examined alternatives. See attachment 1.
2 Pollution Control	(1) Air Quality	(a) Do air pollutants, (such as sulfur oxides (SOx), nitrogen oxides (NOx), and soot and dust) emitted from the proposed infrastructure facilities and ancillary facilities comply with the country's emission standards and ambient air quality standards? Are any mitigating measures taken? (b) Are electric and heat source at accommodation used fuel which emission factor is low?	(a)Y (b)Y	(a)A large volume of air pollutants are not emitted from Central Workshop. (b)ditto.
	(2) Water Quality	(a) Do effluents or leachates from various facilities, such as infrastructure facilities and the ancillary facilities comply with the country's effluent standards and ambient water quality standards?	(a)Y	(a)Waste oil will not discharged by using the oil separator.
	(3) Wastes	(a) Are wastes from the infrastructure facilities and ancillary facilities properly treated and disposed of in accordance with the country's regulations?	(a)Y	(a)Wastes will be transferred to Khartoum Landfill Site and disposed there.
	(4) Soil Contamination	(a) Are adequate measures taken to prevent contamination of soil and groundwater by the effluents or leachates from the infrastructure facilities and the ancillary facilities?	(a)Y	(a)Soil and groundwater pollution by waste oil will be prevented by using the oil separator.
	(5) Noise and Vibration	(a) Do noise and vibrations comply with the country's standards?	(a)Y	(a) The effect of noise and vihlatioin will be minimized by managing the operation time.
	(6) Subsidence	(a) In the case of extraction of a large volume of groundwater, is there a possibility that the extraction of groundwater will cause subsidence?	(a)Unrelated	(a)A large volume of groundwater will not be extracted.
	(7) Odor	(a) Are there any odor sources? Are adequate odor control measures taken?	(a)Unrelated	(a)There are not any odor sources.

3 Natural Environment	(1) Protected Areas	(a) Is the project site or discharge area located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a)N	(a)There are not any protected areas in and around the site.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) Is there a possibility that changes in localized micro-meteorological conditions, such as solar radiation, temperature, and humidity due to a large-scale timber harvesting will affect the surrounding vegetation? (d) Is there a possibility that the amount of water (e.g., surface water, groundwater) used by the project will adversely affect aquatic environments, such as rivers? Are adequate measures taken to reduce the impacts on aquatic environments, such as aquatic organisms?	(a)N (b)N (c)N (d)N	(a) The project site does not encompass primeval forests, tropical rain forests, and ecologically valuable babitats. (b) Tthe project site does not encompass the protected habitats of endangered species. (c) There is not a possibility that changes in localized micro-meteorological condition. (d) There is not a possibility that the amount of water used by the project.
	(3) Hydrology	(a) Is there a possibility that hydrologic changes due to the project will adversely affect surface water and groundwater flows?	(a)Unrelated	(a) There is not a possibility that hydrologic changes due to the project will adversely affect surface water and groundwater flows.
	(4) Topography and Geology	(a) Is there a possibility the project will cause large-scale alteration of the topographic features and geologic structures in the project site and surrounding areas?	(a)Unrelated	(a) There is not a possibility the project will cause large-scale alteration of the topographic features and geologic structures in the project site and surrounding areas.
4 Social Environment	(1) Resettlement	(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? (d) Is the compensations going to be paid prior to the resettlement? (e) Is the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism establisbed?	(a)N (b)Unrelated (c)Unrelated (d)Unrelated (e)Unrelated (f)Unrelated (g)Unrelated (h)Unrelated (i)Unrelated (j)Y	(a)Involuntary resettlement is not caused by project implementation. (b)It is not related to this project. (c)ditto. (d)ditto. (e)ditto. (f)ditto. (g)ditto. (h)ditto. (i)ditto. (j)Planning and Research Department in SACKS will be in charge of the Grievance Redress.
4 Social Environment	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary?	(a)N	(a) There is not a possibility that the project will adversely affect the living conditions of inhabitants.
	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a)N	(a) There is not a possibility that the project will damage the local archeological, historical, cultural, and religious heritage.

	(4) Landscape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken? (b) Is there a possibility that landscape is spoiled by construction of high-rise buildings such as huge hotels?	(a)N (b)Unrelated	(a) There is not a possibility that the project will adversely affect the local landscape. (b) There is not a possibility that landscape is spoiled by construction of high-rise buildings such as huge hotels.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples? (b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources respected?	(a)Unrelated (b)Unrelated	(a) There is not a possibility of impacts on the culture and lifestyle of ethnic minorities and indigenous peoples. (b) There is not a possibility of impacts on the rights of ethnic minorities and indigenous peoples in relation to land and resources respected.
	(6) Working Conditions	(a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? (b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? (c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.? (d) Are appropriate measures taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents?	(a)Yes (b)Under preparation (c)Under preparation (d)Under prepration	(a) Based on Public Health Act 2008 (PHA 2008), SACKS will supervise the Contractor to follow PHA 2008. (b) Based on PHA 2008, SACKS will examine the proper tangible safety measures with the Consultant, and supervise the Contractor to conduct it during the construction. (c) Based on PHA 2008, SACKS will examine the proper intangible safety measures with the Consultant, and supervise the Contractor to conduct it during the construction. (d) Based on PHA 2008, SACKS will examine the appropriate measures with the Consultant, and supervise the Contractor to allocate security guards not to violate safety of other individuals involved, or local residents.
5 Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts?	(a)Under prepration (b)No (c)No	(a) Regarding the concerned impacts, SACKS will examine the adequate measures with the related organizations and the Consultant, and finalize it. And SACKS will supervise the Contractor to conduct these measures. (b) There is no possibility that the construction activities will adversely affect the natural environment. (c) There is no possibility that the construction activities will adversely affect the social environment.
	(2) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) What are the items, methods and frequencies of the monitoring program? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a)Y (b)Y (c)Y (d)Y	(a) Regarding the concerned impacts, SACKS will examine and the monitoring plan with the related organizations and the Consultant. After that, SACKS will supervise the Contractor to conduct the monitoring plan appropriately. (b) SACKS will examine the necessary items, methods and frequencies included in the monitoring program and prepare the appropriate monitoring plan with the Consultant. (c) SACKS will be responsible to conduct the monitoring, and the monitoring framework has been already established because the monitoring is one of the routine works of SACKS. (d) SACKS plans to submit the monthly report as a report to the regulatory authorities.

1) Regarding the term "Country's Standards" mentioned in the above table, in the event that environmental standards in the country where the project is located diverge significantly from international standards, appropriate environmental considerations are required to be made.

In cases where local environmental regulations are yet to be established in some areas, considerations should be made based on comparisons with appropriate standards of other countries (including Japan's experience).

2) Environmental checklist provides general environmental items to be checked. It may be necessary to add or delete an item taking into account the characteristics of the project and the particular circumstances of the country and locality in which the project is located.

Attachment 1

Examination of Alternatives

The following 4 options were examined as the alternatives for construction of Central Workshop.

- Option 1: Zero option (to keep the present situation)
- Option 2: Rehabilitation of the existing workshop in Omdurman Locality (to add the function as the Central Workshop)
- Option 3: Rehabilitation of the existing workshop in Bahri Locality (to add the function as the Central Workshop)
- Option 4: Newly construction of the Central Workshop in Khartoum Locality

In July, 2013, MEFPD, SACKS and JICA Team discussed on the results of the site survey by SACKS and JICA Team. As a result, Option 4 was selected as shown in Table 1.

Table 1 Examination of Alternatives

	Option 1: Zero option (to keep the present situation)	**Option 2: Rehabilitation of the existing workshop in Omdurman Locality** (to add the function as the Central Workshop)	**Option 3: Rehabilitation of the existing workshop in Bahri Locality** (to add the function as the Central Workshop)	**Option 4: Newly construction of the Central Workshop in Khartoum Locality**
Surrounding Area	Workshops in localities are in commercial and industrial areas.	The existing workshop is in the commercial area.	The existing workshop is in the commercial area.	The site is in the industrial area.
Technical Points	Daily maintenance can be done. However, there are not any equipment and space for overhaul and other important periodical maintenance and examination.	It is convenient that the existing workshop is near the center of locality. The access to the existing workshop is not good because the access road from the main road is narrow. It is necessary to demolish the existing workshop because it does not have the necessary facility for overhaul and other important periodical maintenance and examination. The existing workshop is not only for waste management vehicles, but also for other locality's works, and the demarcation is not decided among sections in the locality.	The site area is small. The access to the existing workshop is not good because the access road from the main road is narrow. It is necessary to demolish the existing workshop because it does not have the necessary facility for overhaul and other important periodical maintenance and examination. The existing workshop is not only for waste management vehicles, but also for other locality's works, and the demarcation is not decided among sections in the locality.	The site area is large and the boundary of the site is clear. The access to the site is good because the access road from the main road is enough wide.
Project Cost		Construction cost and demolition cost of the existing workshop	Construction cost and demolition cost of the existing workshop	Only construction cost

	Option 1: Zero option (to keep the present situation)	**Option 2: Rehabilitation of the existing workshop in Omdurman Locality** (to add the function as the Central Workshop)	**Option 3: Rehabilitation of the existing workshop in Bahri Locality** (to add the function as the Central Workshop)	**Option 4: Newly construction of the Central Workshop in Khartoum Locality**
Natural Environment		Not any significant impacts.	Not any significant impacts.	Not any significant impacts.
Social Environment		It is necessary to consider the negative impact on the surrounding small shops. Construction wastes will generate by demolition of the existing workshop.	It is necessary to consider the negative impact on the surrounding small shops. Construction wastes will generate by demolition of the existing workshop.	There are not any significant impacts on surrounding industries because the distance between the site and surrounding industries is secured.
Optimum Option and reasons to select	Not recommended. Under this situation, overhaul and other important periodical maintenance and examination cannot be done.	Not recommended. There are not many advantages from the technical and financial views because this option will not be rehabilitation, but demolition and newly construction.	Not recommended. There are not many advantages from the technical and financial views because this option will not be rehabilitation, but demolition and newly construction.	Recommended. Effectiveness of the Central Workshop is highly expected.