

People's Republic of Bangladesh

Ministry of Local Government, Rural Development and Cooperatives

PREPARATORY SURVEY REPORT

ON

**THE PROJECT FOR IMPROVEMENT OF SOLID WASTE
MANAGEMENT EQUIPMENT IN THE PEOPLE'S REPUBLIC OF
BANGLADESH**

FEBRUARY 2015

Japan International Cooperation Agency

(JICA)

Yachiyo Engineering Co., Ltd.

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PREFACE

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to Yachiyo Engineering Co., LTD.

The survey team held a series of discussions with the officials concerned of the Government of People's Republic of Bangladesh, and conducted a field investigations. As a result of further studies in Japan, the present report was finalized..

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of People's Republic of Bangladesh for their close cooperation extended to the survey team.

February, 2015

Masami Fuwa
Director General,
Global Environment Department
Japan International Cooperation Agency

Summary

1. Overview of Bangladesh

The People's Republic of Bangladesh (hereinafter referred to as "Bangladesh") has an area of 144,000km², approx. 40% of the area of Japan. It has a population of 154.69 million people (in 2012, the World Bank), which is increasing at an average annual rate of 1.3% (a UN estimate for the period between 2010 and 2015). The great majority of its people are Bengalis and Bengali is its official language.

Bangladesh is located in a delta formed by large rivers, which divide its land into several pieces. It is noted for the frequent occurrence of natural disasters such as floods and cyclones. Natural gas is the only significant natural resource of Bangladesh. Its economy depends heavily on agriculture and labor-intensive industries including the manufacturing of clothing. Despite the concern over the negative impact of the rise in crude oil prices, implementation of the Multi-Fiber Agreement and political instability on the economy, the GDP of Bangladesh has been growing at a high average annual rate of 6% or above since 2006. Due to this stable economic growth, it is included in the "Next Eleven" emerging countries which are expected to follow BRICs in the economic development.

The breakdown of the real GDP of Bangladesh in fiscal 2013 shows that each of the five largest industries, *i.e.* manufacturing, agriculture and forestry, wholesale and retail, distribution, warehousing and communications, and construction, make up 19.5%, 14.4%, 14.1%, 11% and 9.4%, respectively, of the real GDP.

2. Background to and Outline of the Project

The urban population of Bangladesh is growing and urban areas are expanding rapidly. As a consequence, action is urgently needed to combat the deterioration of the urban environment, including measures for solid waste disposal, and to combat air pollution and the expansion of slum areas. Rapid population growth and economic development, particularly in the cities of Dhaka North and Dhaka South, which were created in 2011 through the division of the capital of Bangladesh, and in Chittagong, have turned solid waste management into a significant social problem, as these cities are producing increasing amounts of solid waste. Dhaka North City Corporation (DNCC) and Dhaka South City Corporation (DSCC) are responsible for solid waste management in Dhaka North and Dhaka South, respectively. However, because of the lack of a well-established implementation structure, plans and equipment for solid waste management and the lack of hygiene awareness on the part of the residents, these city corporations have been unable to implement appropriate management of solid waste. Recognizing the need for appropriate solid waste management in order to achieve the sound development of Dhaka North and Dhaka South and to provide residents with a safe urban living environment, in 2002 the Government of Bangladesh submitted to the Government of Japan a request for a survey and the preparation of a plan for solid waste management in what was then Dhaka City. In response, JICA implemented a development study entitled "Solid Waste Management Study in Dhaka City" (referred to below as the "D/S") (from November 2003 to March 2006) and prepared the "Clean Dhaka Master Plan (referred to below as the "M/P")", to be completed by 2015.

After the conclusion of the D/S, Dhaka City Corporation (DCC) actively promoted its own initiatives

including the collection and disposal of medical waste in cooperation with a local NGO, in accordance with the recommendations of the M/P. JICA provided supplementary assistance to the activities of DCC in the form of the “Follow-up Cooperation on the Management and Improvement of the Existing Disposal Sites”(in 2006); assistance in the introduction of hygienic methods to existing waste disposal sites and the expansion of waste disposal sites via the Japan Debt Cancellation Fund (2006 – 2011); and the dispatch of Japan Overseas Cooperation Volunteers in the environmental education sector, to create awareness among the residents and to promote a system of participatory waste collection (2006 – present). In addition, JICA implemented a technical cooperation project aimed at enhancing the capacity of DCC staff members and establishing a system for efficient solid waste management in DCC in order to resolve the technical and management problems of solid waste management in general, and the collection and transport of solid waste in particular, for a period of approx. six years from February 2007 to March 2013.

DNCC and DSCC have been increasing their budgets for solid waste management each year by managing to allocate to the maintenance costs required for solid waste management current expenditure from the general fund revenue, in addition to the revenue from the cleaning tax levied on residents. However, they have no prospect of acquiring a source of funds to cover the expense required to purchase the solid waste collection equipment mentioned in the M/P. Against this background, JICA implemented the Programme for Improvement of Solid Waste Management in Dhaka City toward the Low Carbon Society (referred to below as EGAP), in which approx. 100 solid waste collection vehicles were procured and a workshop for their maintenance was constructed. Nonetheless, the number of available waste collection vehicles is still insufficient. In addition, many of the collection vehicles procured by DCC in the 1990s are expected to become unfit for use around 2014 due to age, and DNCC and DSCC are unable to procure the collection vehicles set out in the M/P because of their financial difficulties. Therefore, they submitted to JICA this request for grant aid assistance.

Chittagong is the second largest city in Bangladesh and is a center of commerce and industry, where 90% of the total imports and exports of Bangladesh are handled and 40% of the industrial products of Bangladesh are manufactured. Despite the extremely large amount of solid waste generated (1,600 t/day), the number of solid waste collection vehicles owned by Chittagong City Corporation (CCC), approx. 80, is insufficient to the task of collecting and transporting the waste. CCC spent 4.5% of its total budget on solid waste management (in fiscal 2013/14). This figure is smaller than the corresponding figures for DNCC and DSCC, of 7.1% and 10.4%, respectively. Therefore, it is difficult for CCC to procure waste collection vehicles from its own financial sources. Against this background, CCC submitted to JICA a request for grant aid assistance.

3. Summary of the Survey Result and Contents of the Project

JICA dispatched a survey team to Bangladesh to conduct the first-phase survey (between August 6th and September 9th, 2014). The team confirmed the contents of the request and conducted a field survey for the selection of equipment. After returning to Japan, the team analyzed the data collected in the field survey, prepared an outline design and estimated the project cost. The team conducted an Outline Design Survey in Bangladesh between December 3rd and 12th, 2014 on the basis of the result of the analysis.

This Project Survey Team established the basic components of the Project as mentioned below on the basis of the results of the field surveys and the discussion with the Bangladeshi side, after returning to Japan.

(1) Brief Description of the Waste Collection Vehicles to be Procured

No.	Waste collection vehicle	Maximum carrying capacity	Quantity				Main characteristics
			DNCC	DSCC	CCC	Total	
1	Compactor (small)	Approx. 3t	10	8	6	24	These vehicles shall be used for the waste collection in urban areas. However, they shall not be used for the collection of road cleaning waste or bulk waste.
2	Compactor (large)	Approx. 8t	13	14	7	34	
3	Container carrier	Approx. 6t (including the container)	20	24	13	57	These vehicles can be used for the collection of all types of solid waste. However, as the containers placed on roadside may worsen congestion, they shall be used in areas such as markets and newly developed areas in suburbs where there are extra spaces to place them.
4	Dump truck (small)	Approx. 2t	4	3	4	11	These vehicles shall be used mainly for the collection of road cleaning waste, construction waste, debris and bulk waste.
5	Dump truck (large)	Approx. 7t	5	4	4	13	
6	Dump truck (4WD)	Approx. 6t	4	3	4	11	
Total			56	56	38	150	

(2) Soft Component (draft)

The two activities mentioned below are planned for implementation in the three target cities in the soft component of this Project.

- Assistance to the allocation and introduction of the compactors
- Strengthening of the management of the workshops (including technical guidance to the staff members in charge of the vehicle maintenance)

4. Project Period and Project Cost Estimation

The cost of implementing this Project is estimated at 1,525 million JPY (1,486 million JPY and 39 million JPY to be borne by the Japanese and Bangladeshi sides, respectively). The obligations of the Bangladeshi side shall be the procurement of the containers for the container carriers and the payment of bank commissions. A period of approx. 21 months is required for the implementation of this Project, from the field survey and detailed design to the completion (including the Soft Component).

Month No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Detailed design			Field survey/detailed design																		
						Tender(Preparation of tender documents,announcement of the tender, evaluation of the proposals)															
Equipment procurement					Manufacturing, , inspection and transportation of the equipment																
Soft Component					Plans for the allocation of vehicles,Introduction of the vehicles Strengthening of the workshop management system																

5. Project Evaluation

(1) Relevance of the Project

① Urgency

The amount of solid waste generated in the three target cities has been rising because of the population growth triggered by rapid urban development and the influx of refugees. However, as the waste is not collected or disposed of appropriately, the living environment has significantly deteriorated. Only 70% of the solid waste generated is being collected. There are areas where solid waste is not collected at all. Many of those no-collection areas are found in low-income residential areas. However, the waste collection and transportation equipment of the three target cities is old and in poor condition, and the waste collection capacity of the three cities is expected to fall by approx. 20% over the next five years. This Project needs to be implemented urgently in order to improve the situation described above.

② Project Contributing to the Achievement of the Medium- to Long-term Developmental Goals

“Improvement of solid waste management” is defined as a strategy to be followed by local governments in “SFYP Objectives and Strategies for the Pourashavas and City Corporations” in the Sixth Five Year Plan (FY2011 – FY2015) in the poverty reduction strategy paper (PRSP) of Bangladesh, “Unlocking the Potential: National Strategy for Accelerated Poverty Reduction.”

This Project is expected to contribute to the achievement of the objectives through the procurement and provision of the equipment required for waste collection.

③ Consistency with the Assistance Policies and Strategies of the Government of Japan

The Country Assistance Policy for Bangladesh published in June 2012 mentions as priority areas (medium objectives) for Bangladesh to become a middle-income country: (1) Accelerating inclusive economic growth and (2) Overcoming social vulnerability. This Project is considered to be consistent with the policy, as it is expected to contribute to “(2) Overcoming social vulnerability” through the improvement of the sanitary environment.

(2) Effectiveness of the Project

① Quantitative Effects

The main quantitative effects expected from the implementation of this Project are described in the

following.

Indicator	Before the improvement (2014)			After the improvement (2019)		
	DNCC	DSCC	CCC	DNCC	DSCC	CCC
Amount of solid waste collected (t/day)	1,356	1,991	1,200	2,052	2,470	1,870
Proportion of waste collected %	65	66	75	86	75	98
CO ₂ emissions per unit of collected waste kg/t	4.3	3.3	4.3	3.3	2.9	3.6

② Qualitative Effects

The main qualitative effects expected from the implementation of this Project are described in the following.

(i) Expansion of the Solid Waste Collection Service and Improvement of the Living Environment

The implementation of this Project is expected to bring about solid waste collection in areas where it is not being collected at present and to increase the frequency of waste collection in areas where it is being collected. This expansion of the waste collection service is expected to improve the living environment by reducing the amount of solid waste strewn on the streets and, consequently, by reducing the negative impact of the uncollected solid waste (offensive odors, pests, etc.) on the living environment.

(ii) Improvement in the People's Perception of Solid Waste Management

The procurement of the first compactors by DCC in the previous Japanese grant aid project was reported by the media. The media report significantly changed the people's concept of solid waste management. A similar effect is expected from this Project, as compactors will also be procured in this Project.

Because this Project is expected to have sufficient beneficial effects as mentioned above, the relevance of implementing this Project with grant aid from the Government of Japan has been confirmed.

Implementation of the Project with higher efficiency and effectiveness than similar projects in the past shall require establishment of a system for the operation and maintenance of the waste collection vehicles, employment and assignment of appropriate personnel to the system without delay and allocation of required amount of budget to the operation/maintenance.

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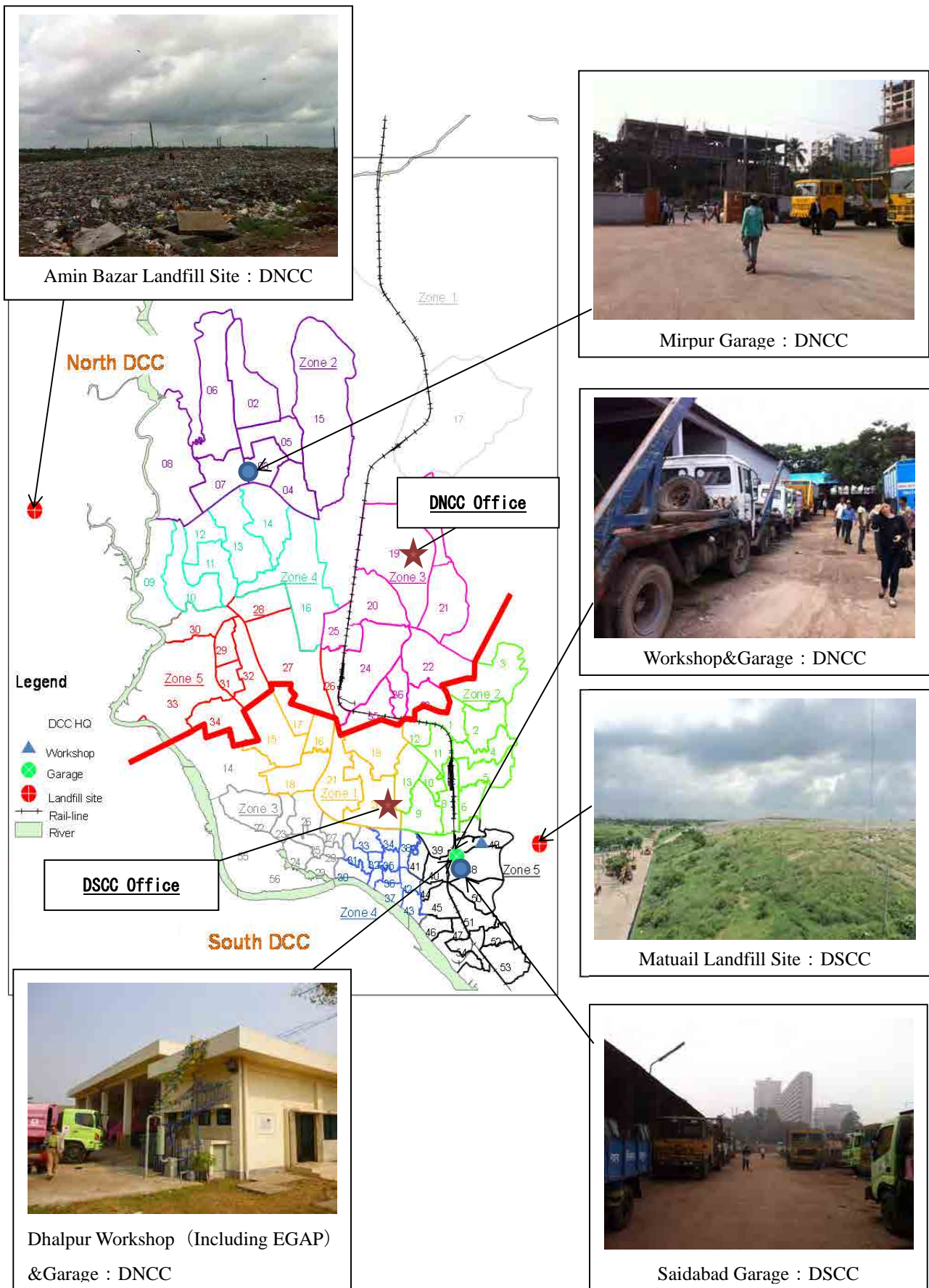
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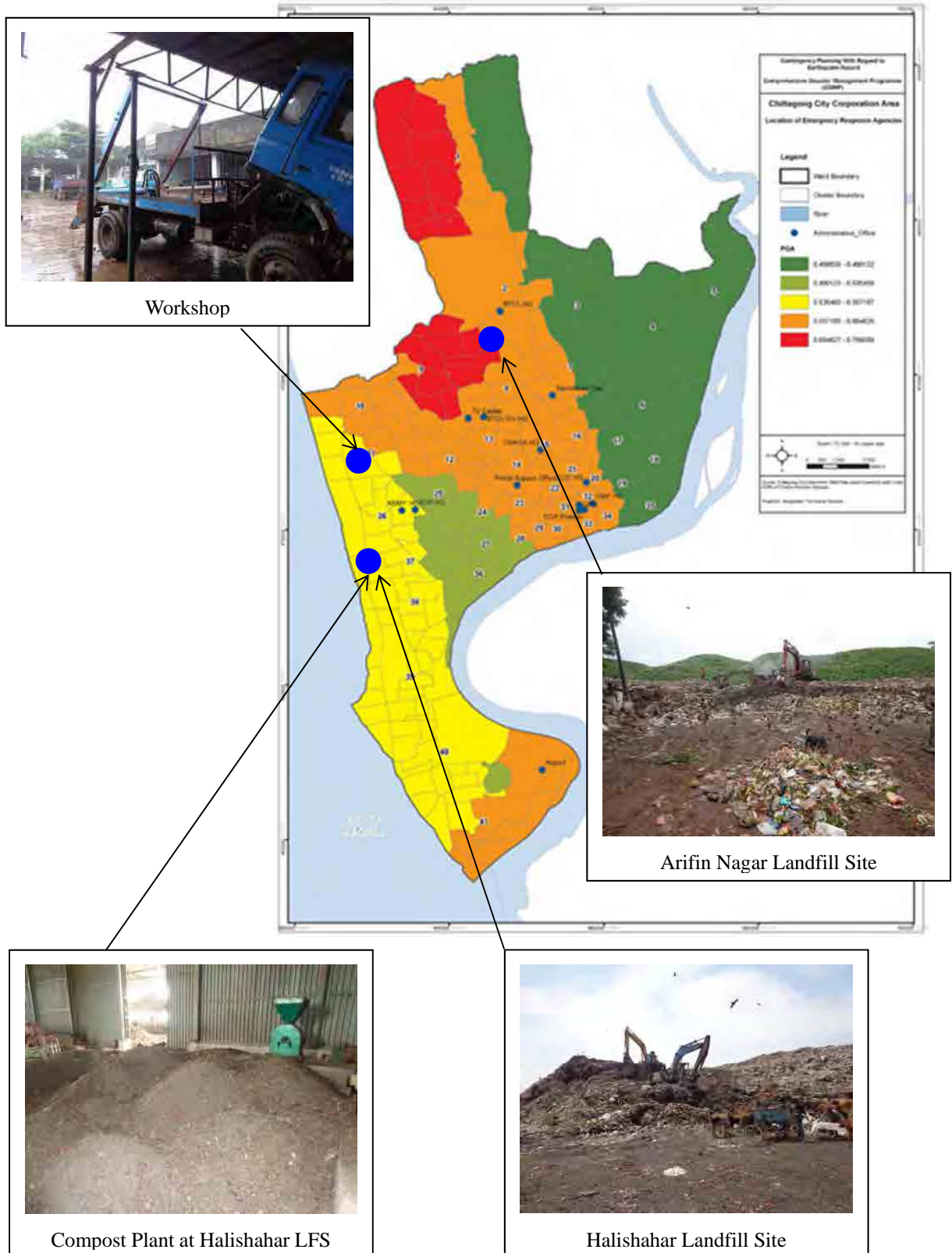
Location Map



Waste Management Site of DNCC,DSCC



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Abbreviation

ADB	: Asian Development Bank
AE	: Assistant Engineer
AP	: Authorization to Pay
B/A	: Banking Arrangement
CCC	: Chittagong City Corporation
CI	: Conservancy Inspector
CNG	: Compressed Natural Gas
CO	: Conservancy Officer
CWMO	: Chief Waste Management Officer
DCC	: Dhaka City Corporation
DNCC	: Dhaka North City Corporation
DSCC	: Dhaka South City Corporation
EE	: Executive Engineer
E/N	: Exchange of Notes
EGAP	: Program Grant Aid for Environment and Climate Change
ERD	: Economic Relations Division
GDP	: Gross Domestic Product
GOB	: Government of Bangladesh
GVW	: Gross Vehicle Weight
JICA	: Japan International Cooperation Agency
LGD	: Local Government Division
M/D	: Minutes of Discussion
MLGRD&C	: Ministry of Local Government, Rural Development and Cooperatives
NGO	: Non—Governmental Organization
OJT	: On-the-job Training
PRSP	: Poverty Reduction Strategy Papers
SAE	: Sub Assistant Engineer
SE	: Super Intending Engineer
Tk	: Taka
WMD	: Waste Management Department
3R	: Reduce, Reuse, Recycle

Chapter 1 Background of the Project

1-1 Background to the Request for Grant Aid Assistance

The urban population of Bangladesh is growing and urban areas are expanding rapidly. As a consequence, action is urgently needed to combat the deterioration of the urban environment, including measures for solid waste disposal, and to combat air pollution and the expansion of slum areas. Rapid population growth and economic development, particularly in Dhaka North and Dhaka South, which were created in 2011 through the division of the capital of Bangladesh, and in Chittagong, have turned solid waste management into a significant social problem, as these cities are producing increasing amounts of solid waste.

DNCC and DSCC are responsible for solid waste management in Dhaka North and Dhaka South, respectively. However, because of the lack of a well-established implementation structure, plans and equipment for solid waste management and the lack of hygiene awareness on the part of the residents, these city corporations have been unable to implement appropriate management of solid waste. Recognizing the need for appropriate solid waste management in order to achieve the sound development of Dhaka North and Dhaka South and to provide residents with a safe urban living environment, in 2002 the Government of Bangladesh submitted to the Government of Japan a request for a survey and the preparation of a plan for solid waste management in what was then Dhaka City. In response, JICA implemented a development study entitled “Solid Waste Management Study in Dhaka City” (referred to below as the “D/S”) (from November 2003 to March 2006) and prepared the “Clean Dhaka Master Plan (referred to below as the “M/P”)”, to be completed by 2015.

After the conclusion of the D/S, Dhaka City Corporation (DCC) actively promoted its own initiatives including the collection and disposal of medical waste in cooperation with a local NGO, in accordance with the recommendations of the M/P. JICA provided supplementary assistance to the activities of DCC in the form of the “Follow-up Cooperation on the Management and Improvement of the Existing Disposal Sites” (in 2006); assistance in the introduction of hygienic methods to existing waste disposal sites and the expansion of waste disposal sites via the Japan Debt Cancellation Fund (2006 – 2011); and the dispatch of Japan Overseas Cooperation Volunteers in the environmental education sector, to create awareness among the residents and to promote a system of participatory waste collection (2006 – present). In addition, JICA implemented a technical cooperation project aimed at enhancing the capacity of DCC staff members and establishing a system for efficient solid waste management in DCC in order to resolve the technical and management problems of solid waste management in general, and the collection and transport of solid waste in particular, for a period of approx. six years from February 2007 to March 2013.

DNCC and DSCC have been increasing their budgets for solid waste management each year by managing to allocate to the maintenance costs required for solid waste management current expenditure from the general fund revenue, in addition to the revenue from the cleaning tax levied on residents. However, they have no prospect of acquiring a source of funds to cover the expense required to purchase the solid waste collection equipment mentioned in the M/P. Against this background, JICA implemented an EGAP, in which approx. 100 solid waste collection vehicles were procured and a workshop for their maintenance was constructed.

Nonetheless, the number of available waste collection vehicles is still insufficient. In addition, many of the collection vehicles procured by DCC in the 1990s are expected to become unfit for use around 2014 due to age, and DNCC and DSCC are unable to procure the collection vehicles set out in the M/P because of their financial difficulties. Therefore, they submitted to JICA this request for grant aid assistance.

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1-2 Content and Revision of the Requests

The amounts of the grant mentioned in the original requests were:

DNCC: 2,615.5 million Tk

Equipment	3ton Open truck
	5ton Open truck
	5ton Container carrier
	10ton Container carrier
	7ton Armroll
	5ton Compactor
	7ton Dump truck
	Bulldozer
	Excavator
	Tier dozer
	Landfill compactor
	Road sweeping truck
	Jet and suckers
	Water sprinkler
	Small long boom excavator
	Pay loader
Forklift	
Wrecker	
Soft component	Community participation and stakeholder engagement

DSCC: 3,317 million Tk

Facilities	Maintenance workshop, warehouse and training center
	6 story cleaner's colony (residential facility) x 5 sets
Equipment	3ton Open truck
	5ton Open truck
	5ton Container carrier
	7ton Armroll
	2ton Compactor
	5ton Compactor
	7ton Dump truck
Bulldozer	

	Tire dozer
	Chain excavator
	Road sweeping truck
	Jet and suckers
	Water sprinkler
	Pay loader
	Forklift
	Wrecker
	Ambulance
	Supervising vehicle (pick-up)
	Bus
Soft component	Community participation

CCC: 590 million Tk

Facilities	Road construction
	Improvement of landfill sites
Equipment	Compactor
	Container and container vehicle
Soft component	
Design/ Supervision	

Table 1-1 shows the content of the requests confirmed in the M/D dated September 4th, 2014.

Table 1-1 Content of the Requests Confirmed in the M/D

Item	Description/quantity
Equipment for solid waste collection and transport	
Compactor	Not specified
Container carrier	Not specified
Dump truck	Not specified
Soft component	Not specified

When DCC was divided into DNCC and DSCC in 2011, all the assets of DCC were divided between DNCC and DSCC. In April 2014, in discussions between the Chief Waste Management Officers (CWMOs) of DNCC and DSCC it was agreed, though only verbally, that the workshop constructed in the EGAP would be used jointly. However, progress toward joint use is hampered by problems, such as the assignment of mechanics, the allocation of offices, competition for the use of maintenance equipment, sharing of costs to cover misplaced equipment, and arrogant behavior by the drivers of the waste collection vehicles. Therefore, DSCC is maintaining its waste collection vehicles with other vehicles at its own workshop managed by the Engineering Department. However, since this workshop does not have sufficient equipment, the Bangladeshi side submitted a request for the provision of the maintenance equipment listed in Table 1-2.

Table 1-2 Maintenance Equipment Requested for the DSCC Workshop

No.	Equipment Name	Qty	Uses	Degree of Priority		
				1st	2nd	3rd
1	Inflammable gas analyzer	1	Inspecting for leakage of inflammable gas		X	
2	Diesel smoke tester	1	Inspection of diesel engine smoke emissions	x		
3	High-pressure car washer	3	Improvement of chassis washing and maintenance efficiency	x		
4	Air compressor (250 L)	2	Improvement of maintenance efficiency through using air pressure	x		
5	Hydraulic press	2	Attachment and removal of pressure-fitted parts	x		
6	Garage jack	4	Jacking up of large vehicle wheel sections	x		
7	Garage jack	4	Jacking up of medium-size vehicle wheel sections	x		
8	Truck lift jack	1	Lifting up of large vehicle chassis sections	x		
9	Truck lift jack	1	Lifting up of medium-size vehicle chassis sections	x		
10	Rigid rack	8	Safety maintenance for large vehicles	x		
11	Rigid rack	8	Safety maintenance for medium-size vehicles	x		
12	Air gun (with hose and reel)	5	Compressed air blow cleaning work	x		
13	High pressure grease pump	5	Greasing up of chassis sections	x		
14	Oil pump	1	Oil injection	x		
15	Wheel dolly	4	Wheel hub attachment and removal in large vehicles	x		
16	Parts washing bench	1	Parts washing	x		
17	Impact wrench	4	Bolt tightening and loosening work	x		
18	Tool set (with board)	2	Medium-size vehicle maintenance	x		
19	Large vehicle maintenance tools set	2	Large vehicle maintenance	x		
20	Hand tools set	8	Light work	x		
21	Torque wrench	4	Measurement of bolt tightening specified values	x		
22	Rapid battery charger	2	Battery charging	x		
23	Arc welder	1	Electric welding	x		
24	Gas cutter and welder	1	Acetylene cutting and welding	x		
25	Bench drill machine	1	Steel cutting work	x		
26	Rapid cutting machine	1	Steel cutting work	x		
27	Work bench	2	General work	x		
28	Bench grinder	2	Steel cutting work	x		
29	Vice	2	Parts fixing	x		
30	Large vehicle puller set	2	Large vehicle maintenance	x		
31	Puller set	1	Medium-size vehicle maintenance	x		
32	Tap dice set	2	Screw correction	x		
33	Parts storage tray	15	Work environment improvement	x		
34	Steel rack	20	Tools arrangement and storage	x		
35	Engine crane	2	Engine maintenance work	x		
36	Lathe machine	1	Repairing of spare parts turning, facing etc.	x		
37	Shearing machine	1	Cutting sheet	x		
38	Bending machine	1	Bending of base plate, sheet for vehicle and container box	x		
38	Mig welding machine	1	For container repair, welding of base plate	x		
39	Tig welding machine	1	For container repair,	x		
40	Generator(32KVA)	1	For workshop vehicle maintenance	x		
41	Painting machine	1	For body painting of vehicle	x		
42	Hand drill machine	1	For vehicle repair	x		

1-3 Conditions at and around the Project Sites

1-3-1 Status of the Development of Relevant Infrastructure

Road networks have been developed in Dhaka North, Dhaka South and Chittagong. However, the condition of the roads is poor, as there are depressions in the road surface. There are unpaved roads in certain areas, mainly in the suburbs. It is sometimes difficult to drive vehicles on such roads. Therefore, vehicles that can be operated on partially degraded roads will have to be procured.

1-3-2 Natural Conditions

1-3-2-1 Location of the Project Sites

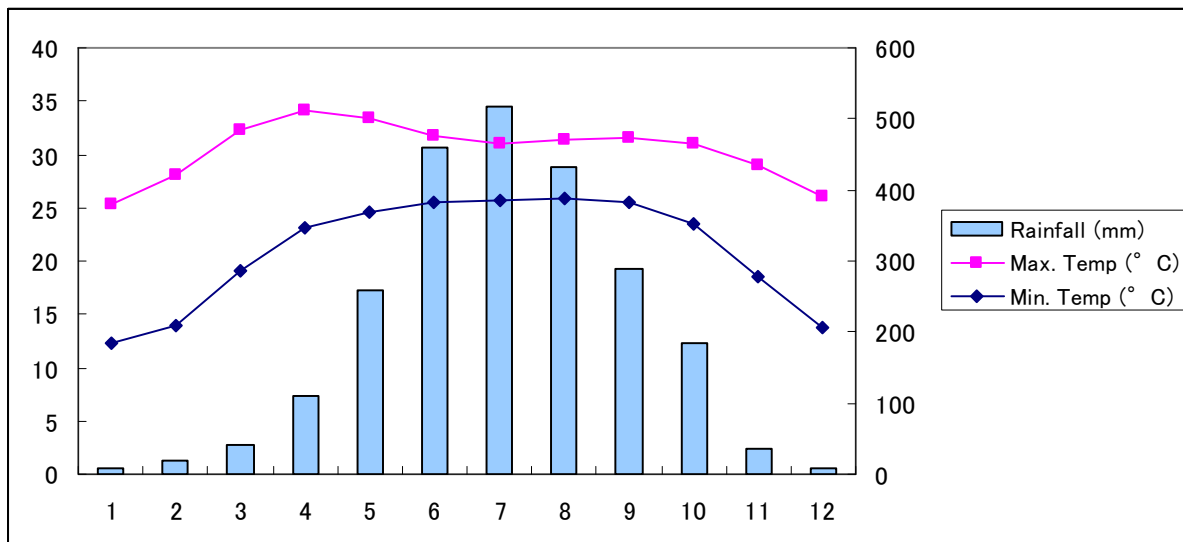
Dhaka North and Dhaka South are located in the central part of Bangladesh. They are located near the center of the Ganges Delta created by the Ganges, Brahmaputra and Meghna Rivers. They have a combined area of 153.84km². They are located on lowland with an elevation of between 2m and 12m. The city of Chittagong has an area of 155.40km². It is located in the southeastern part of Bangladesh, near the border with Myanmar. It is located adjacent to the Chittagong Hill Tracts, where the elevation is between 300m and 600m above sea level – a characteristic rarely observed in Bangladesh where the land is generally flat and low.

1-3-2-2 Topography and Geology

There are many ponds and low wetlands everywhere in Dhaka North and Dhaka South. Large areas of these cities are inundated in the rainy season. Chittagong is located in an area with many slopes between the coastal area and the hill tracts.

1-3-2-3 Meteorological Conditions

Bangladesh is located in the subtropical monsoon climate zone and has a hot season between March and May, a rainy season between June and October and a dry season between November and February. The climate of Bangladesh is characterized by a large amount of rainfall, some 2,500 – 3,000 mm/year; approx. 90% of the rainfall is recorded during the rainy season. Cyclones often hit the country before and after the rainy season. The effects of global climate change have been observed in recent years, in the form of a shift in the timing of peak rainfall and coastal erosion caused by rising sea levels. Coastal erosion in Chittagong, in particular, is depriving the poor who live along the coast and rivers of their homes, and forcing them to move into the city.



Source: Bangladesh Meteorological Department

Figure 1-1 Maximum and Minimum Temperatures and Rainfall in Bangladesh

1-3-3 Environmental and Social Considerations

“The Bangladesh Environment Conservation Act, 1995” and “The Environment Conservation Rules, 1997” established in accordance with the Act will need to be followed when vehicles are provided to the Bangladeshi side in this Project. The vehicles to be provided will need to comply specifically with the standards provided in Article 6 of the Act, “Restrictions regarding vehicles emitting smoke injurious to the environment”. Following the Article, the vehicles shall be designed not to emit injurious smoke as considering environment and health effect. In Article 4 of the Rules, “Vehicles emitting smoke injurious to health and otherwise harmful”, vehicles using petrol, diesel and gas as fuel shall ensure that a catalytic converter or a diesel particulate filter is fitted in the vehicle, under the Motor Vehicles Ordinance, 1983 (LV of 1983).

Chapter 2 Contents of the Project

2-1 Outline of the Project

2-1-1 Overall Goal and Project Purpose

The overall goal and purpose of the Project are shown in Table 2-1.

Table 2-1 Overall Goal and Purpose of the Project

Overall Goal	Sanitary condition in Dhaka and Chittagong is improved through sustainable solid waste management implemented by DNCC, DSCC and CCC
Project Purpose	Capacity of waste collection in Dhaka and Chittagong is strengthened.
Project Outcome Indicator	Waste collection amount in the cities Waste collection rate in the cities

2-1-2 Outline of the Project

(1) Procurement of waste collection vehicles (draft)

Proposed Project Component of Waste Collection Vehicles is shown in Table 2-2.

Table 2-2 Proposed Project Component of Waste Collection Vehicles

	DNCC	DSCC	CCC	Total
Compactor (small)	10	8	6	24
Compactor (large)	13	14	7	34
Container Carrier	20	24	13	57
Dump truck (small)	4	3	4	11
Dump truck (large)	5	4	4	13
Dump truck (4WD)	4	3	4	11
Total	56	56	38	150

Notes: Spare parts are included

(2) Soft Component (draft)

The following two activities are planned for the three target cities in the Soft Components:

- Instruction for proper allocation and use of compactors
- Strengthening of the management of workshops (including technical guidance to the staff in charge of vehicle maintenance)

(3) Provision of Maintenance Equipment to the DSCC Workshop

DNCC and DSCC are working on establishing a system of shared use of the workshop constructed under the Environmental Grant Aid Program (EGAP), which is also being recommended by the Government of Japan. Therefore, the relevance of including provision of maintenance equipment to DSCC in this Project is low and therefore the maintenance equipment is not included in the Project.

2-2 Outline Design of the Japanese Assistance

2-2-1 Design Policy

2-2-1-1 Basic Policies (Policies on the Selection of Models and Sizes of Equipment)

(1) Basic Policy on Waste Collection Equipment

At present four types of waste collection vehicles, *i.e.* dump (open) trucks, compactors, container carriers and armrolls, are used in DNCC, DSCC and CCC. The characteristics of these four types of vehicles are described in Table 2-3 below. When a container is to be loaded on an armroll, it has to be dragged on the road surface. Therefore, it has to be installed on a flat (paved) surface. However, the surface of roads in the three cities is in a very poor condition with depressions and unevenness. In fact, armrolls are used in DNCC and DSCC for waste collection. Therefore, roads had to be paved specifically for the installation of containers for armrolls. Because of this special paving requirement, armrolls shall be excluded from the list of equipment to be procured by the Project and the remaining three types of the vehicles, dump trucks, compactors and container carriers, shall be procured by the Project. A pilot project to introduce a fixed time-station waste collection system with dump trucks was implemented in the Project for Strengthening of Solid Waste Management in Dhaka City (hereinafter “the Technical Cooperation Project”). However, the pilot project failed because the primary waste collectors and residents had not accepted the change in the collection method required for the introduction of the new system, unlike they had done when the compactors had been introduced presumably because of the image of technological advancement that the vehicles had. Therefore, dump trucks shall be used mainly for collection of street sweeping waste, construction waste, debris and bulk waste since a pilot project to establish a fixed time-station waste collection system failed to establish the system in the Technical Cooperation Project.

Table 2-3 Characteristics of Waste Collection Vehicles Currently in Use

	Waste collection method	Work efficiency (transport capacity)	Environmental protection	Other characteristics
Dump truck	Dustbin	× The work efficiency is extremely low because of the significant time required for loading waste on trucks.	× The use of dump trucks is an unsanitary waste collection method because loading waste on dump trucks is a messy work and waste is always uncovered while it is being loaded and transported on the trucks.	It is suitable for collecting debris and bulk waste.
Compactor	Fixed time-station system (with small containers)	△ The work efficiency is low because it takes time to load waste on the vehicles. ○ The work efficiency is high when a container lifter is used.	○ The use of a compactor is very sanitary waste collection method because waste is loaded and transported without being exposed to the air. However, it may become unsanitary if waste is loaded inappropriately.	It is not suitable for collecting debris and bulk waste.
Container carrier	Containers	○ The efficiency of waste collection with container carriers is very high.	× Because containers containing waste are placed on streets throughout the day, they deteriorate the surrounding environment.	The size class (and price) of a container carrier is (are) usually higher than that of an armroll with the same

				container capacity.
Armroll	Containers	○ The efficiency of waste collection with armrolls is very high.	× Because containers containing waste are placed on streets throughout the day, they deteriorate the surrounding environment.	As containers have to be dragged on the ground surface when they are loaded on an armroll, they have to be placed on paved surface.

Table 2-4 summarizes the characteristics and use of the three types of vehicles to be procured in the Project. The numbers of the three types of vehicles to be procured shall be decided in consultation with the Bangladeshi side with the characteristics mentioned in the table above and the numbers of the existing vehicles taken into consideration.

Table 2-4 Characteristics and Use of Three Types of Vehicles

	Characteristics and use
Dump truck	It is mainly used to collect street sweeping waste, construction waste and debris and bulk waste.
Compactor	It is used for waste collection in urban areas. It is not used for collecting street sweeping waste or bulk waste.
Container carrier	It can be used for collecting all types of waste. However, as installation of waste containers may aggravate traffic congestion, they shall be installed at locations where sufficient space is available for their installation, such as market places and suburbs.

2-2-1-2 Policy on the Natural Environmental Conditions

Since the annual precipitation in Dhaka North, Dhaka South and Chittagong is large, waste generated in these cities has a large moisture content and the specific gravity of the waste is high. Guidance shall be provided specifically not to overload the compactors with waste in the Soft Component. In addition, compactors of the highest affordable size class shall be procured and the brake systems and suspensions on them shall be reinforced. Specifically, the large-sized compactors to be procured shall be equipped with a full air brake system.

2-2-1-3 Policy on the Socio-Economic Condition

The volumes of road traffic are very large and traffic congestion is increasingly becoming heavier year after year in the three cities. There are many places with unpaved roads (where some of the roads are unpaved) in these three cities. Therefore, a study shall be conducted to find ways to collect waste which will not aggravate the traffic congestion. Types of vehicles which can be used for waste collection on poor roads shall be selected.

2-2-1-4 Policy on Construction and Procurement Conditions or Special Conditions and Business Practices in the Industry

Waste collection vehicles manufactured by Japanese manufacturers, in addition to those manufactured by Indian manufacturers, are widely in use in Bangladesh. None of these vehicles was manufactured in Bangladesh. All of them were imported from abroad. Since all the equipment to be procured in this project

shall be products of Japanese manufacturers, it shall be procured from Japan.

2-2-1-5 Policy on Employment of Local Contractors (Construction companies and consultants)

There is no need to conduct a study on local contractors for manufacturing of equipment because all the equipment to be procured in the Project shall be procured from Japan. However, if the equipment of a Japanese manufacturer which has an agent in Bangladesh is to be procured, a local company shall be employed at the stage of operation and maintenance.

Meanwhile, local manufacturers shall be used for the manufacturing of waste containers which is in the scope of the Bangladeshi side. As the three target City Corporations (hereinafter “the three CCs”) concerned procure waste containers every year, they will be able to procure containers manufactured in Bangladesh in this Project.

2-2-1-6 Policy on Operation and Maintenance

(1) Dhaka North and Dhaka South City Corporations (DNCC and DSCC)

DNCC and DSCC have managed to maintain vehicles despite the fact that they have not had sufficient numbers of mechanics in their workshops. The two CCs had started the process of hiring mechanics to fill the vacancies (a head mechanic and six mechanics) and DSCC completed the process. DNCC will have to successfully fill the vacancies. They shall have to assign necessary staff members for reliable and smooth maintenance. Although waste collection vehicles have been inspected regularly at three month intervals at the workshops, this regular inspection shall have to be upgraded with more emphasis put on preventive maintenance to prevent occurrence of breakdowns.

(2) Chittagong City Corporation (CCC)

There are many engineers and mechanics at the workshop of CCC and they are engaged in the maintenance of vehicles. However, as their maintenance remains at the level of taking actions such as inspection and repair after vehicles have broken down, there is a need to improve the maintenance system with the introduction of the concept of preventive maintenance intended for prevention of occurrence of breakdowns.

2-2-1-7 Policy on the Selection of Grades of Facilities and Equipment

(1) Grades of Equipment

Table 2-5 below shows the policy on the grades of equipment. At present, 2t and 5t container carriers are used by DNCC and DSCC, while 5t carriers are used by CCC. The use of two types of container carrier, small-sized (2t) and large-sized (5t), is recommended in the future as waste has to be collected in areas with different conditions. Meanwhile, since the collection of waste with container carriers requires waste containers specifically designed for the carriers, two types of containers corresponding to the two types of the container carrier shall be required. Since there is a limit in the number of container carriers which can be provided in this Project, procurement of only large-sized container carriers shall be included in the Project for greater convenience. Multiple waste containers shall be required for each container carrier. The waste containers can

be manufactured locally and the three target cities procure them for the existing container carriers every year. In this Project a minimum of one waste container shall be procured for each container carrier to be procured. Other containers shall be procured by the Bangladeshi side.

The use of two types of compactors is also recommended as they are also to be used in areas of narrow roads. Because there is a tendency to overload the compactors with waste, the measures shall be taken to select larger size of chassis. The large-sized compactors to be procured shall be equipped with a full air brake system which is usually equipped on much larger compactors. The use of such a full air brake system shall ensure that the compactors can be stopped even when their vehicle weight has been increased with significant overloading with waste.

Procurement of two types of dump trucks is also recommended for this Project. The condition of the pavement on roads in the suburbs is poor and there are areas where roads have not been paved in DNCC, DSCC and CCC. In addition, because it is very rainy in the target cities, roads in certain areas in these cities where the condition of road surface is poor become too muddy particularly in the rainy season to collect waste with ordinary two-wheel drive vehicles. Four-wheel drive (4WD) dump trucks shall be procured in the Project for the collection of waste in these areas. Therefore, three types of dump trucks shall be procured. While open trucks without a dumper function are being used for waste collection in the three CCs, those with a dumper function shall be procured in the Project for the efficiency of offloading waste at the disposal sites.

Table 2-5 Policy on Grades of Equipment

Vehicle type	Grade of waste collection equipment
Container carrier	Only large-sized container carriers shall be procured.
Compactor	Two types of compactors, small-sized and medium-sized compactors, shall be procured. The medium-sized compactors shall be equipped with a full air brake system.
Dump truck	Medium-sized four-wheel-drive dump trucks, in addition to ordinary small-sized and medium-sized dump trucks, shall be procured.

(2) Engine Type

CNG-engine container carriers were procured in EGAP to reduce the effects of greenhouse gas emission and fuel cost. However, the maintenance of CNG engines is more difficult than that of diesel engines. The CNG engines concerned are not standard equipment of the manufacturer, but custom-made by a Bangladeshi company. The company disassembled, remodeled and reinstalled the engines with the permission of the manufacturer of the vehicles. As the calorific value of CNG is smaller than that of diesel, output of a CNG engine is smaller than that of a diesel engine at the same revolution speed. Therefore, the CNG engines have frequently to be operated at a high revolution speed. Load working on an engine is large when it is operated at a high speed. As a consequence, the CNG engines have broken down more frequently than diesel engines. DNCC and DSCC have concluded maintenance contracts for the maintenance of the CNG-engine container carriers with a professional maintenance company and the carriers have been maintained appropriately by the maintenance company. Meanwhile the price of CNG is on the increase in recent years. The price of CNG has

been almost doubled from Tk 17/m³ in 2009, when the outline design survey for EGAP was conducted, to Tk 30/m³. With these facts taken into consideration, it has been decided that diesel engine vehicles shall be procured by the Project.

2-2-1-8 Policy on Procurement Method and Project Schedule

The equipment for waste collection shall be procured from Japan, in principle. The schedule and route of marine transport of the equipment shall be designed taking into consideration the facts that a large quantity of equipment shall have to be transported and that the equipment has to be delivered to three different destinations, DNCC, DSCC and CCC.

2-2-2 Basic Plan (Equipment Plan)

2-2-2-1 Waste Collection Equipment Plan

The target date for the achievement of the project purpose has been set at three years after the provision of the equipment. Therefore, the year 2019 shall be the target completion year. The workflow shown in Figure 2-1 shall be followed for the preparation of the waste collection equipment plan. In the preparation of the plan, the design amount of waste collection in the target year shall be set and the numbers of different types of vehicles to be procured shall be determined by the value obtained by subtracting the waste collection capacity of the currently-operating waste collection vehicles from the design amount.

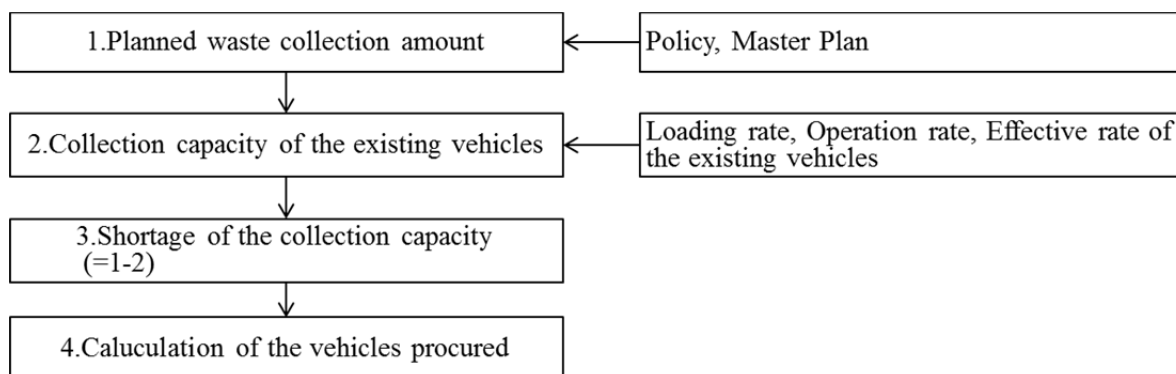


Figure 2-1 Workflow of the Preparation of Waste Collection Equipment Plan

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

$$\text{Collection amount} = \text{Loading weight (ton)} \times \text{No. of trips} \times \text{Loading rate} \times \text{Operation rate} \times \text{Effective rate}$$

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

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

Operation Rate: The operation rate with the numbers of ordinary stand-by days and days required for repair taken into consideration: The effective rate mentioned below shall be used for the

estimation of the decrease in the operation rate by aging (sudden need for repair and vehicle disposal).. The Project will be applied 97% (one day per month for maintenance: $353 / 365 = 97\%$) of operation rate.

Effective Rate: It is an indicator of reduction in the operating rate caused by aging of equipment. The operating rate of a vehicle decreases because breakdowns occur more frequently on it as it ages until it is eventually scrapped. The service life of the vehicles to be procured is assumed at 10 years for this project. However, a repairable vehicle should be operated as much as possible after repair, even if its service life of 10 years has expired. The table below shows the effective rates of waste collection vehicles by age used in this study assumed with the expectation that the Bangladeshi side will repair them to the best of its capacity. As breakdowns occur frequently on vehicles aged between 11 and 15 years and some of them may have to be scrapped, their operating rate is assumed at 25% lower than the original level (the effective rate of 75%). The operating rate of vehicles aged between 16 and 20 years is assumed at 50% (the effective rate of 50%) and all those aged 21 years or older are assumed to be scrapped (the effective rate of 0%). Therefore, the effective rate of vehicles manufactured in or before 1998 in the target year of 2019 is assumed at 0%. Although DNCC and DSCC are still operating waste collection vehicles aged 21 years or older, they often break down and, thus, their effective rate is low. Therefore, the effective rate for those vehicles is assumed as mentioned above for this project.

Equipment age in the target year	Effective rate
1 - 10 years	100%
11 - 15 years	75%
16 - 20 years	50%
21 years or more	0%

Table 2-6 below shows the waste collection rate in 2014 and the design waste collection rate in 2019. The amount of waste generated in 2019 was estimated from the existing master plan and the projection of the population growth. The target of this Project is to achieve the design waste collection rate shown in Table 2-6. Since more than half of the waste collection vehicles currently owned by DNCC and DSCC were procured before 2000, a significant decrease in the waste collection capacity of these vehicles is expected by 2019. Since a large part of this decrease in the waste collection capacity has to be covered by the vehicles to be procured by the Project for DSCC, the target collection rate has been set at 75%, an increase of 10% from the current figure. The target collection rate for DNCC has been set at 85%, a rate higher than that of DSCC, since DNCC is increasing the outsourcing of waste collection to private companies and the amount of waste generated in DNCC is smaller than that in DSCC. Meanwhile, the waste collection vehicles currently owned by CCC are relatively new and most of them are expected to be operational in 2019. Therefore, a significant improvement in the waste collection rate is expected from the procurement of waste collection equipment by

this Project. It should be ideal to set the target collection rate at 100%, or to collect all the waste produced. However, since there are areas where roads are too narrow for the waste collection vehicles to be used for waste collection, the target waste collection rate has been set at 98%.

Table 2-6 Waste Collection Rates at Present and Target Waste Collection Rates in the Target Completion Year

	DNCC	DSCC	CCC
Year 2014			
Amount of waste generated (tons/day)	2,100	3,000	1,600
Amount of collected waste (tons/day)	1,356	1,991	1,200
Collection rate	65%	66%	75%
Year 2019			
Amount of waste generated (tons/day)	2,400	3,300	1,900
<u>Target waste collection rate</u>	85 %	75%	98 %
Design amount of waste collection (tons/day)	2,040	2,475	1,862
Increase in the amount of collected waste (tons/day)	684	484	662

In Table 2-7, the waste collection capacities of the existing waste collection vehicles in 2019 were estimated and the deficiencies in the capacity in 2019 were estimated from the design amounts of waste collection set in Table 2-6 and the estimated capacity of the existing vehicles in 2019. In the estimation of the capacity of the existing vehicles in 2019, the loading rate, operation rate and effective rate mentioned above were taken into consideration. The existing vehicles were assumed to make the same numbers of trips to the disposal sites in 2019 as at present. As DNCC is planning to expand the outsourcing of waste collection to private companies in the future, it is assumed that the amount of waste collection by those companies shall increase at the same rate as the waste generation. In this way, the deficiencies in the waste collection capacity in DNCC, DSCC and CCC were estimated at 801 tons/day, 880 tons/day and 957 tons/day, respectively. The number of waste collection vehicles required to cover the deficiencies shall be procured by this Project.

Table 2-7 Deficiencies in Waste Collection Capacities in the Target Year

	DNCC	DSCC	CCC
Planned collection amount (ton/day)	2,040	2,475	1,862
Effective capacity of existing vehicles (ton/day)	809	1,595	905
Private collection company (ton/day)	430	0	0
Shortage of capacity (New vehicle) (ton/day)	801	880	957

In the estimation of the numbers of new waste collection vehicles to be procured by this Project, the new vehicles were expected to make the numbers of trips mentioned in Table 2-8. The numbers of trips of the vehicles in CCC were set on the assumption that they should be used in two shifts per day in the same way as

the existing ones were used.

Table 2-8 Design Numbers of Trips of the Vehicles to be Procured

	DNCC	DSCC	CCC
Dump truck	2	2	3 (2 + 1)
Container Carrier	4	4	8 (4 + 4)
Compactor	2	2	3 (2 + 1)

Table 2-9 shows the numbers of the vehicles to be provided, which is estimated on the conditions mentioned above. According to the result, the total number of vehicles to be procured is 150, 56 for each DNCC and DSCC and 38 for CCC.

Table 2-9 Proposed Numbers of Waste Collection Vehicles to be Procured

	DNCC	DSCC	CCC	Total
Compactor (small)	10	8	6	24
Compactor (large)	13	14	7	34
Container Carrier	20	24	13	57
Dump truck (small)	4	3	4	11
Dump truck (large)	5	4	4	13
Dump truck (4WD)	4	3	4	11
Total	56	56	38	150

Table 2-10 shows the outline of the waste collection expected in 2019 after the completion of the Project. In DNCC, it is expected that 1) 76 waste collection vehicles among those currently owned by DNCC will be still operational and they will be collecting 809 tons/day of waste, 2) the 56 new vehicles to be procured for DNCC by this Project will be collecting 813 tons/day of waste, 3) the contracted private companies will be collecting 430 tons/day of waste and 4), thus, in total, 2,052 tons of waste will be collected every day (collection rate of 86%) in 2019. In DSCC, it is expected that 1) 140 waste collection vehicles among those currently owned by DNCC will be still operational and they will be collecting 1,595 tons/day of waste, 2) the 56 new vehicles to be procured for DSCC by this Project will be collecting 875 tons/day of waste, and 3), thus, in total, 2,470 tons of waste will be collected every day (waste collection rate of 75%) in 2019. In CCC, it is expected that 1) 63 waste collection vehicles among those currently owned by CCC will be still operational and they will be collecting 905 tons/day of waste, 2) the 38 new vehicles to be procured for CCC by this Project will be collecting 965 tons/day of waste and 3), thus, in total, 1,870 tons of waste will be collected every day (collection rate of 98%) in 2019.

Table 2-10 Outline of Waste Collection in the Target Year

		DNCC	DSCC	CCC
Year 2014				
	Number of vehicles	139	200	79
	Waste collection amount (ton/day)	1,356	1,991	1,200
Year 2019				
	Number of vehicles			
	1) Existing vehicles	76	140	63
	2) New vehicles from Grant Aid Project	56	56	38
	Total	132	196	101
	Waste collection amount (ton/day)			
	1) Existing vehicles	809	1,595	905
	2) Private company	430	0	0
	3) New vehicles from Grant Aid Project	813	875	965
	Total	2,052	2,470	1,870
	Collection rate	86%	75%	98%

Table 2-11 shows the expected numbers of operable waste collection vehicles in the three target cities in 2019 after the implementation of this Project. The total numbers of operable collection vehicles will decrease by seven to 132, decrease by four to 196 and increase by 22 to 101 from the corresponding figures in 2014 in DNCC, DSCC and CCC, respectively. As seen in Figure 2-2, the numbers of the existing small open trucks shall decrease and the open trucks shall be replaced by compactors, container carriers and dump trucks in DNCC and DSCC. Meanwhile, dump trucks shall remain to be the major waste collection vehicles, while compactors and container carriers shall also be used for the waste collection and transportation, in CCC in 2019.

Table 2-11 Numbers of Operable Waste Collection Vehicles at Present and Expected in 2019

		DNCC	DSCC	CCC
Number of operable vehicles at present in 2014				
	Compactor	25	19	0
	Container carrier	57	63	10
	Armroll	8	12	0
	Open truck	45	101	0
	Dump truck	4	5	69
	Subtotal (a)	139	200	79
Expected numbers of operable vehicles in 2019				
	Among the existing vehicles			
	Compactor	25	19	0
	Container carrier	26	45	10
	Armroll	8	12	0
	Open truck	4	59	0

	Dump truck	13	5	53
	Subtotal	76	140	65
Vehicles to be procured in this Project				
	Compactor	23	22	13
	Container carrier	20	24	13
	Dump truck	13	10	12
	Subtotal	56	56	38
Total				
	Compactor	48	41	13
	Container carrier	46	69	23
	Armroll	8	12	0
	Open truck	4	59	0
	Dump truck	26	15	65
	Subtotal (b)	132	196	101
Change in the number; (b)-(a)		-7	-4	22

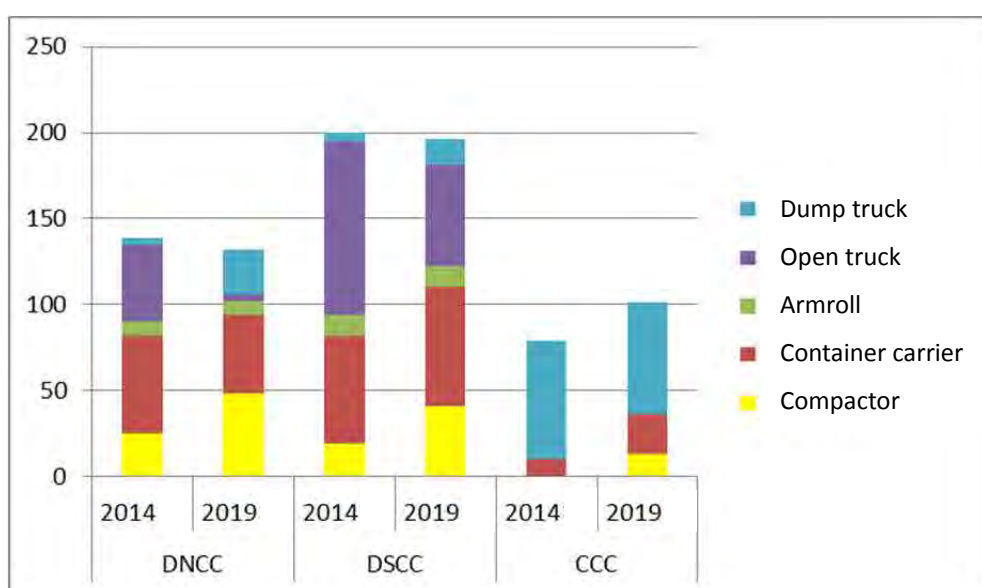


Figure 2-2 Change in the Numbers of Vehicles by Type

2-2-2-2 A Road Map to the Establishment of a Sustainable Waste Collection System in the Next Ten Years (a case study)

The design amount of waste collection of this Project has been set with the year 2019 as the target year for the achievement of the project purpose. However, establishment of a sustainable waste collection system will require continuous procurement of waste collection vehicles by the three target CCs. A case study was conducted on the preparation of a plan for the procurement of the waste collection vehicles for the ten-year period up to 2024. The amounts of waste generated and the target waste collection rates in 2024 were assumed

as shown in Table 2-12. The target waste collection rates in DNCC, DSCC and CCC were assumed at 90%, 80% and 98% of the amounts of waste generated, respectively.

Table 2-12 Amounts of Waste Generated and Target Waste Collection Rates in 2024

	DNCC	DSCC	CCC
Generation amount (ton/day)	2,700	3,700	2,200
Target waste collection rate (%)	90%	80%	98%
Planned collection amount (ton/day)	2,430	2,960	2,156

Figure 2-3 shows the plan for the procurement of waste collection vehicles of DNCC. In the case study, procurement of waste collection vehicles in 2021 and 2024 was assumed. It was also assumed 1) that the number of operational vehicles among those currently owned by DNCC will be reduced to 47 by 2024 and the waste collection capacity of the 47 vehicles would be 536 tons/day, 2) that the amount of waste collected by private companies should increase at the same rate as the increase in the amount of waste generated and 3) that all the 56 waste collection vehicles to be procured in this Project should be operational as planned in 2024 as less than ten years would have passed since their procurement. In order to achieve the target waste collection rate of 90% by 2024 on the above assumption, DNCC will have to procure 48 waste collection vehicles (25 in 2021 and 23 in 2024).

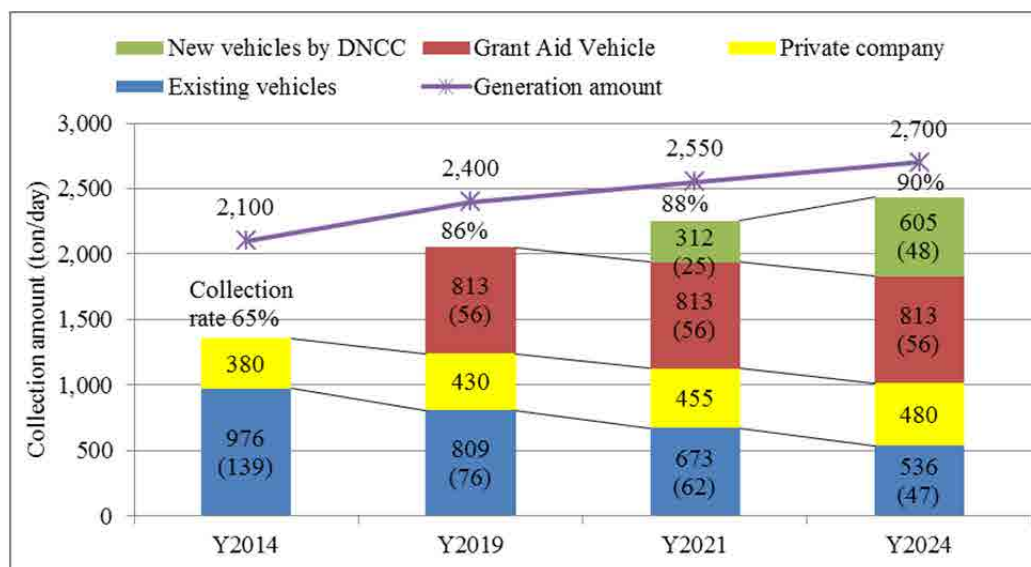


Figure 2-3 Road Map for the Waste Collection and Transportation up to the Target Year of 2024 (for DNCC)

Figure 2-4 shows the plan for the procurement of waste collection vehicles of DSCC. In order to achieve the target waste collection rate of 80% by 2024, DSCC will have to procure 90 waste collection vehicles by 2024 (45 in 2021 and 45 in 2024).

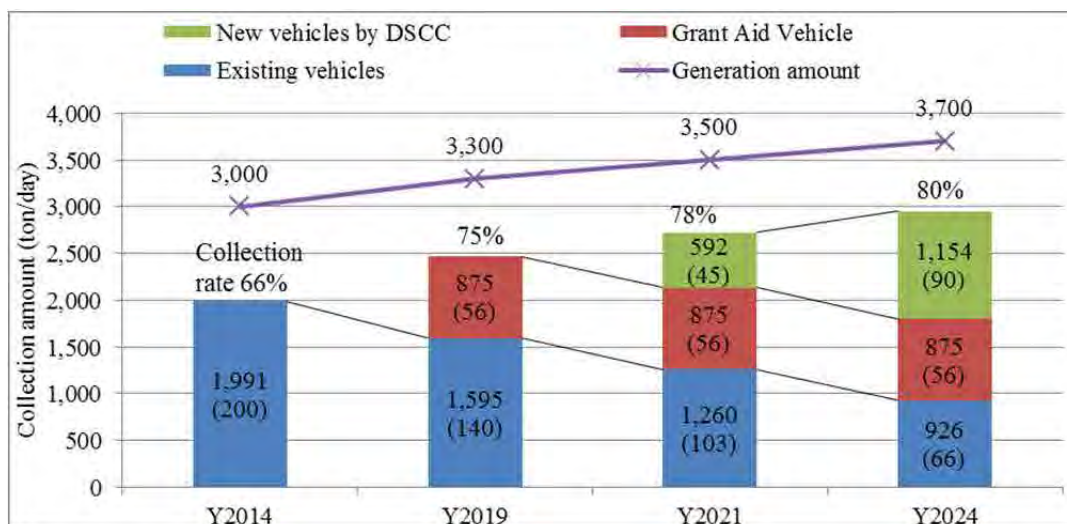


Figure 2-4 Road Map for the Waste Collection and Transportation up to the Target Year of 2024 (for DSCC)

Figure 2-5 shows the plan for the procurement of waste collection vehicles of CCC. In order to achieve the target waste collection rate of 98% by 2024, CCC will have to procure 12 waste collection vehicles by 2024 (4 in 2021 and 8 in 2024).

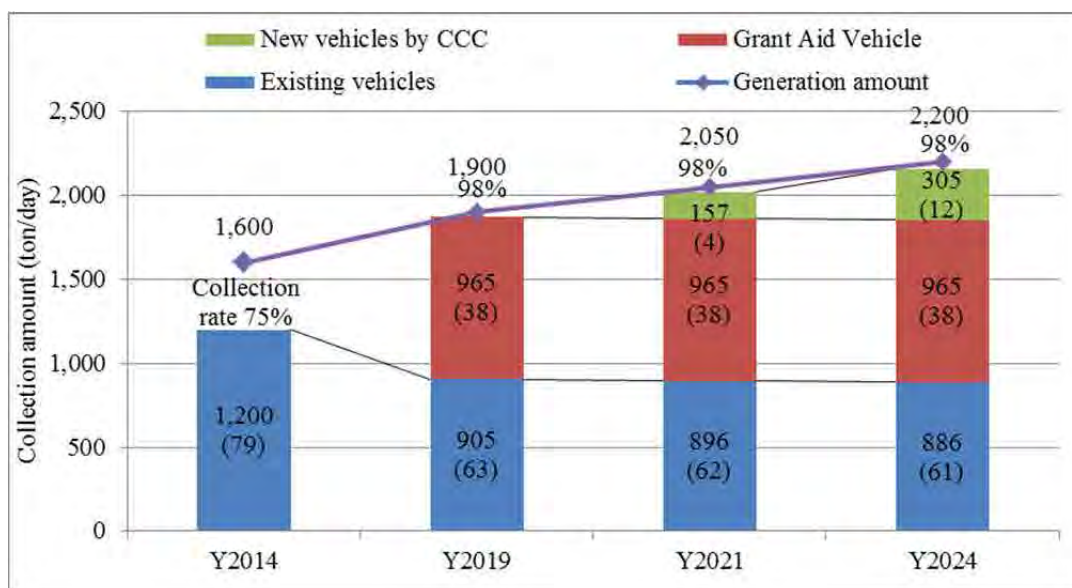


Figure 2-5 Road Map for the Waste Collection and Transportation up to the Target Year of 2024 (for CCC)

2-2-3 Outline Design Drawings

The specifications of the waste collection vehicles to be procured by the Project shall be as follows:

Compactor (small)

Gross vehicle weight (GVW) Around 10 ton

Payload	Around 3 ton
Body capacity	Around 6 m ³
Container lifting device	Winch system
Hydraulic operation system	Mechanical lever system (not electric system)
Sewage tank	Provided
Chassis operation	Right hand steering wheel, manual transmission
Engine and chassis operation system	Diesel engine, 4 x 2 rear drive

Compactor (large)

Gross vehicle weight (GVW)	Around 17 ton
Payload	Around 8 ton
Body capacity	Around 10 m ³
Container lifting device	Winch system
Hydraulic operation system	Mechanical lever system (not electric system)
Sewage tank	Provided
Chassis operation	Right hand steering wheel, manual transmission
Engine and chassis operation system	Diesel engine, 4 x 2 rear drive

Container Carrier

Gross vehicle weight (GVW)	Around 15 ton
Payload	Around 6 ton (including container)
Container capacity	Around 8 m ³
Number of waste containers	One per vehicle
Chassis operation	Right hand steering wheel, manual transmission
Engine and chassis operation system	Diesel engine, 4 x 2 rear drive

Dump truck (small)

Gross vehicle weight (GVW)	Around 6 ton
Payload	Around 2 ton
Chassis operation	Right hand steering wheel, manual transmission
Engine and chassis operation system	Diesel engine, 4 x 2 rear drive

Dump truck (large)

Gross vehicle weight (GVW)	Around 14 ton
Payload	Around 7 ton
Chassis operation	Right hand steering wheel, manual transmission
Engine and chassis operation system	Diesel engine, 4 x 2 rear drive

Dump truck (4WD)

Gross vehicle weight (GVW)	Around 13 ton
Payload	Around 6 ton
Chassis operation	Right hand steering wheel, manual transmission
Engine and chassis operation system	Diesel engine, 4 x 4

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

(1) Project Implementation Organizations

After the conclusion of the Exchange of Notes (E/N) and Grant Agreement (G/A) on the grant aid cooperation of the Project, the Government of Bangladesh shall select a consultant and a contractor and conclude contracts with them. The organizational structure for the project implementation in Bangladesh shall be as follows:

1) Responsible organization

The Locality Government Division of the Ministry of Local Government, Rural Development and Cooperatives (referred to below as the "LGD") shall be the organization responsible for the implementation of the Project.

2) Implementing Organization

While LGD shall be the implementing organization of the Project, DNCC, DSCC and CCC shall operate and maintain the waste collection vehicles to be procured in the Project. LGD, DNCC, DSCC and CCC shall have to maintain close contact and hold discussion with the Japanese consultant and the Japanese contractor and select persons in charge of this Project for its smooth implementation.

(2) Consultant

The Japanese consultant shall conclude a contract with LGD, prepare detailed designs and supervise the procurement in order to facilitate the equipment procurement in this Project. The Consultant shall prepare tender documents and implement the tender on behalf of LGD, the project implementing organization. The responsibilities of the Consultant at each stage of the project implementation are described as below.

1) Detailed Designs

The Consultant shall prepare detailed designs from the outline design and prepare tender documents. The Consultant shall also provide answers to technical questions on the contents of the tender documents and evaluate the technical proposals submitted by tenderers.

2) Procurement Supervision

The Consultant shall supervise the procurement of equipment. The Consultant shall inspect procured equipment for its quality, functions, quantities and damage on the exterior surface caused during the transportation. If abnormality is found in the inspection, the Consultant shall prepare a report on the

abnormality without delay and parties concerned shall have discussion on measures to be taken on the abnormality.

(3) Contractor

A Japanese company selected by the Bangladeshi side as the Contractor of this Project in a general open tender implemented in accordance with the scheme of the grant aid cooperation program of Japan shall procure the equipment for this Project and provide technical assistance. Sufficient attention shall be paid to the communication and coordination with the counterparts after the handover of the materials, equipment and facilities concerned as follow-up services such as provision of spare parts and responses to malfunctions will be required in the future after the completion of the Project.

Procurement of Japanese products by a Japanese company shall be a basic condition for the tender for the procurement of equipment. Since waste collection vehicles manufactured by Japanese companies similar to those to be procured by this Project have been delivered to Bangladesh, the procurement agent(s) (the manufacturer(s) of the procured equipment) shall provide minimum required technical assistance on how to operate the delivered equipment.

2-2-4-2 Implementation Policy

(1) Technology Transfer to Bangladeshi Engineers

Engineers from the manufactures of the equipment shall provide OJT to Bangladeshi engineers (operators and mechanics of waste collection vehicles) to transfer technologies concerning the procured equipment after the delivery.

(2) Lot Division of the Project

The procurement of vehicles in this Project shall be divided into three lots mentioned below, and a separate tender shall be conducted for each lot for enhancing the competitiveness of the tender.

Lot 1: Dump trucks

Lot 2: Container carrier

Lot 3: Compactors

(3) Safety Measures

Three target cities have parking spaces which have boundary fence, office etc. The equipment will be secured with the existing vehicles in the parking space for preventing theft after the delivery

(4) Exemption of Customs Duties and Taxes

The Government of Bangladesh shall take actions required for tax exemption (including value added tax) on equipment to be procured by this Project. However, the contractor shall have to monitor the progress of the processing of the application for the tax exemption, because the delay in the processing may result in extension of the project period.

2-2-4-3 Scope of Works

The scopes of works of the Japanese and Bangladeshi sides are as described in “Obligations of the Recipient Country” mentioned in 2-3 of Chapter 2.

2-2-4-4 Consultant Supervision

The Consultant shall plan to implement the project smoothly in compliance with the scheme of the grant aid cooperation of the Government of Japan, with understanding of the aim of the outline design and by forming a cohesive project team for the Consultant Supervision. The Consultant shall dispatch engineers specialized in various stages, such as inspection of completed equipment and on-site technical assistance, in accordance with the progress of the procured equipment. The issues requiring special attention in the Consultant Supervision are described below.

(1) Monitoring of the Progress

The Consultant shall demand that the Contractor shall complete the work by the day stipulated in the contract and monitor the progress of the project every month. When delay in the progress of work is expected, the Consultant shall report the expected delay to JICA, draw attention of the Contractor to the possible delay and request submission of a plan of countermeasures and their implementation.

(2) Quality and Quantity Control

The Consultant shall inspect the equipment to be procured for whether or not it complies with the quality and quantities stipulated in the contract documents using the following methods:

- i) Comparison with the specifications of the equipment
- ii) Comparison with the shop drawings and specifications of the equipment
- iii) Attendance at shop inspection or verification of the shop inspection results
- iv) Technical Assistance and comparison with the inspection manual

If the verification and comparison revealed a possibility that the manufactured equipment may not comply with the quality or quantity standards, the Consultant shall request the Contractor to correct, replace or repair it.

(3) Basic Policy for the Consultant Supervision

In this Project, a large quantity of vehicles shall be procured from Japan. Therefore, the Consultant shall take note of the number of days required for their transportation and the permissions/licenses expected to be required for the Project implementation for the smooth implementation of the monitoring of the progress and quality control. The Consultant shall also inspect the vehicles, which are to be procured from various places, for whether or not they comply with the required specifications.

2-2-4-5 Quality Control Plan

The quality control shall be implemented simultaneously with the Consultant Supervision mentioned above. The Consultant shall verify whether or not the manufactured and delivered vehicles satisfy the qualities and specifications required in the contract documents.

2-2-4-6 Procurement Plan

It is assumed that all the waste collection vehicles to be procured by this Project shall be Japanese products, as shown in Table 2-13. Therefore, they will have to be cleared after they have arrived at the Port of Chittagong. Some of the waste collection vehicles currently in use in Bangladesh (including those procured under EGAP) are manufactured in Japan. Several Japanese auto manufacturers have local agents in Bangladesh. These facts indicate that systems to provide repair and maintenance services to the vehicles to be procured by this Project are available in Bangladesh.

Table 2-13 Country of Origin of the Equipment to be Procured

Equipment	Country of origin		
	Bangladesh	Japan	Third country
Compactor (small)		○	
Compactor (large)		○	
Container Carrier		○	
Dump truck (small)		○	
Dump truck (large)		○	
Dump truck (4WD)		○	
Spare parts*		○	
Percentage		100%	
*All the spare parts to be procured in the Project shall be genuine products of the manufacturers. As a wide variety of spare parts are to be procured, genuine parts produced in a third country by the manufactures may be procured by this Project			

Procurement of spare parts required for the maintenance and replacement for a two-year period after the procurement of the vehicles shall be included in the Project. The spare parts for both chassis manufactured by auto manufacturers and bodies manufactured by coachbuilders shall be procured. The composition of the spare parts shown in Table 2-14 shall be considered as the basic spare part composition. However, since different manufacturers have different opinions on the types and quantities of required spare parts, the actual composition shall be decided with the difference in the opinions taken into consideration.

Table 2-14 Basic Composition of Spare Parts to be Procured

Main spare part	Quantity	Frequency of replacement
For chassis		
1) Engine glow plug	2 sets	Once a year
2) Engine oil filter	4 sets	Twice a year

3) Air filter	2 sets	Once a year
4) Clutch disk	1 set	Once in two years
5) Front brake shoe	1 set	Once in two years
6) Front brake lining	1 set	Once in two years
7) Rear brake shoe	1 set	Once in two years
8) Rear brake lining	1 set	Once in two years
9) Headlight	1 set	Once in two years
For Bed and body		
1) Oil seal for cylinder	1 set each	Once in three years
2) Hydraulic oil filter	2 sets	Every year

2-2-4-7 Operation Guidance Plan

The counterpart shall need explanation and technical guidance on operation and maintenance of the waste collection vehicles to be procured in the Project when the vehicles are handed over to them.

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

Waste collection vehicles are to be procured in this Project. “1) Introduction of new vehicles” and subsequent “2) Continuous maintenance of the vehicles” are essential for increasing the amount of waste collection. Fixed time-station waste collection with compactors, in particular, requires understanding and cooperation of primary waste collectors and the residents. Therefore, procurement of the vehicles alone shall not be sufficient to increase waste collection. While the use of compactors of EGAP was introduced in DNCC and DSCC with the support of the Technical Cooperation Project, this Project shall provide CCC with the first opportunity to use them in waste collection.

Inspection and maintenance system of the vehicles including vehicles other than the compactors before and after the work by drivers, regular inspection at the workshops and in-house training system were introduced to the workshop in DNCC and DSCC constructed under EGAP. As a result, the workers at the workshops wash the vehicles and inspect them every three months. However, improvement of the understanding of the vehicle maintenance of the drivers and the mechanics, and their willingness to maintain them is still a challenge. While the results of maintenance and repair works conducted in periodical inspections and at the time of breakdown have been recorded in the register, spare parts have not been procured systematically. Instead, spare parts run out of the stock have been ordered. Therefore, it takes a long time to repair broken-down vehicles. Such a situation may lead to low availability of the vehicles. There are also problems of operating the workshops such as lack of an established work management system including the management of the work shifts of the mechanics and lack of awareness of the occupational safety and health in the maintenance work. Meanwhile, Japanese side had never provided CCC for technical assistance for the maintenance due to not targeting city. The vehicles are not inspected regularly at the workshop of CCC. Instead, an unsystematic way of repairing vehicles when they have broken down is still in use.

The Soft Component to be implemented against this background by the Consultant shall consist of the two major activities mentioned below.

Assistance Activity-1: Assistance to facilitate the introduction of compactors and guidance on their safe

operation

Assistance Activity-2: Assistance to the establishment of a sustainable maintenance system (Management system)

(1) Objective of the Soft Component

The project purpose is to strengthen the capacity to collect and transport waste of DNCC, DSCC and CCC. The objective of the Soft Component, a component of the Project, is to increase the waste collection capacity as planned by facilitating the use of the equipment to be procured by this Project and assisting the establishment of a system for their appropriate operation and maintenance.

(2) Expected Outcomes of the Soft Component

The implementation of the Soft Components is expected to improve the capacity to use and maintain the equipment to be procured and increase the amount of waste collection. The specific outcomes expected from the Soft Component are as follows:

- 1) Assistance Activity-1: Assistance to facilitate the introduction of compactors and guidance on their safe operation
 - a) Staff members of the three CCs concerned become able to prepare plans for the allocation of compactors including collection time and collection points based on the characteristics of the service area.
 - b) Drivers of the waste collection vehicles and waste collectors become able to collect waste safely and hygienically after receiving safety education and guidance on loading waste on the compactors.
- 2) Assistance Activity-2: Assistance to the establishment of a sustainable maintenance system
 - a) The management systems at the maintenance workshops are strengthened.
 - b) The skill of the mechanics in automobile maintenance is improved and vehicles are maintained appropriately.

(3) Methods to Verify the Achievement of the Outcomes

Table 2-15 and Table 2-16 show the criteria for the verification of the achievement of the outcomes in Assistance Activities-1 and -2, respectively.

Table 2-15 Verification Criteria for Outcome Achievement of Assistance Activity-1

Outcome	Criterion	Description of criterion
Staff members of the three CCs concerned become able to prepare plans for the allocation of compactors with the difference in the	Preparation of plans for the allocation of vehicles	Plans for the allocation of compactors have been prepared. Reference materials to explain the use of compactors to the residents and primary waste collectors have

characteristics of areas within the service areas taken into consideration and operate the vehicles in accordance with the plans.		been prepared. (to be confirmed by the materials)
	Introduction of the vehicles	Discussions with the residents and primary waste collectors have been held. Waste collection with compactors is expanding in accordance with the plans for the allocation. (to be confirmed by interview with staff)
Drivers of the waste collection vehicles and waste collectors become able to collect waste safely and hygienically after receiving safety education and guidance on loading waste on the compactors.	Safety education	The trainees become able to understand the safety and operation manuals for collection work by the compactor correctly. (to be confirmed by observation)
	Guidance on loading waste on compactors	

Table 2-16 Verification Criteria for Outcome Achievement of Assistance Activity-2

Outcome	Criterion	Description of criterion (to be confirmed by the materials)
The management systems at the maintenance workshops are strengthened.	Establishment of working conditions	A manual for the staff members on the working conditions has been prepared.
	Strengthening of the inventory management of consumables and spare parts	A manual on the management of spare parts for repair works has been prepared.
	Establishment of systems for safety control and training	Systems for safety control and training have been established.
The skill of the mechanics in automobile maintenance is improved and vehicles are maintained appropriately.	Improvement of the skill of the mechanics	The forms for the records of daily and regular inspection have been prepared and records are being entered in the forms.

(4) Activities in the Soft Component (Input Plan)

1) Assistance Activity-1

(a) Description of the Soft Component

The Soft Component assistance shall be provided for (1) the preparation and implementation of compactor allocation plans and (2) the provision of safety education and guidance on waste loading to the waste collectors in Assistance Activity-1. In the Technical Cooperation Project, assistance was provided for the introduction of the compactors procured in the EGAP project in accordance with the workflow shown in Figure 2-6.

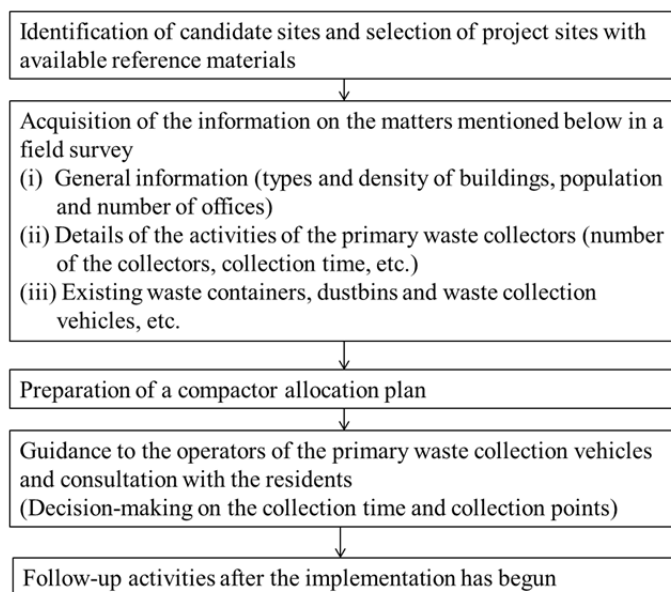


Figure 2-6 Preparation and Implementation of Compactor Allocation Plan

The same approach as the one mentioned above shall be used in this Soft Component. The numbers of the compactors for which allocation plans are to be prepared in this Soft Component shall be three for DNCC and DSCC combined (3 compactors x 2 trips = 6 areas) and three for CCC (3 compactors x 2 trips = 6 areas). For the rest of the compactors, DNCC, DSCC and CCC shall prepare allocation plans by themselves using the experience in the preparation of the plans with the Consultant. As compactors were already procured for DNCC and DSCC in the Technical Cooperation Project, most of the time of this Soft Component shall be spent on the activities in CCC.

A “Leaflet for the Explanation of Collection Time and Collection Points” and a “Leaflet for the Safety Instruction” shall be prepared by revising and updating the reference materials prepared in the Technical Cooperation Project.

(b) Implementation resource

The details of the instructor in the Assistance Activity-1 in the Soft Component are as follows:

Job description:	Consultant to assist allocation and introduction of compactors
Quantity of work:	3.00 man-months (1.50 man-months x 2 times)
Time of the dispatch:	Before the arrival of the vehicles in Bangladesh and after the handover of the vehicles
Description of the duties:	Selection of the candidate areas for the allocation of compactors, field survey of the candidate areas, preparation of compactor allocation plans, preparation of leaflets to explain the waste collection with compactors, discussions with the residents and Primary Collection Service Provider (PCSP) regarding collection time and collection points, and safety education and instruction on waste collection

to drivers and waste collectors etc.

(c) Trainees (Target Groups)

Table 2-17 shows the trainees in Assistance Activity-1.

Table 2-17 Trainees in Assistance Activity-1

CC	Allocation plan and introduction of compactors	Safety education and guidance on waste loading
DNCC and DSCC	Engineers, Conservation Officers (COs) and Conservation Inspectors (CIs) of the Waste Management Department	Drivers and waste collectors
CCC	Engineers and CIs of the Health and Mechanical Engineering Departments	Drivers and waste collectors

2) Assistance Activity-2

(a) Description of the Soft Component

Soft Component assistance shall be provided to (1) the strengthening of the management system and (2) the improvement of the maintenance skill in Assistance Activity-2. An expert in the mechanical engineering prepared technical manuals including those for daily inspection and regular inspections and constructed an inventory management system for spare parts for repair in the software component of the EGAP project. Assistance shall be provided to prepare of the manual for the staff members on the working conditions for the staff members of the workshops and to prepare plans of the safety control and to establish training systems for the strengthening of the management systems in this Soft Component. The manual for the staff members on the working conditions shall provide the scope of work of each staff member, work shift and budgetary management plan, among others. As the inventory management system for spare parts for repair established in the EGAP project has not been utilized fully, a study shall be conducted to identify the reasons why the system has not been used and a manual on the use of the system which includes measures against the identified reasons shall be prepared. The manuals for the daily inspection and regular inspections prepared in the EGAP project shall be applied to the workshop of CCC and the guidance shall be provided to the staff members of the workshop on the preventive maintenance.

For the improvement in the maintenance skills, training on basis of daily and regular inspections and management of spare parts for repair shall be provided in the form of OJT, utilizing local resources.

(b) Implementation resource

The details of the instructor in the Assistance Activity-2 in the Soft Component are as follows:

Job description:	Consultant for workshop management
Quantity of work:	2.50 man-months (Preparatory work in Japan: 0.5 man-months, work in Bangladesh: 2.0 man-months)

Time of dispatch: After the handover of the equipment

Description of the duties: See the table below.

Duty		Description of the duty
Strengthening of the management system	Manual for the staff members on the working conditions	Study of the actual state/analysis of problems, lectures/consultation Preparation of the manual (on verification of the scope of work of each staff member, work shift, budgetary management plan, etc.)
	Manual on the management of spare parts for repair works	Study of the actual state/analysis of problems, lectures/consultation Preparation of the manual
	Safety control and training systems	Study of the actual state/analysis of problems, lectures/consultation Designing of the systems
	Daily inspection/ regular inspections	Introduction of the manuals prepared in the EGAP project and training on the manual (only in CCC)
Improvement of the maintenance skill		Employment of local workers for the implementation of OJT for the mechanics of the workshops.

(c) Trainees (Target groups)

Table 2-18 shows the trainees in Assistance Activity-2.

Table 2-18 Trainees in Assistance Activity-2

CC	Strengthening of the management system	Improvement of the maintenance skill
DNCC and DSCC	Workshop managers (Executive Engineers, Assistant Engineers and Sub-Assistant Engineers)	Sub-Assistant Engineers and Mechanics of Sub-Assistant Engineers and the workshops
CCC	As above	As above

(5) Implementation Schedule of the Soft Component

Table 2-19 shows the implementation schedule of the Soft Component. In Assistance Activity-1, assistance shall be provided for the preparation of compactor allocation plans before the handover and for the introduction of compactors in accordance with the plans after the handover. Assistance Activity-2 shall be implemented after the handover.

Table 2-19 Soft Component Implementation Schedule

Item	August 2016	September	October	November	December
Handover of the equipment			↔		
1) Assistance Activity-1: Assistance to facilitate the introduction of compactors and guidance on their safe operation					
DNCC and DSCC					
(1) Allocation plans and introduction of the vehicles					
Assistance to the preparation for the introduction		↔			
Assistance to the introduction of vehicles				↔	
(2) Safety education and guidance on waste loading					
Preparation of explanatory leaflets		↔			
Safety education and guidance on waste loading to drivers and waste collectors				↔	
CCC					
(1) Allocation plans and introduction of the vehicles					
Assistance to the preparation for the introduction		↔			
Assistance to the introduction of vehicles					↔
(2) Safety education and guidance on waste loading					
Preparation of explanatory leaflets		↔			
Safety education and guidance on waste loading to drivers and waste collectors					↔
2) Assistance Activity-2: Assistance to the establishment of a sustainable maintenance system					
Preparatory work in Japan			↔		
DNCC and DSCC					
(1) Strengthening of the Management system					
Preparation of a manual for staff members on working conditions				↔	
Preparation of a manual on management of spare parts for repair				↔	
Establishment of systems for safety management and training					◇
(2) Improvement in maintenance skills					
Implementation of OJT				↔	
CCC					
(1) Strengthening of the Management system					
Preparation of a manual for staff members on working conditions				↔	
Preparation of a manual on management of spare parts for repair					↔
Establishment of systems for safety management and training					◇
Guidance of daily and periodical inspection					◇
(2) Improvement in maintenance skills					
Implementation of OJT					↔

2-2-4-9 Implementation Schedule

Table 2-20 shows the implementation schedule of the Project after the conclusion of E/N and G/A.

Table 2-20 Project Implementation Schedule

Month No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
Detailed design	■		Field survey/detailed design																			
		■	Tender(Preparation of tender documents,announcement of the tender, evaluation of the proposals)																			
Equipment procurement					Manufacturing, inspection and transportation of the equipment																	
Soft Component					Plans for the allocation of vehicles,Introduction of the vehicles Strengthening of the workshop management system												■					

2-3 Obligations of the Recipient Country

2-3-1 Major Undertakings to be Taken by Each Government

Table 2-21 shows the items which are confirmed as a general obligation of the recipient country in Minutes of Discussion dated 4 September 2014.

Table 2-21 Major Undertakings to be Taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	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) Internal transportation from the port of disembarkation to the project site	●	
2	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 borne by the Authority without using the Grant		●
3	To accord Japanese physical persons and / or physical persons of third countries 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		●
4	To ensure that the products be maintained and used properly and effectively for the implementation of the Project		●
5	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		●
6	To bear the following commissions paid to the Japanese bank for banking services based upon the B/A (Banking Arrangement)		
	1) Advising commission of A/P (Authorization to Pay)		●
	2) Payment commission		●
7	To give due environmental and social consideration in the implementation of the Project.		●

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

2-3-2 Additional Procurement of Waste Containers for Waste Collection Vehicles

Although a great number of compactors and container carriers will be procured by the Project, the number of waste containers for the vehicles of the Project will be one per vehicle. Therefore Bangladesh side should procure necessary number of waste containers.

2-4 Project Operation Plan

2-4-1 Operation and Maintenance Plan for the Waste Collection Vehicles

The following two types of work shall be the major components of the operation and management of the waste collection vehicles:

- Planning, management and operation of the waste collection and transportation; and
- Maintenance of the waste collection vehicles

(1) Planning, Management and Operation of the Waste Collection and Transportation

1) Planning, Management and Operation of the Waste Collection and Transportation in DNCC and DSCC

As the total numbers of the waste collection vehicles are expected to decrease in DNCC and DSCC, the current drivers and waste collectors shall be sufficient to operate the vehicles. Therefore, DNCC or DSCC shall not have to hire new drivers or waste collectors.

Management of such data as amount of collected waste is essential for systematic waste collection and transportation. DNCC and DSCC have Amin Bazar and Matuail Waste Disposal Sites, respectively. A weigh bridge is installed at each site. While more than 80% of vehicles have the weight of the collected waste measured on the bridges, drivers of remaining 20% of the waste collection vehicles still refuse to have the waste on their vehicles weighed. Stricter instruction shall have to be issued to reduce the proportion of drivers who refuse the weighing steadily until all the waste collection vehicles entering the sites are weighed. In addition, the specific gravity of waste in Bangladesh tends to be larger than in other countries because of the frequent rains. Therefore, the waste collection vehicles are often loaded with waste heavier than the design collection weight. Such overloading is likely to affect the durability of the vehicles. Strict compliance with the weighing of collected waste on the weigh bridges shall have to be enforced also for the prevention of such overloading.

Against this background, a new technical cooperation project shall be implemented to enforce compliance with the weighing on all the drivers of waste collection vehicles and provide guidance on weighing with weigh bridges. In practice, strict compliance with the weighing shall be achieved by providing lectures on the importance of managing the data on the amount of collected waste to the drivers and the workers at the final disposal sites in cooperation with DNCC and DSCC.

2) Planning, Management and Operation of the Waste Collection and Transportation in CCC

Because CCC is expected to have 22 more waste collection vehicles after the implementation of this Project, CCC shall have to hire additional drivers and waste collectors. It is expected to take approx. two years for the new vehicles to be delivered to CCC after the decision to implement this Project is made. CCC shall be able to hire them in this two-year period.

While management of such data as amount of collected waste is essential for systematic waste collection and transportation, weigh bridges have not been installed at the two disposal sites in CCC. Instead, CCC keeps the record of the numbers of trips made by each type of waste collection vehicle. With this record, CCC has managed to obtain a rough estimate of the total amount of the waste collected in the city. However, as it is impossible to inspect each vehicle for overloading in the current environment, installation of weigh bridges shall be required.

As CCC owns no compactor at present, CCC shall have to give thorough instruction on the operation of the compactors and safety of the operation to their drivers and waste collectors when their use begins. Cooperation and coordination with the residents and primary waste collectors shall be indispensable for the successful introduction of the compactors as the waste collection method shall also have to be changed with

the introduction of compactors. Discussions shall be held with the residents and primary waste collectors on the cooperation and coordination in Assistance Activity-1, "Assistance to facilitate the introduction of compactors and guidance on their safe operation," in the Soft Component to facilitate the introduction of compactors.

(2) Maintenance of the Waste Collection Vehicles

1) Maintenance of the Waste Collection Vehicles by DNCC and DSCC

DNCC is maintaining its waste collection vehicles at the workshop constructed with the assistance from EGAP. DSCC is maintaining its waste collection vehicles at its own workshop managed by the Engineering Department. Although the two CCs have had discussions on using the workshop constructed under EGAP for the maintenance of the waste collection vehicles of both CCs, there still remain various problems to materialize such joint use. As DSCC agreed to assign newly employed mechanics to the workshop after they have completed technical training and to resume the joint use of the workshop with DNCC after the assignment during the Study for the explanation of the Draft Final Report in December, the Survey Team shall continue to monitor the activities of the two CCs on the joint use.

DNCC and DSCC are to employ new mechanics (one head mechanic and six mechanics each) to be assigned to the workshop. DSCC has already employed the mechanics to be assigned to the workshop, while DNCC has not. Therefore, the Survey Team shall have to monitor the progress in the employment of the new mechanics by DNCC. The team shall also have to pay attention to the progress in the assignment of the mechanics of DSCC and their technical training.

2) Maintenance of the Waste Collection Vehicles by CCC

CCC shall continue to maintain its waste collection vehicles at its workshop managed by the Mechanical Engineering Department. Approx. 100 staff members, including 15 engineers, are working at the workshop. Among the staff members, five engineers and several assistants are mainly engaged in the maintenance of the waste collection vehicles. Since the workshop is staffed with sufficient number of staff members and equipped with required maintenance equipment, it is consider possible for the workshop to maintain the vehicles to be procured by this Project. However, the maintenance performed at the workshop is limited to mainly repair of breakdowns and regular inspections for the prevention of malfunctions are not performed. Regular inspections shall have to be included in the maintenance work for the prevention of breakdowns. Technical assistance to the establishment of such a maintenance system shall be provided not only in the Soft Component of this Project, but also in the guidance on a system for the maintenance of waste collection vehicles in the planned technical cooperation project.

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

(1) Cost Borne by the Japanese side

This part is closed due to the confidentiality.

(2) Cost Borne by the Bangladeshi Side

Procurement of waste containers for container carriers and bank commissions: approx. 39.2 million yen
(approx. 26.7 million Tk)

Waste containers for DNCC	: 9.0 million Tk
Waste containers for DSCC	: 10.8 million Tk
Waste containers for CCC	: 5.9 million Tk
Bank commissions	: 1.0 million Tk

(3) Estimation Conditions

- i) Time of estimation: December 2014
- ii) Foreign exchange rates: 1 Tk = 1.47 yen
1 US\$ = 114.5 yen
- iii) Implementation period: The periods for the detailed design and Project implementation are as shown in the execution schedule.
- iv) Miscellaneous matter: The costs are to be estimated in accordance with the provisions of the grant aid program of the Government of Japan.

2-5-2 Operation and Maintenance Cost

The labor cost associated with the waste collection and transportation, the maintenance cost (spare parts, oil and outsourcing of repair work) and the fuel cost were estimated for the estimation of the operation and maintenance cost. The conditions shown in Table 2-22 were assumed in the estimation.

Table 2-22 Conditions for the Estimation of the Operation and Maintenance Cost

	Condition
Labor cost of the driver (Tk/month)	25,000
Labor cost for the waste collector (Tk/month)	13,000
Distance covered by a single round trip to a disposal site	30 km
Purchase price of diesel (Tk/L)	68
Purchase price of CNG (Tk/m ³)	30
Purchase price of oil (Tk/L)	600

Types and quantities of spare parts required for maintenance differ by type of vehicle, *e.g.* between compactors and container carriers. The cost of spare parts for maintenance per year was estimated by type of vehicle as shown in Table 2-23 to Table 2-26. Meanwhile, the spare part cost of the open truck which has only a load-carrying platform on its chassis was estimated at Tk 76,610, the sum of the spare part cost for the

maintenance of the chassis of Tk 75,610 and Tk 1,000 as material cost for repair of corrosion on the load carrying platform (one in ten years on the assumption of proper cleaning vehicle).

Table 2-23 Spare Part Cost of a Compactor per Year

Main spare parts	Unit price (Tk)	Quantity/year	Amount (Tk)	Frequency of replacement
Chassis				
Engine glow plug	1,700	1	1,700	One per year
Fuel filter	800	2	1,600	Two per year
Engine oil filter	2,100	2	4,200	Two per year
Air filter	3,800	1	3,800	One per year
Clutch disc	16,700	0.5	8,350	One in two years
Front brake shoe	21,700	0.5	10,850	One in two years
Brake lining	15,000	0.5	7,500	One in two years
Rear brake shoe	21,700	0.5	10,850	One in two years
Brake lining	15,000	0.5	7,500	One in two years
Headlight	1,700	1	1,700	Two in two years
Windshield wiper	1,700	2	3,400	Two per year
Tire	25,000	0.5	12,500	Once in two years
Others (fuel cap, light cover, etc.)	8,300	0.2	1,660	Once in five years
Subtotal			75,610	
Platform and body				
Oil seal for the injection cylinder	25,000	0.3	7,500	One in three years
Oil seal for the lift cylinder	3,300	0.6	1,980	Two in three years
Oil seal for the press cylinder	6,700	0.6	4,020	Two in three years
Oil seal for the packer cylinder	6,700	0.6	4,020	Two in three years
High pressure hose for the injection cylinder	6,300	0.3	1,890	One in three years
High pressure hose for the lift cylinder	10,000	0.6	6,000	Two in three years
High pressure hose for the press cylinder	6,300	0.6	3,780	Two in three years
Hydraulic oil filter	4,200	1	4,200	One per year
Subtotal			33,390	
Total			109,000	

Table 2-24 Spare Part Cost of a Container Carrier per Year

Main spare parts	Unit price (Tk)	Quantity/year	Amount (Tk)	Frequency of replacement
Chassis (the same as the compactor)				
Subtotal			75,610	
Platform and body				
Oil seal for the hook cylinder	4,200	0.3	1,260	One in three years
Oil seal for the lift cylinder	20,800	0.6	12,480	Two in three years
Oil seal for the jack cylinder	5,000	0.6	3,000	Two in three years
High pressure hose for the hook cylinder	8,300	0.3	2,490	One in three years
High pressure hose for the lift cylinder	5,000	0.6	3,000	Two in three years
High pressure hose for the jack cylinder	5,000	0.6	3,000	Two in three years
Hydraulic oil filter	4,200	1	4,200	One per year
Subtotal			29,430	
Total			105,040	

Table 2-25 Spare Part Cost of an Armroll per Year

Main spare parts	Unit price (Tk)	Quantity/year	Amount (Tk)	Frequency of replacement
Chassis (the same as the compactor)				
Subtotal			75,610	
Platform and body				
Oil seal for the lift cylinder	19,200	0.6	11,520	Two in three years
Oil seal for the slide cylinder	9,200	0.3	2,760	One in three years
Oil seal for the jack cylinder	20,800	0.3	6,240	One in three years
Oil seal for the container lock cylinder	1,700	0.3	510	One in three years
High pressure hose for the lift cylinder	4,200	0.6	2,520	Two in three years
High pressure hose for the slide cylinder	10,000	0.3	3,000	One in three years
High pressure hose for the jack cylinder	5,000	0.3	1,500	One in three years
High pressure hose for the container lock cylinder	5,800	0.3	1,740	One in three years
Hydraulic oil filter	2,500	1	2,500	One per year
Subtotal			32,290	
Total			107,900	

Table 2-26 Spare Part Cost of a Dump Truck per Year

Main spare parts	Unit price (Tk)	Quantity/year	Amount (Tk)	Frequency of replacement
Chassis (the same as the compactor)				
Subtotal			75,610	
Platform and body				
Oil seal for the dump cylinder	6,700	0.3	2,010	One in three years
Subtotal			2,010	
Total			77,620	

Table 2-27 summarizes the costs of spare parts for maintenance per year by type of vehicle described above.

Table 2-27 Summary of the Spare Part Cost per Unit per Year

	Spare part cost in a year (Tk/unit/year)
Compactor	109,000
Container carrier	105,040
Armroll	107,900
Dump truck	77,620
Open truck	76,610

It was assumed that a small-sized vehicle with the load capacity of 3ton or less and a large-sized vehicle with the larger load capacity used 60L and 120L, respectively, of engine oil in a year. In addition, the cost of outsourcing repair work which could not be carried out at the workshops of the three CCs from private workshops was assumed at Tk 15,000 per vehicle per year.

2-5-2-1 Operation and Maintenance Cost for the Waste Collection and Transportation in DNCC

(1) Labor Cost

Labor costs of the drivers of the waste collection vehicles and the waste collectors who load waste on the vehicles were estimated as the labor costs associated with the waste collection and transportation. It was assumed that one driver is to be assigned to each vehicle, two waste collectors to each compactor, and four waste collectors to each dump/open truck. Table 2-28 and Table 2-29 show the estimated labor costs for the years 2014 and 2019, respectively.

Table 2-28 Estimated Labor Cost for the Waste Collection and Transportation (in DNCC in 2014)

Unit: million Tk/year

	Quantity	Labor cost of the drivers	Labor cost of the waste collectors	Total
Compactor	25	7.5	7.8	15.3
Container carrier	57	17.1	0.0	17.1
Armroll	8	2.4	0.0	2.4
Open truck	45	13.5	28.1	41.6
Dump truck	4	1.2	2.5	3.7
Total	139	41.7	38.4	80.1

Table 2-29 Estimated Labor Cost for the Waste Collection and Transportation (in DNCC in 2019)

Unit: million Tk/year

	Quantity	Labor cost of the drivers	Labor cost of the waste collectors	Total
Compactor	48	14.4	15.0	29.4
Container carrier	46	13.8	0.0	13.8
Armroll	8	2.4	0.0	2.4
Open truck	4	1.2	2.5	3.7
Dump truck	26	7.8	16.2	24.0
Total	132	39.6	33.7	73.3

(2) Maintenance Cost (spare parts, oil and outsourcing of repair work)

Table 2-30 shows the estimated costs of spare parts in 2014 and 2019.

Table 2-30 Estimated Costs of Spare Parts for Maintenance in 2014 and 2019 (in DNCC)

	2014			2019		
	Quantity	Cost of spare parts per unit (Tk/unit)	Cost of spare parts (million Tk)	Quantity	Cost of spare parts per unit (Tk/unit)	Cost of spare parts (million Tk)
Compactor	25	109,000	2.7	48	109,000	5.2
Container carrier	57	105,040	6.0	46	105,040	4.8
Armroll	8	107,900	0.9	8	107,900	0.9
Open truck	45	76,610	3.4	4	76,610	0.3
Dump truck	4	77,620	0.3	26	77,620	2.0
Total	139		13.3	132		13.2

Table 2-31 shows the result of the estimation of the oil cost and cost of outsourcing repair work from private workshops in 2014 and 2019.

Table 2-31 Estimated Costs of Oil and Outsourcing in 2014 and 2019 (in DNCC)

	2014			2019		
	Quantity	Cost of oil (million Tk)	Cost of outsourcing (million Tk)	Quantity	Cost of oil (million Tk)	Cost of outsourcing (million Tk)
Small-sized vehicle	58	2.1	—	28	1.0	—
Large-sized vehicle	81	5.8	—	104	7.5	—
Total	139	7.9	2.1	132	8.5	2.0

(3) Fuel Cost

The fuel cost of each type of the waste collection vehicles was estimated as follows: The distance covered by each type of the waste collection vehicles for the waste collection and transportation in a year was estimated; Then, the amount of fuel consumed by a vehicle in a year was estimated by multiplying the estimated distance by the fuel efficiency; Finally, the fuel cost was estimated by multiplying the amount of fuel consumption by the unit price of fuel. DNCC owns CNG waste collection vehicles procured in the project under EGAP, as well as diesel waste collection vehicles. Therefore, the fuel costs were estimated separately for those two types of vehicles. Table 2-32 to Table 2-34 show the estimated fuel consumptions in 2014 and 2019 for the diesel vehicles. The distance travelled for the waste collection and transportation was estimated by multiplying the distance covered by a trip by the number of trips and other factors including an availability factor (decrease in the capacity factor due to aging) of each vehicle. Then, the fuel consumption was estimated by multiplying the distance estimated above by the fuel efficiency, and the estimated fuel consumption was used in the estimation of the fuel cost. The fuel efficiencies of the existing vehicles were assumed at 70% of those of the vehicles to be procured by this Project.

Table 2-32 Estimated Consumption of Diesel at present (DNCC)

	Travel distance (km/day)	Travel distance (km/year)	Fuel efficiency (km/L)	Fuel consumption (L/year)
Compactor, small	131	47,815	2.1	22,769
Compactor, large	961	350,765	1.4	250,546
Container carrier, small	917	334,705	2.8	119,538
Container carrier, large	1,594	581,810	2.1	277,052
Dump truck, small	850	310,250	2.8	110,804
Dump truck, large	502	183,230	2.1	87,252
Dump truck, 4WD		0	2.1	0
Armroll	698	254,770	2.1	121,319
Total	5,653	2,063,345		989,280

Table 2-33 Estimated Consumption of Diesel in 2019 (by the existing vehicles, DNCC)

	Travel distance (km/day)	Travel distance (km/year)	Fuel efficiency (km/L)	Fuel consumption (L/year)
Compactor, small	131	47,815	2.1	22,769

Compactor, large	961	350,765	1.4	250,546
Container carrier, small	0	0	2.8	0
Container carrier, large	1,004	366,460	2.1	174,505
Dump truck, small	350	127,750	2.8	45,625
Dump truck, large	394	143,810	2.1	68,481
Dump truck, 4WD		0	2.1	0
Armroll	698	254,770	2.1	121,319
Total	3,538	1,614,760		683,245

Table 2-34 Estimated Consumption of Diesel in 2019 (by the newly-procured vehicles, DNCC)

	Travel distance (km/day)	Travel distance (km/year)	Fuel efficiency (km/L)	Fuel consumption (L/year)
Compactor, small	582	212,430	3	70,810
Compactor, large	757	276,305	2	138,153
Container carrier, small		0	4	0
Container carrier, large	2,328	849,720	3	283,240
Dump truck, small	233	85,045	4	21,261
Dump truck, large	291	106,215	3	35,405
Dump truck, 4WD	233	85,045	3	28,348
Armroll	582	0	3	0
Total	4,424	2,906,130		577,217

It was revealed in the field survey that the fuel consumption of the CNG vehicles was 20 m³/day. The fuel consumptions shown in Table 2-35Table 2-36 were estimated from this figure.

Table 2-35 Estimated CNG Consumption (in DNCC)

	Number of CNG vehicles	Average consumption (m ³ /day/unit)	Average fuel consumption (m ³ /year)
2014	14 units	20	102,200
2019	14 units	20	102,200

Table 2-36 shows the fuel costs in 2014 and 2019 estimated from the current unit prices of 68 Tk/L and 30 Tk/m³ of diesel and CNG, respectively.

Table 2-36 Estimated Fuel Costs (DNCC)

	2014 (million Tk)	2019 (million Tk)		
		Existing vehicles	Newly-procured vehicles	Total
Diesel	67.3	46.5	39.3	85.8
CNG	3.1	3.1	0.0	3.1
Total	70.4	49.6	39.3	88.9

(4) Summary of the Operation and Maintenance Cost of DNCC

Table 2-37 shows the result of the estimation of the operation and maintenance cost of the waste collection vehicles of DNCC. While the labor cost is estimated to decrease because of the reduction in the total number of vehicles, the maintenance and fuel costs are estimated to increase. The total operation and maintenance cost is expected to increase by 12.1 million Tk. However, this figure corresponds to less than 1% of the budget for

the waste management of DNCC for 2013/2014 of 1.4 billion Tk. Therefore, it is concluded that DNCC shall be able to cope with the increase in the operation and maintenance cost arising from the implementation of this Project.

Table 2-37 Summary of the Operation and Maintenance Cost of DNCC

	in million Tk		
	2014	2019	Change
Labor cost	80.1	73.3	-6.8
Maintenance cost	23.3	23.7	0.4
Fuel cost	70.4	88.9	18.5
Total	173.8	185.9	12.1

2-5-2-2 Operation and Maintenance Cost for the Waste Collection and Transportation in DSCC

(1) Labor Cost

Similar to the DNCC, labor costs of the drivers of the waste collection vehicles and the waste collectors who load waste on the vehicles were estimated as the labor costs associated with the waste collection and transportation. It was assumed that one driver is to be assigned to each vehicle, two waste collectors to each compactor, and four waste collectors to each dump/open truck. Table 2-38 and Table 2-39 show the estimated labor costs for the years 2014 and 2019, respectively.

Table 2-38 Estimated Labor Cost for the Waste Collection and Transportation (in DSCC in 2014)

Unit: million Tk/year

	Quantity	Labor cost of the drivers	Labor cost of the waste collectors	Total
Compactor	19	5.7	5.9	11.6
Container carrier	63	18.9	0.0	18.9
Armroll	12	3.6	0.0	3.6
Open truck	101	30.3	63.0	93.3
Dump truck	5	1.5	3.1	4.6
Total	200	60.0	72.0	132.0

Table 2-39 Estimated Labor Cost for the Waste Collection and Transportation (in DSCC in 2019)

Unit: million Tk/year

	Quantity	Labor cost of the drivers	Labor cost of the waste collectors	Total
Compactor	41	12.3	12.8	25.1
Container carrier	69	20.7	0.0	20.7
Armroll	12	3.6	0.0	3.6
Open truck	59	17.7	36.8	54.5
Dump truck	15	4.5	9.4	13.9
Total	196	58.8	59.0	117.8

(2) Maintenance Cost (spare parts, oil and outsourcing of repair work)

Table 2-40 shows the estimated costs of spare parts in 2014 and 2019.

Table 2-40 Estimated Costs of Spare Parts for Maintenance in 2014 and 2019 (in DSCC)

	2014			2019		
	Quantity	Cost of spare parts per unit (Tk/unit)	Cost of spare parts (million Tk)	Quantity	Cost of spare parts per unit (Tk/unit)	Cost of spare parts (million Tk)
Compactor	19	109,000	2.1	41	109,000	4.5
Container carrier	63	105,040	6.6	69	105,040	7.2
Armroll	12	107,900	1.3	12	107,900	1.3
Open truck	101	76,610	7.7	59	76,610	4.5
Dump truck	5	77,620	0.4	15	77,620	1.2
Total	200		18.1	196		18.7

Table 2-41 shows the result of the estimation of the oil cost and cost of outsourcing repair work from private workshops in 2014 and 2019.

Table 2-41 Estimated Costs of Oil and Outsourcing in 2014 and 2019 (in DSCC)

	2014			2019		
	Quantity	Cost of oil (million Tk)	Cost of outsourcing (million Tk)	Quantity	Cost of oil (million Tk)	Cost of outsourcing (million Tk)
Small-sized vehicle	135	4.9	—	104	3.7	—
Large-sized vehicle	65	4.7	—	92	6.6	—
Total	200	9.6	3.0	196	10.3	2.9

(3) Fuel Cost

DSCC owns CNG waste collection vehicles procured in the project under EGAP, as well as diesel waste collection vehicles. Therefore, the fuel costs were estimated separately for those two types of vehicles. Table 2-42 to Table 2-44 show the estimated fuel consumptions in 2014 and 2019 for the diesel vehicles. The distance travelled for the waste collection and transportation was estimated by multiplying the distance covered by a trip by the number of trips and other factors including an availability factor (decrease in the capacity factor due to aging) of each vehicle. Then, the fuel consumption was estimated by multiplying the distance estimated above by the fuel efficiency, and the estimated fuel consumption was used in the estimation of the fuel cost. The fuel efficiencies of the existing vehicles were assumed at 70% of those of the vehicles to be procured by this Project.

Table 2-42 Estimated Consumption of Diesel at Present (DSCC)

	Travel distance (km/day)	Travel distance (km/year)	Fuel efficiency (km/L)	Fuel consumption (L/year)
Compactor, small	522	190,530	2.1	90,729
Compactor, large	522	190,530	1.4	136,093
Container carrier, small	870	317,550	2.8	113,411
Container carrier, large	1,711	624,515	2.1	297,388
Dump truck, small	3,813	1,391,745	2.8	497,052
Dump truck, large	540	197,100	2.1	93,857
Dump truck, 4WD		0	2.1	0

Armroll	1,363	497,495	2.1	236,902
Total	9,341	3,409,465		1,465,432

Table 2-43 Estimated Consumption of Diesel in 2019 (by the existing vehicles, DSCC)

	Travel distance (km/day)	Travel distance (km/year)	Fuel efficiency (km/L)	Fuel consumption (L/year)
Compactor, small	522	190,530	2.1	90,729
Compactor, large	522	190,530	1.4	136,093
Container carrier, small	0	0	2.8	0
Container carrier, large	1,218	444,570	2.1	211,700
Dump truck, small	2,233	815,045	2.8	291,088
Dump truck, large	435	158,775	2.1	75,607
Dump truck, 4WD		0	2.1	0
Armroll	1,363	497,495	2.1	236,902
Total	6,293	1,700,170		1,042,119

Table 2-44 Estimated Consumption of Diesel in 2019 (by the newly-procured vehicles, DSCC)

	Travel distance (km/day)	Travel distance (km/year)	Fuel efficiency (km/L)	Fuel consumption (L/year)
Compactor, small	466	170,090	3	56,697
Compactor, large	815	297,475	2	148,738
Container carrier, small		0	4	0
Container carrier, large	2,794	1,019,810	3	339,937
Dump truck, small	175	63,875	4	15,969
Dump truck, large	233	85,045	3	28,348
Dump truck, 4WD	175	63,875	3	21,292
Armroll		0	3	0
Total	4,658	3,997,115		610,981

It was revealed in the field survey that the fuel consumption of the CNG vehicles was 20 m³/day. The fuel consumptions shown in Table 2-45 were estimated from this figure.

Table 2-45 Estimated CNG Consumption (in DSCC)

	Number of CNG vehicles	Average consumption (m ³ /day/unit)	Average fuel consumption (m ³ /year)
2014	31 units	20	226,300
2019	31 units	20	226,300

Table 2-46 shows the fuel costs in 2014 and 2019 estimated from the current unit prices of 68 Tk/L and 30 Tk/m³ of diesel and CNG, respectively.

Table 2-46 Estimated Fuel Costs (DSCC)

	2014 (million Tk)	2019 (million Tk)		
		Existing vehicles	Newly-procured vehicles	Total
Diesel	99.6	70.9	41.5	112.4
CNG	6.8	6.8	0.0	6.8
Total	106.4	77.7	41.5	119.2

(4) Summary of the Operation and Maintenance Cost of DSCC

Table 2-47 shows the result of the estimation of the operation and maintenance cost of the waste collection vehicles of DSCC. While the maintenance and fuel costs are estimated to increase, the labor cost is estimated to decrease. The total operation and maintenance cost is expected to be approximately the same as the current cost. Therefore, it has been concluded that DSCC shall be able to bear the operation and maintenance cost arising from the implementation of this Project.

Table 2-47 Summary of the Operation and Maintenance Cost of DSCC

	in million Tk		
	2014	2019	Change
Labor cost	132.0	117.8	-14.2
Maintenance cost	30.7	31.9	1.2
Fuel cost	106.4	119.2	12.8
Total	269.1	268.9	-0.2

2-5-2-3 Operation and Maintenance Cost for the Waste Collection and Transportation in CCC

(1) Labor Cost

Similar to the other two cities, labor costs of the drivers of the waste collection vehicles and the waste collectors who load waste on the vehicles were estimated as the labor costs associated with the waste collection and transportation. It was assumed that one driver was to be assigned to each vehicle, two waste collectors to each compactor, and four waste collectors to each dump/open truck.. Table 2-48 and Table 2-49 show the estimated labor costs for the years 2014 and 2019, respectively.

Table 2-48 Estimated Labor Cost for the Waste Collection and Transportation (in CCC in 2014)

Unit: million Tk/year

	Quantity	Labor cost of the drivers	Labor cost of the waste collectors	Total
Compactor	0	0.0	0.0	0.0
Container carrier	10	3.0	0.0	3.0
Armroll	0	0.0	0.0	0.0
Open truck	0	0.0	0.0	0.0
Dump truck	69	20.7	43.1	63.8
Total	79	23.7	43.1	66.8

Table 2-49 Estimated Labor Cost for the Waste Collection and Transportation (in CCC in 2019)

Unit: million Tk/year

	Quantity	Labor cost of the drivers	Labor cost of the waste collectors	Total
Compactor	13	3.9	4.1	8.0
Container carrier	23	6.9	0.0	6.9
Armroll	0	0.0	0.0	0.0
Open truck	0	0.0	0.0	0.0
Dump truck	65	19.5	40.6	60.1

Total	101	30.3	44.7	75.0
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(2) Maintenance Cost (spare parts, oil and outsourcing of repair work)

Table 2-50 shows the estimated costs of spare parts in 2014 and 2019.

Table 2-50 Estimated Costs of Spare Parts for Maintenance in 2014 and 2019 (in CCC)

	2014			2019		
	Quantity	Cost of spare parts per unit (Tk/unit)	Cost of spare parts (million Tk)	Quantity	Cost of spare parts per unit (Tk/unit)	Cost of spare parts (million Tk)
Compactor	0	109,000	0.0	13	109,000	1.4
Container carrier	10	105,040	1.1	23	105,040	2.4
Armroll	0	107,900	0.0	0	107,900	0.0
Open truck	0	75,610	0.0	0	75,610	0.0
Dump truck	69	77,620	5.4	65	77,620	5.0
Total	79		6.5	101		8.8

Table 2-51 shows the result of the estimation of the oil cost and cost of outsourcing repair work from private workshops in 2014 and 2019.

Table 2-51 Estimated Costs of Oil and Outsourcing in 2014 and 2019 (in CCC)

	2014			2019		
	Quantity	Cost of oil (million Tk)	Cost of outsourcing (million Tk)	Quantity	Cost of oil (million Tk)	Cost of outsourcing (million Tk)
Small-sized vehicle	46	1.7	—	57	2.1	—
Large-sized vehicle	33	2.4	—	44	3.2	—
Total	79	4.1	1.2	101	5.3	1.5

(3) Fuel Cost

Table 2-52 to Table 2-54 show the estimated diesel consumptions in 2014 and 2019. The distance travelled for the waste collection and transportation was estimated by multiplying the distance covered by a trip by the number of trips and other factors including an availability factor (decrease in the capacity factor due to aging) of each vehicle. Then, the fuel consumption was estimated by multiplying the distance estimated above by the fuel efficiency, and the estimated fuel consumption was used in the estimation of the fuel cost. The fuel efficiencies of the existing vehicles were assumed at 70% of those of the vehicles to be procured by this Project.

Table 2-52 Estimated Consumption of Diesel at Present (CCC)

	Travel distance (km/day)	Travel distance (km/year)	Fuel efficiency (km/L)	Fuel consumption (L/year)
Compactor, small	0	0	2.1	0
Compactor, large	0	0	1.4	0
Container carrier, small	0	0	2.8	0
Container carrier, large	3,492	1,274,580	2.1	606,943

Dump truck, small	4,283	1,563,295	2.8	558,320
Dump truck, large	931	339,815	2.1	161,817
Dump truck, 4WD	0	0	2.1	0
Armroll	0	0	2.1	0
Total	8,706	3,177,690		1,327,080

Table 2-53 Estimated Consumption of Diesel in 2019 (by the existing vehicles, CCC)

	Travel distance (km/day)	Travel distance (km/year)	Fuel efficiency (km/L)	Fuel consumption (L/year)
Compactor, small	0	0	2.1	0
Compactor, large	0	0	1.4	0
Container carrier, small	0	0	2.8	0
Container carrier, large	2,328	849,720	2.1	404,629
Dump truck, small	3,781	1,380,065	2.8	492,880
Dump truck, large	873	318,645	2.1	151,736
Dump truck, 4WD	0	0	2.1	0
Armroll	0	0	2.1	0
Total	6,982	1,900,920		1,049,245

Table 2-54 Estimated Consumption of Diesel in 2019 (by the newly-procured vehicles, CCC)

	Travel distance (km/day)	Travel distance (km/year)	Fuel efficiency (km/L)	Fuel consumption (L/year)
Compactor, small	524	191,260	3	63,753
Compactor, large	611	223,015	2	111,508
Container carrier, small		0	4	0
Container carrier, large	3,026	1,104,490	3	368,163
Dump truck, small	349	127,385	4	31,846
Dump truck, large	349	127,385	3	42,462
Dump truck, 4WD	349	127,385	3	42,462
Armroll	0	0	3	0
Total	5,208	4,449,350		660,194

Table 2-55 shows the fuel costs in 2014 and 2019 estimated from the current unit prices of 68 Tk/L of diesel, respectively.

Table 2-55 Estimated Fuel Costs (CCC)

	2014 (million Tk)	2019 (million Tk)		
		Existing vehicles	Newly-procured vehicles	Total
Diesel	90.2	71.3	44.9	116.2

(4) Summary of the Operation and Maintenance Cost of CCC

Table 2-56 shows the result of the estimation of the operation and maintenance cost of the waste collection vehicles of CCC. As the number of vehicles is to increase, the total operation and maintenance cost is expected to increase by 38 million Tk. This figure corresponds to 8% of the budget for the waste management of CCC for 2013/2014 of 500 million Tk. CCC has been increasing the budget for the waste management by 50 million Tk every year for the recent years with the recognition of its importance. If CCC is to continue to

implement this policy in the future, CCC is expected to be able to bear the increase in the operation and maintenance cost arising from the implementation of this Project. However, CCC has greater need for concrete budgetary measures to secure the operation and maintenance cost than DNCC and DSCC.

Table 2-56 Summary of the Operation and Maintenance Cost of CCC

in million Tk

	2014	2019	Change
Labor cost	66.8	75.0	8.2
Maintenance cost	11.8	15.6	3.8
Fuel cost	90.2	116.2	26.0
Total	168.8	206.8	38.0

Chapter 3 Project Evaluation

3-1 Preconditions

A precondition for the implementation of this Project is that the Bangladeshi side shall carry out in full its obligations, including procedures required for tax exemption and customs clearance, payment of bank commissions and procurement of additional containers.

3-2 Necessary Inputs by the Recipient Country

The Bangladeshi side must take measures to satisfy the following conditions in order for the outcomes of the Project to be realized and maintained.

- 1) To employ the workers (drivers, waste collectors and mechanics) required for the operation and maintenance of the vehicles to be provided, and to secure a budget for their operation and maintenance;
- 2) To allocate and operate appropriately the vehicles to be provided;
- 3) To improve the vehicle maintenance capacity of the three target CCs to enable regular inspections to be carried out as scheduled and replacement parts to be managed appropriately; and
- 4) To expand the final disposal sites in Dhaka North and Dhaka South, and to prepare a master plan showing a framework for sustainable solid waste management

The implementation of a technical cooperation project for the improvement of solid waste management capacity with DNCC, DSCC and CCC as the major counterpart organizations is scheduled to begin in 2015. It is expected that the capacities referred to in 2), 3) and 4) above will be improved to a satisfactory level by means of this technical cooperation project.

3-3 Important Assumptions

The important assumptions for the implementation of this Project are that peace and order will be maintained in the three target cities and that no large-scale natural disaster will occur.

3-4 Project Evaluation

3-4-1 Relevance

(1) Beneficiaries of the Project

The number of direct beneficiaries of this Project are 3.56 million, 5.09 million and 3.29 million people in Dhaka North, Dhaka South and Chittagong, respectively.

(2) Urgency

The amount of solid waste generated in the three target cities has been rising because of the population growth triggered by rapid urban development and the influx of refugees. However, as the waste is not collected or disposed of appropriately, the living environment has significantly deteriorated. Only 70% of the solid waste

generated is being collected. There are areas where solid waste is not collected at all. Many of those no-collection areas are found in low-income residential areas. However, the waste collection and transportation equipment of the three target cities is old and in poor condition, and the waste collection capacity of the three cities is expected to fall by approx. 20% over the next five years. This Project needs to be implemented urgently in order to improve the situation described above.

(3) Project Contributing to the Achievement of the Medium- to Long-term Developmental Goals

“Improvement of solid waste management” is defined as a strategy to be followed by local governments in “SFYP Objectives and Strategies for the Pourashavas and City Corporations” in the Sixth Five Year Plan (FY2011 – FY2015) in the poverty reduction strategy paper (PRSP) of Bangladesh, “Unlocking the Potential: National Strategy for Accelerated Poverty Reduction.”

“The Clean Dhaka Master Plan” formulated in 2005 is a master plan for solid waste management in the city of Dhaka for the period up to 2015. It was revised in 2011 in the “Project for Strengthening of Solid Waste Management in Dhaka City.” The revised master plan defines its objectives as 1) improvement in the quality and efficiency of primary waste collection, and participation by the residents; and 2) improvement in the efficiency of secondary waste collection and transportation, in collection and transportation capacity and in the working environment. This Project is expected to contribute to the achievement of these objectives through the procurement and provision of the equipment required for waste collection.

(4) Consistency with the Assistance Policies and Strategies of the Government of Japan

The Country Assistance Policy for Bangladesh published in June 2012 mentions as priority areas (medium objectives) for Bangladesh to become a middle-income country: (1) Accelerating inclusive economic growth and (2) Overcoming social vulnerability. This Project is considered to be consistent with the policy, as it is expected to contribute to “(2) Overcoming social vulnerability” through the improvement of the sanitary environment.

3-4-2 Effectiveness

3-4-2-1 Quantitative Effects

Table 3-1 shows the indicators of the quantitative effects expected from this Project together with the current (standard) values and the target values of the indicators after completion of the Project.

Table 3-1 Quantitative Effects Expected from the Implementation of this Project

Indicator	Standard values			Target values		
	(2014)			(2019)		
	DNCC	DSCC	CCC	DNCC	DSCC	CCC
Amount of solid waste collected (t/day)	1,356	1,991	1,200	2,052	2,470	1,870
Proportion of waste collected %	65	66	75	86	75	98

CO ₂ emissions per unit of collected waste kg/t	4.3	3.3	4.3	3.3	2.9	3.6
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3-4-2-2 Qualitative Effects

The qualitative effects described below can be expected from the implementation of this Project.

(1) Expansion of the Solid Waste Collection Service and Improvement of the Living Environment

The implementation of this Project is expected to bring about solid waste collection in areas where it is not being collected at present and to increase the frequency of waste collection in areas where it is being collected. This expansion of the waste collection service is expected to improve the living environment by reducing the amount of solid waste strewn on the streets and, consequently, by reducing the negative impact of the uncollected solid waste (offensive odors, pests, etc.) on the living environment.

(2) Improvement in the People's Perception of Solid Waste Management

The procurement of the first compactors by DCC in the previous Japanese grant aid project was reported by the media. The media report significantly changed the people's concept of solid waste management. In fact, the then DCC received requests for allocation of the compactors even from the official residence of the Prime Minister and from the University of Dhaka. A similar effect is expected from this Project, as compactors will also be procured in this Project.

Appendices

1. Member List of the Study Team

Member List of the Study Team

Name	Title	Affiliation
Mr. Koichi Kito	Leader (First Survey)	Global Environment Department, JICA
Mr. Noriaki Murase	Leader (Second Survey)	Environmental Management Team 1, Environmental Management Group, Global Environment Department, JICA
Mr. Kazuya Yao	Planning Management	Environmental Management Division 2, Environmental Management Group, Global Environment Department, JICA
Mr. Masayuki Hayashi	Grant Aid Planning	Grant Aid Project Management Division 3 , Financial Cooperation Implementation Department, JICA
Ms. Yoko Onuma	Waste Management	Environmental Management Team 1, Environmental Management Group, Global Environment Department, JICA
Mr. Norihito Kaigai	Cooperation Planning	Environmental Management Team 1, Environmental Management Group, Global Environment Department, JICA
Mr. Takatoshi Arai	Chief Consultant/ Collection & Transportation Planning 1	Yachiyo Engineering Co., Ltd.
Mr. Akio Ishii	Waste Equipment Planning	Yachiyo Engineering Co., Ltd.
Mr. Shoriful Alam Mondal	Operation and Maintenance Planning	Yachiyo Engineering Co., Ltd.
Ms. Yume Mori	Collection & Transportation Planning 2/ GHGs Reduction	Yachiyo Engineering Co., Ltd.
Mr. Akinori Seino	Procurement Planning/ Cost Estimation	Yachiyo Engineering Co., Ltd.

2. Study Schedule

Study Schedule

First Survey

Date			Official		Consultant					
			Leader JICA	Planning Management JICA	Chief Consultant/ Collection & Transportation Planning 1	Waste Equipment Planning	Operation and Maintenance Planning	Collection & Transportation Planning 2/ GHGs Reduction	Procurement Planning/ Cost Estimation	
			Mr. Kouichi Kito	Mr. Kazuya Yao	Mr. Takatoshi Arai	Mr. Akio Ishii	Mr. Shoriful Alam Mondal	Ms. Yume Mori	Mr. Akinori Seino	
1	6-Aug-14	Wed			Departure from Narita Arrive in Dhaka				Departure from Narita Arrive in Dhaka	
2	7-Aug-14	Thu			Meeting at JICA Bangladesh Office Meeting at DNCC Meeting at DSCC			Meeting at JICA Bangladesh Office Meeting at DNCC Meeting at DSCC		
3	8-Aug-14	Fri			Site Survey at LFS			Site Survey at LFS		
4	9-Aug-14	Sat								
5	10-Aug-14	Sun			Meeting at DNCC			Meeting at DNCC		
6	11-Aug-14	Mon			Site Survey at DNCC Workshop Site Survey at DSCC Workshop			Site Survey at DNCC Workshop Site Survey at DSCC Workshop		
7	12-Aug-14	Tue			Meeting at NAVANA Office Meeting at DSCC Meeting with JOCVs in Dhaka	Departure from Khartoum		Meeting at NAVANA Office Meeting at DSCC Meeting with JOCVs in Dhaka		
8	13-Aug-14	Wed			Meeting with JICA SV	Arrive in Dhaka Meeting with JICA SV		Meeting at State of Bureau	Meeting with JICA SV	
9	14-Aug-14	Thu						Meeting at JICA Bangladesh Office		
10	15-Aug-14	Fri								
11	16-Aug-14	Sat						Departure from Dhaka Arrive in Chittagong		
12	17-Aug-14	Sun						Meeting at CCC Site Survey for CCC Workshop		
13	18-Aug-14	Mon						Meeting at CCC		
14	19-Aug-14	Tue			Meeting at CCC Site survey for NAVANA and a private mechanical workshop	Meeting at CCC Site Survey (Collection points, transfer station, Composting Plant, LFS)	Meeting at CCC Site survey for NAVANA and a private mechanical workshop	Meeting at CCC Site Survey (Collection points, transfer station, Composting Plant, LFS)	Meeting at CCC Site survey for NAVANA and a private mechanical workshop	
15	20-Aug-14	Wed			Meeting with CDA Supplementary survey	Supplementary survey	Supplementary survey	Meeting with CDA Supplementary survey	Supplementary survey	
16	21-Aug-14	Thu						Meeting at CCC		
17	22-Aug-14	Fri						Departure from Chittagong Arrive in Dhaka		
18	23-Aug-14	Sat								
19	24-Aug-14	Sun						Preparation of Progress Report Meeting at JICA Bangladesh Office		
20	25-Aug-14	Mon			Meeting at Uttara Motors			Preparation of Progress Report		Meeting at Uttara Motors
21	26-Aug-14	Tue						Preparation of Progress Report		
22	27-Aug-14	Wed						Meeting at LGD Meeting at DNCC		Preparation of Progress Report
23	28-Aug-14	Thu			Meeting at LGD			Preparation of Progress Report	Meeting at LGD	Preparation of Progress Report
24	29-Aug-14	Fri								
25	30-Aug-14	Sat			Departure from Narita Arrive in Dhaka					
26	31-Aug-14	Sun			Meeting at JICA Bangladesh Office Departure from Dhaka Arrive in Chittagong			Departure from Dhaka Arrive in Chittagong Preparation of Progress Report		
27	1-Sep-14	Mon			Meeting at CCC Site Survey for CCC's situation Departure from Chittagong Arrive in Dhaka			Meeting at CCC Site Survey for CCC's situation Departure from Chittagong Arrive in Dhaka Preparation of Progress Report		
28	2-Sep-14	Tue			Meeting at LGD Meeting at DNCC, DSCCC			Preparation of Progress Report	Meeting at LGD Meeting at DSCC	Preparation of Progress Report
29	3-Sep-14	Wed			Meeting at DNCC Meeting at DNCC, DSCCC			Preparation of Progress Report		Meeting at DNCC Preparation of Progress Report
30	4-Sep-14	Thu			Signing of MM Meeting at JICA Bangladesh Office			Meeting at JICA Bangladesh Office		
31	5-Sep-14	Fri			Departure from Dhaka					
32	6-Sep-14	Sat			Arrive in Narita					
33	7-Sep-14	Sun						Preparation of Progress Report		
34	8-Sep-14	Mon						Wrap Up Meeting at LGD		
35	9-Sep-14	Tue						Meeting at JICA Bangladesh Office Departure from Dhaka		
36	10-Sep-14	Wed						Arrival at Narita		

Second Survey

Date			Official				Consultant	
			Leader JICA	Waste Management JICA	Cooperation Planning JICA	Grant Aid Planning JICA	Chief Consultant/ Collection & Transportation Planning 1	Procurement Planning/ Cost Estimation
			Mr. Noriaki Murase	Ms. Yoko Onuma	Mr. Norihito Kaigai	Mr. Masayuki Hayashi	Mr. Takatoshi Arai	Mr. Akinori Seino
1	1-Dec-14	Mon	Departure from Narita Arrive in Dhaka					
2	2-Dec-14	Tue	Meeting with JICA Office Meeting with DSCC Meeting with LGD, DNCC, DSCC					
3	3-Dec-14	Wed	Meeting with ERD Meeting with DNCC Meeting with EOJ Departure from Dhaka Arrive in Chittagong				Departure from Narita Arrive in Dhaka	
4	4-Dec-14	Thu	Meeting with CCC Site visit to workshop and final disposal site				Meeting with LGD, DSCC and DNCC	
5	5-Dec-14	Fri	Internal Meeting Departure from Chittagong Arrive in Dhaka				Additional survey	
6	6-Dec-14	Sat	Internal Meeting				Departure from Narita Arrive in Dhaka	Internal Meeting Departure from Dhaka Arrive in Chittagong
7	7-Dec-14	Sun	Internal Meeting Meeting with DNCC and DSCC Meeting with LGD					Meeting with CCC Additional survey Departure from Chittagong Arrive in Dhaka
8	8-Dec-14	Mon	Site visit to workshop and final disposal site				Preparation of Final Report	
9	9-Dec-14	Tue	Site visit to workshop and final disposal site Meeting with JICA office					
10	10-Dec-14	Wed	Signing meeting of MM and MD Departure from Dhaka	Signing meeting of MM and MD				Additional survey
11	11-Dec-14	Thu	To China	Departure from Dhaka				
12	12-Dec-14	Fri		Arrival at Haneda				Arrival at Narita

3. List of Parties Concerned in the Recipient Country

List of Parties Concerned in Bangladesh

<u>Agency and Name</u>	<u>Title</u>
Economic Relations Division (ERD)	
Mr. Monoranjan Biswas	Deputy Secretary
Ministry of Local Government, Rural Development and Cooperatives (MLGRD&C)	
Local Government Division	
Mr. Ashok Madhab Roy	Additional Secretary
Mr. Akhter Hossain	Joint Secretary
Mr. Saroj Kumar Nath	Senior Assistant Secretary
Dhaka North City Corporation (DNCC)	
Mr. B M Enamul Haque	Chief Executive Officer (Junior Secretary)
Mr. Md. Faruque Jalil	Administrator
Captain Bipan Kumar Saha, PSC, BN	Chief Waste Management Officer
Mr. Mesbahul Karim	Superintendent Engineer
Abul Hasnat Md. Asraful Alam	Executive Engineer (Mechanic)
SM. Shofiqur Rahman	Executive Engineer (Landfill)
Mr. Md. Ekramul Hoque Khondoker	Assistant Engineer
Mr. Maksud Alam	Assistant Engineer
Amzad Hossain	Assistant Engineer
Dhaka South City Corporation (DSCC)	
Mr. Ibraheem Hosein Khan	Administrator
Captain Raquib Uddin (TAS),psc,BN	Chief Waste Management Officer
Mr. Abu Saleh Mohammad Mainuddin	Superintendent Engineer
Mr. Mahaboob Alam	Assistant Engineer
AHM Abdullah Harun	Assistant Engineer
Chittagong City Corporation (CCC)	
Mr. Mohammad Manjur Alam	Mayor
Mr. Ali Ahmed	Chief Executive Officer (Joint Secretary)
Mr. Nurul Khassain	Assistant Chief Management
Mr. Mohammad Shaifuddin	Chief Accounts Officer
Arch. A. K. Rezaul Karim	City Planner & Head
Mr.S.M.Shofiqul Mannan Siddique	Chief Conservancy Officer
Mr. Md. Monjurul Hoque Talukder	Assistant Engineer
JICA Bangladesh Office	
Mr. Mikio Hataeda	Resident Representative
Mr. Kei Toyama	Senior Representative
Mr. Tsuyoshi Kano	Representative
Mr. Mizukami Takahiro	Assistant Representative
Mr. Zaki Md. Ziaul Islam	Associate Program Manager

4. Minutes of Discussions

(4th September,2014)

(10th December,2014)

MINUTES OF DISCUSSIONS
FOR
THE PREPARATORY SURVEY ON THE PROJECT FOR
PROVISION OF SOLID WASTE MANAGEMENT EQUIPMENT
IN THE PEOPLE'S REPUBLIC OF BANGLADESH

In response to the request from the Government of Bangladesh, 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 Bangladesh (hereinafter referred to as "the Project") and entrusted the study to Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Bangladesh the Preparatory Survey Team (hereinafter referred to as "the Team"), which is headed by Mr. Koichi KITO, Deputy Director General, JICA, and is scheduled to stay in the country from 1st to 4th September, 2014.


The Team held a series of discussions with the concerned officials of Bangladesh 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.

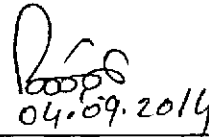
Dhaka, 4th September, 2014

木 藤 耕 一

Mr. Koichi Kito
Leader
Preparatory Survey Team
Japan International Cooperation Agency



Mr. Monoranjan Biswas
Deputy Secretary
Economic Relations Division
Ministry of Finance



04.09.2014

Mr. Ashok Madhab Roy
Additional Secretary
Local Government Division
Ministry of Local Government, Rural
Development and Cooperatives

ATTACHMENT

1. Objective of the Project

The objective of the Project is that solid waste management (SWM) services are operated in a sustainable manner to improve the sanitary condition in Dhaka and Chittagong City.

2. Project Site

The Project sites are North Dhaka, South Dhaka and Chittagong City tentatively. The map of Dhaka North, South and Chittagong City Corporation is shown in Annex-1. Specific areas of the Project will be identified through the Survey.

3. Responsible and Implementing Organizations

The responsible organization is the Local Government Division of the Ministry of Local Government, Rural Development and Cooperatives (hereinafter referred to as "LGD"). Implementing Organizations are LGD and the Dhaka North City Corporation (DNCC), Dhaka South City Corporation, Chittagong City Corporation (hereinafter referred to as "the Agencies").

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

The Agencies are responsible not only for supports for the Team in conducting the Survey but also the implementation of the Project. The Agencies are also responsible to acquire necessary budget and coordinate with the relating offices for the operation and maintenance of the equipment provided under the Project. Organization chart of LGD is shown in Annex-2.

4. Items Requested by the Government of Bangladesh

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

5. Japan's Grant Aid Scheme

- (1) The Bangladesh side understood the Japan's Grant Aid Schemes explained by the Team, as described from Annex-4 to 6.
- (2) The Team explained to the Bangladesh side that Grant Aid for Environment and Climate Change (hereinafter referred to as "GAEC") will be applied for the Project based on the result of the Survey.
- (3) The Bangladesh 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 Bangladesh side if any other undertakings arise based on the result of the Survey.

6. Objective of the Survey

The Team explained to the Bangladesh side that the objective of the Survey is to collect necessary information to confirm the appropriateness of the Project but the implementation of the Survey does not mean the commitment of the Project by the Government of Japan.

7. Schedule of the Survey

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- (1) The consultant members of the Team will continue the 1st Survey in Bangladesh until the middle of September, 2014.
- (2) The schedule of the Survey will be as follows. However, it is subject to change based on the progress of the Survey.
December 2014: Explanation of the draft Preparatory Survey Report
February 2015: Submission of the final report

8. Other Relevant Issues

(1) Inception Report

The contents of Inception Report was understood and accepted in principle by the Bangladesh side.

(2) Arrangements for the Survey

In response to a request from the Team, the Bangladesh side agreed to assign necessary number of counterpart personnel (Project Director: Deputy Secretary or above of LGD, Deputy Project Director: Deputy Secretary or Senior Assistant Secretary of LGD, Project Managers: Executive Engineer or above of 3 City Corporations) for the Survey and provide all the data and information relevant to the Project for the smooth implementation of the Survey. The Bangladesh side (i.e. LGD) also agreed to provide an appropriate office space for the Team.

(3) Responsibility of each organization concerned with the Project

LGD and the Agencies will collaborate with the relevant organizations to support the implementation of the Survey.

(4) Environmental and social considerations

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

(5) Priority of the Project components

The Bangladesh side agreed that the Scope of the Project might be changed based on the financial reasons, and thus, the Project components will be identified in priority order. Both sides confirmed that waste collection equipment and soft component would be the Project components.

(6) Budget allocation for the Project by the Bangladesh side

The budget necessary for the Project including operation and maintenance cost will be assessed in the Survey. The Bangladesh side assures that appropriate budget will be put in place, and the Agencies are responsible for the operation and maintenance of the equipment provided under the Project. Commission for Banking Arrangement would be reflected in Development Project Proposal in Bangladesh.

(7) Undertakings of the Bangladesh side

Although general undertakings of both sides for Japan's Grant Aid are shown in Annex-6, the Team emphasized the responsibilities of the Bangladesh side to execute following matters and the Bangladesh side agreed to it.

1) Appointment of mechanics for proper maintenance

Both DNCC and DSCC appoint 1 head mechanic and 6 assistant mechanics as agreed in

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July 2014. If the advertisement would not be completed by the end of September 2014, the explanation of Draft Final Report would be postponed from December 2014. The Survey could be discontinued if the commitment would not be fulfilled within the certain period of time.

2) Budget for Tax

Import tax, customs duties, internal taxes and other fiscal levies with respect to the purchase of the products and the services will be borne by Bangladesh side. The Bangladesh side will also take necessary measures for the budget for tax, if any.

3) Securing necessary space

The Bangladesh side will secure the necessary space for the implementation of the Project. These spaces include the the parking lots (Saidabad Garage in DSCC, Mirpur Garage in DNCC and Chittagong City Corporation Workshop in CCC) for the procured vehicles and equipment.

4) Necessary measures for operation and maintenance of the equipment

The Bangladesh side will allocate the necessary budget and properly operate and maintain the equipment provided by the Project.

5) Shared use of the workshop provided by previous Grant Aid Programme

JICA requested Bangladesh side to restart using the workshop and its equipment provided by JICA together soon after the recruitment of mechanics.

(8) Avoidance of Duplication with Other Projects

Both sides agreed that any component of the Project would not be duplicated with any other project supported by other donor agencies, NGOs, and the Government of Bangladesh.

(9) Confidentiality of the Survey Reports

The Team explained to the Bangladesh side that both the draft and the final reports of the Survey should be dealt with confidentially until the actual implementation of the Project, namely, until the final stage of the tender to ensure the fairness of the procedure. The Bangladesh side agreed to it.

(10) Careful assessment of vehicle type selection

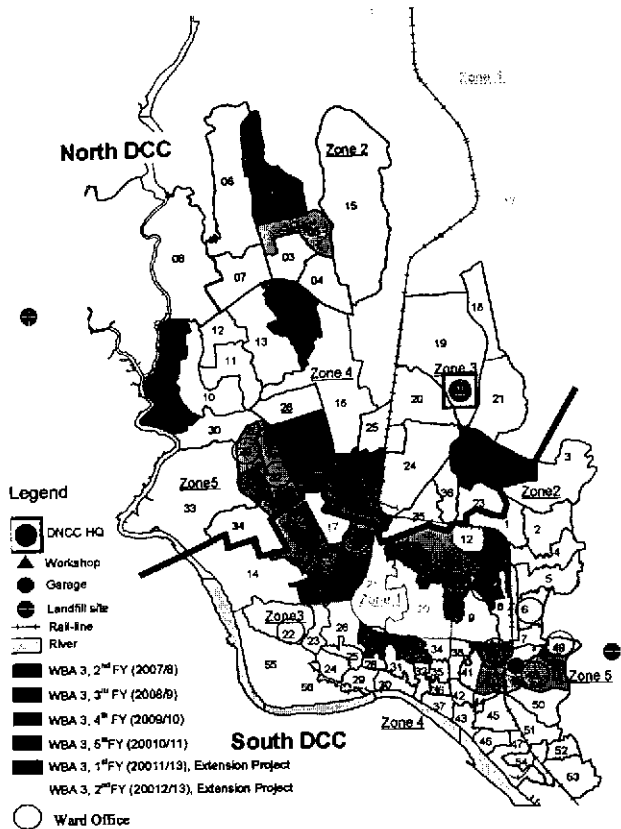
The Bangladesh side requested compactors as a part of Project components, however Japanese side is concerned about the maintenance of these vehicles. The Bangladesh side guaranteed the maintenance of compactors with securing necessary budget for spare parts. The Japanese side will assess the survey report for vehicle selection.

ANNEXES

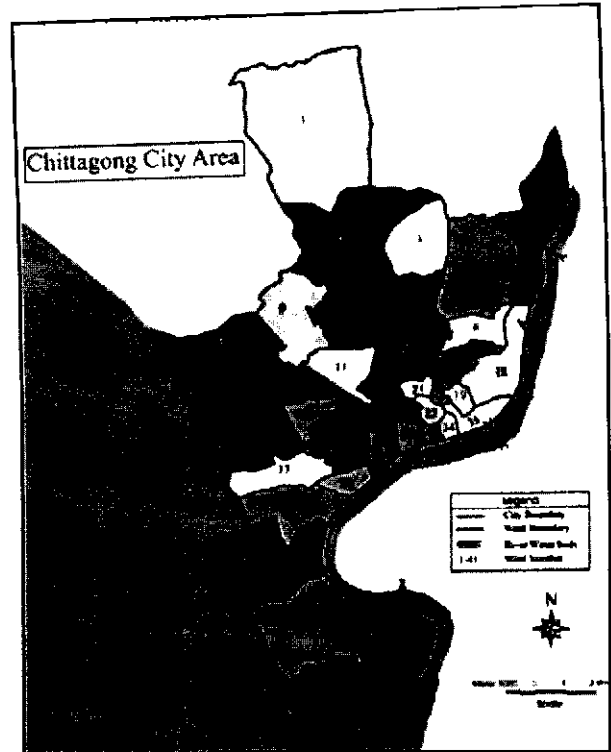
Annex-1	Map of Dhaka North, South and Chittagong City Corporation
Annex-2	Organization Chart of LGD
Annex-3	Requested Components of the Project
Annex-4 and 5	Japan's Grant Aid Scheme for General Projects
Annex-6	Major Undertakings by Each Government for General Projects

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Map of North and South Dhaka City Corporation



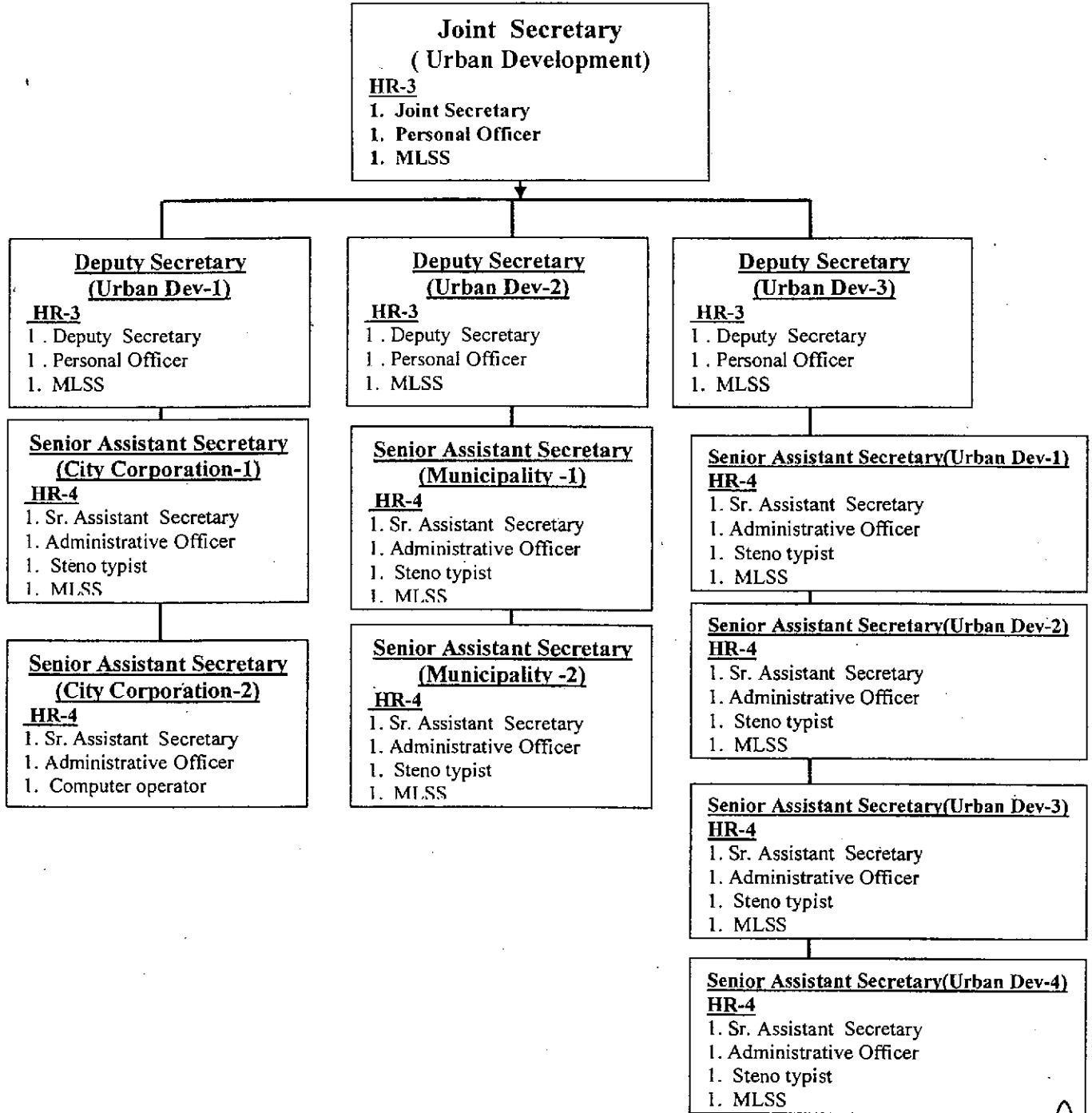
Map of Chittagong City Corporation

Source : North Dhaka City Corporation (Left), A.K. Majumder, Md. E.Hossain, Md. N. Islam (2007): Urban Environmental Quality Mapping: A Perception Study on Chittagong Metropolitan City, Kathmandu University Journal of Science, Engineering and Technology, Vol. 1, No. IV (Right)

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Government of the People's Republic of Bangladesh
 Ministry of Local Government, Rural Development & Cooperatives
 Local Government Division

Urban Development Wing



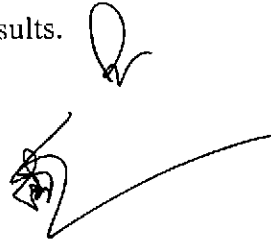
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Requested Components of the Project

- Compactor
- Container carrier and container
- Dump truck
- Soft component

These items are subject to change based on the Survey results.

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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.

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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 signed 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

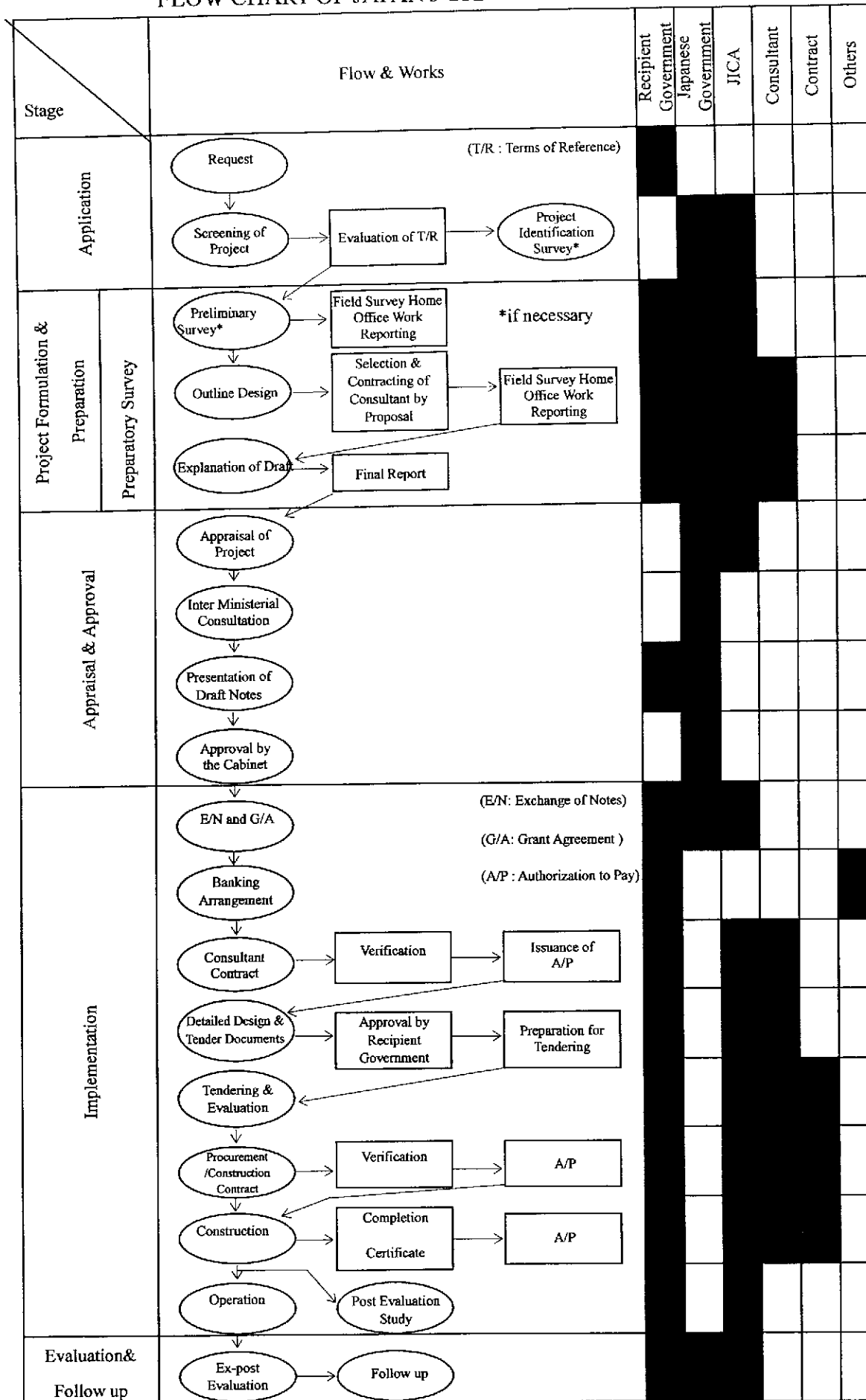
A recipient country must carefully consider social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and JICA socio-environmental guidelines.

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FLOW CHART OF JAPAN'S GRANT AID PROCEDURES



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Annex 6					
Major Undertakings to be taken by Each Government					
No.	Items			To be covered by Grant Aid	To be covered by Recipient Side
1	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 product				
	1)	Marine (Air) transportation of the Products from Japan to the recipient country		●	
	2)	Internal transportation from the port of disembarkation to the project site		(●)	(●)
2	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 borne by the Authority without using the Grant				●
3	To accord Japanese physical persons and / or physical persons of third countries 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				●
4	To ensure that the products be maintained and used properly and effectively for the implementation of the Project				●
5	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project				●
6	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			●
7	To give due environmental and social consideration in the implementation of the Project.				●
(B/A : Banking Arrangement, A/P : Authorization to pay)					

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MINUTES OF DISCUSSIONS
FOR
THE PREPARATORY SURVEY ON THE PROJECT FOR
PROVISION OF SOLID WASTE MANAGEMENT EQUIPMENT
IN THE PEOPLE'S REPUBLIC OF BANGLADESH
(EXPLANATION OF DRAFT REPORT)

From 1st to 4th September, 2014, Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a preparatory survey team on the Project for Provision of Solid Waste Management Equipment (hereinafter referred to as "the Project") to the People's Republic of Bangladesh (hereinafter referred to as "Bangladesh"), 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 Bangladesh (hereinafter referred to as "the GOB"), JICA sent the Draft Report Explanation Team (hereinafter referred to as "the Team") to Bangladesh, which is headed by Mr. Noriaki Murase, Leader Draft Report Explanation Team, JICA, from 1st to 12th December, 2014.

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

Dhaka, 10th December, 2014



Mr. Noriaki Murase
Leader
Draft Report Explanation Team
Japan International Cooperation Agency
Japan



Mr. Monoranjan Biswas
Deputy Secretary
Economic Relation Division
Ministry of Finance



Mr. Ashok Madhab Roy
Additional Secretary
Local Government Division
Ministry of Local Government, Rural
Development and Cooperatives

ATTACHMENT

1. Contents of the Draft Report

The Bangladesh side agreed and accepted in principle the contents of the Draft Report prepared by the Team after series of discussions. The outline of the Draft Report is attached in Annex 1

2. Responsible and Implementing Organizations

The responsible organization is the Local Government Division of the Ministry of Local Government, Rural Development and Cooperatives (hereinafter referred to as "LGD"). Implementing Organization are the Dhaka North City Corporation (hereinafter referred to as "DNCC"), Dhaka South City Corporation (hereinafter referred to as "DSCC"), and Chittagong City Corporation (hereinafter referred to as "CCC").

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

DNCC, DSCC and CCC (hereinafter referred to as "the Agencies") are responsible for not only support for the Team in conducting the survey but also the implementation of the Project. The Agencies are also responsible to acquire necessary budget and coordinate with the relating offices for the operation and maintenance of the equipment provided under the Project.

LGD and the Agencies will collaborate with the relevant organizations to support the implementation of the Project.

3. Confidentiality of the Project

(1) Detailed Specifications

The Team explained to the Bangladesh side that both the draft and the final reports of the Preparatory Survey should be dealt with confidentially until the actual implementation of the Project, namely, until the final stage of the tender to ensure the fairness of the procedure. Both sides agreed to it.

(2) Project Cost Estimate

The Team explained to the Bangladesh side the estimated project cost to be borne by the Government of Japan (hereinafter referred to as "the GOJ") and the GOB in Annex 2. 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 Bangladesh 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.

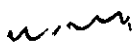
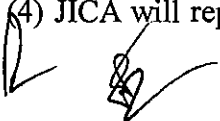
4. Japan's Grant Aid Scheme

(1) The Bangladesh side understood the Japan's Grant Aid Schemes explained by the Team, as described from Annex 3 to 5.

(2) The Team explained to the Bangladesh side that this Project would be implemented under the Grant Aid for Environment for Climate Change (hereinafter referred to as "GAEC").

(3) The Bangladesh side will take necessary measures, as described in Annex 5 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 Bangladesh side if any other unforeseen issues arise based on the



result of the Preparatory Survey.

5. Other Relevant Issues

(1) Budget allocation for the Project by the Bangladesh side

The Bangladesh side assures that the estimated cost of the procurement of waste containers for container carriers and bank commissions to be borne by the GOB is approximately 38 million yen (approximately 26.8 million Tk) as described in Chapter 5, Annex 1. The Agencies are responsible for the operation and maintenance of the equipment provided under the Project in Chapter 5, Annex 1. Commission for Banking Arrangement will be reflected in Development Project Proposal in Bangladesh.

(2) Undertakings of the Bangladesh Side

The Team emphasized the responsibilities of the Bangladesh side to execute the following matters and the Bangladesh side agreed to it.

Main undertakings by the Bangladesh side are as follows.

1) Appointment of mechanics for proper maintenance

The Team confirmed that the DNCC's recruitment and selection process of 1 head mechanic and 6 mechanics has not been completed yet in accordance with the Minutes of Meeting of July 1st, 2014 although the DSCC's recruitment and selection process has already been done. In response to the repeated requests from JICA, DNCC explained that it would hold the practical examination to the candidates on 21 and 22 December and complete the recruitment and selection process by the 2nd week of January, 2015.

2) Budget for Tax

Import tax, customs duties, internal taxes and other fiscal levies with respect to the purchase of the products and the services will be borne by the Bangladesh side. The Bangladesh side will also take necessary measures for the budget for tax, if any.

3) Securing necessary space

The Bangladesh side will secure the necessary space for the implementation of the Project. These spaces include the parking lots (Saidabad Garage in DSCC, Mirpur Garage in DNCC and Chittagong City Corporation Workshop in CCC) for the procured vehicles and equipment. Both DNCC and DSCC will provide the relevant maps.

4) Necessary measures for operation and maintenance of the equipment

The Bangladesh side will allocate necessary budget and properly operate and maintain the equipment provided by the Project.

5) Shared use of the workshop provided by previous Grant Aid Programme

The Bangladesh side explained that the workshop and its equipment provided under previous Grant Aid Programme are shared limitedly between DNCC and DSCC because of the difficulty on the financial management including the lack of sufficient number of mechanics. The Bangladesh side also explained that the workshop currently managed by DNCC would be utilized for the maintenance of the Grant Aid vehicles by both DNCC and DSCC till such time DSCC builds its own workshop. Based on the explanation, JICA requested the Bangladesh side to complete to recruit the relevant mechanics and effectively utilize the workshop and its equipment provided under previous Grant Aid Programme. Both sides confirmed that DSCC would use the workshop by the middle of January, 2015 on the completion of training for the newly recruited mechanics.



6) Recruitment of drivers for the Project

The Team requested to the Bangladesh side to recruit the drivers only who have heavy driving license to ensure proper operation of the vehicles to be provided by the Project and the Bangladesh side agreed to it.

(3) Strengthening Operation and Maintenance

According to the results of the Preparatory Survey, the Team requested the Bangladesh 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 equipment, even after the Project completion.

The Team also requested that the necessary actions for recruitment of staffs and operators of the vehicles and securing workshops for maintenance of the vehicles in the Agencies respectively be taken in time, so that proper staff members are trained at proper places.

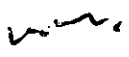
(4) Technical Assistance

The Team explained that the contents of the technical assistance as "Soft Component" would focus on the subjects as described in Annex 1, and the Bangladesh side agreed to it.

ANNEXES

Annex 1 Draft Preparatory Survey (Draft Report)
Annex 2 Project Cost Estimate
Annex 3 to 5 Japan's Grant Aid Scheme

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JAPAN'S GRANT AID

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 :

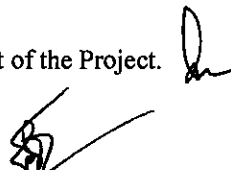
- Preparatory Survey
 - The Survey conducted by JICA
- Appraisal & Approval
 - Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- Authority for Determining Implementation
 - The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as "the 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 a 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 signed 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)

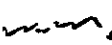
The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.



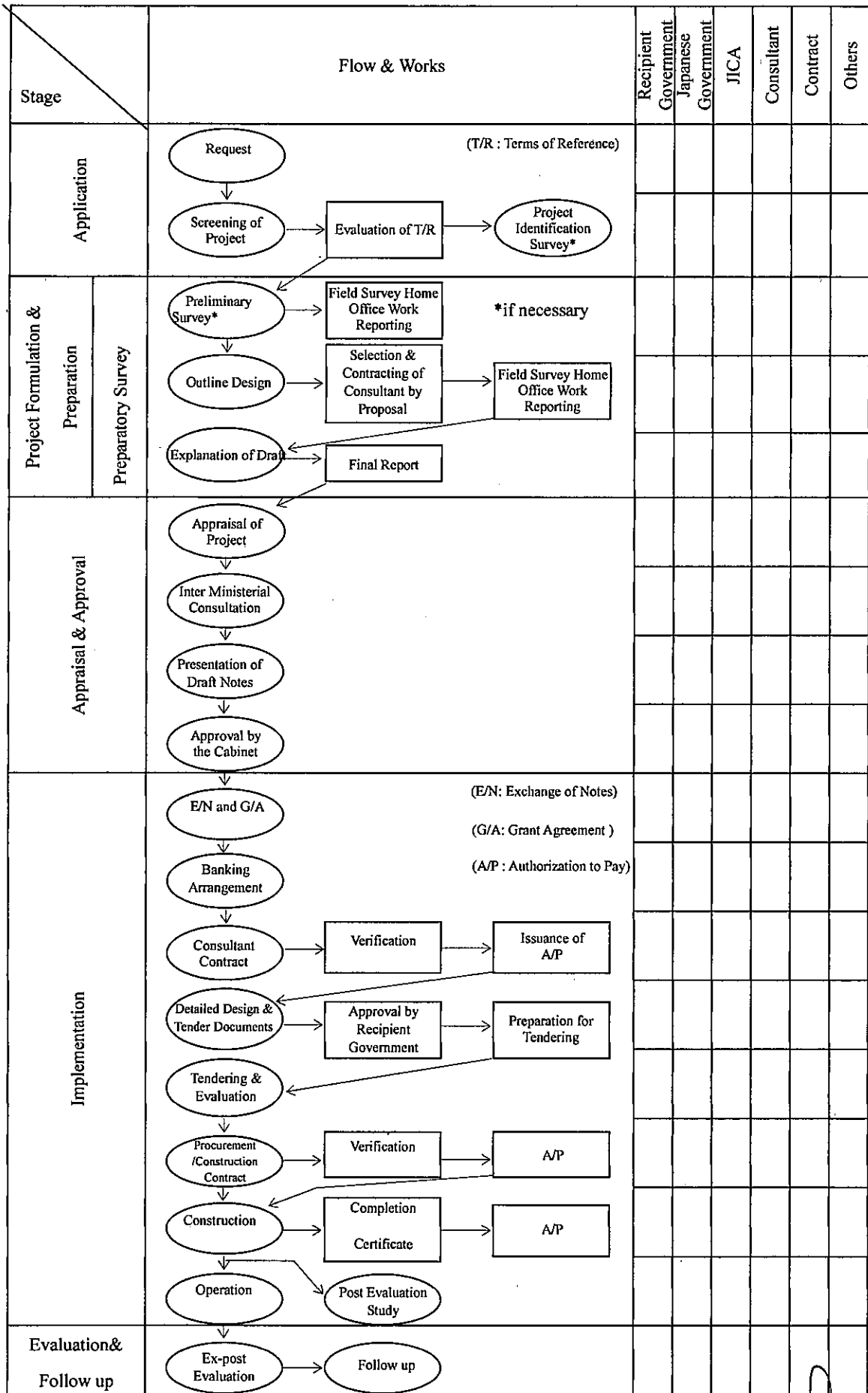
(10) Social and Environmental Considerations

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.

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FLOW CHART OF JAPAN'S GRANT AID PROCEDURES



Major Undertakings to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	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) Internal transportation from the port of disembarkation to the project site	●	
2	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 borne by the Authority without using the Grant]		●
3	To accord Japanese physical persons and / or physical persons of third countries 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		●
4	To ensure that the products be maintained and used properly and effectively for the implementation of the Project		●
5	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project		●
6	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		●
7	To give due environmental and social consideration in the implementation of the Project.		●

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

5. Soft Component (Technical Assistance) Plan

**THE PROJECT FOR IMPROVEMENT OF SOLID WASTE
MANAGEMENT EQUIPMENT IN THE PEOPLE'S
REPUBLIC OF BANGLADESH**

Soft Component Plan

FEBRAURY 2015

YACHIYO ENGINEERING CO., LTD.

1. Background for Planning the Soft Component

In “the Project for Improvement of Solid Waste Management Equipment in the People’s Republic of Bangladesh,” equipment for solid waste collection and transport shall be procured for the aim of improving the solid waste collection and transport capacity of Dhaka North City, Dhaka South City and Chittagong City where rapid population and economic growth has been observed. Dump trucks, container carriers and compactors shall be procured in the Project.

JICA implemented “Solid Waste Management Study in Dhaka City” (a development study) from 2003, “The Project for Strengthening of Solid Waste Management in Dhaka City” (a technical cooperation project, hereinafter referred to as “the TCP”) from 2007 and “the Programme for Improvement of Solid Waste Management in Dhaka City toward the Low Carbon Society” (an environmental grant aid project, hereinafter referred to as “the EGAP”) as assistance in solid waste management to Dhaka North City Corporation and Dhaka South City Corporation (hereinafter referred to as “DNCC” and “DSCC,” respectively). At present, DNCC and DSCC are collecting solid waste using approx. 140 and 200 waste collection vehicles, respectively. Approximately 65% of the solid waste generated in the two cities is being collected. The remaining approx. 35% of the waste remains uncollected and is disposed of illegally and the illegally disposed waste is causing the living environment to deteriorate. More than half of the waste collection vehicles currently owned by DNCC and DSCC are deteriorated ones manufactured before 2000. As these aged vehicles are expected to become non-operational in a few years, the waste collection and transport capacity of the two cities is likely to decline significantly in the near future. Meanwhile, Chittagong City Corporation (CCC) currently owns approx. 80 waste collection vehicles. The waste collection capacity of CCC shall also have to be improved as only approx. 75% of the solid waste generated in the city is collected and transported.

Waste collection vehicles are to be procured in this Project. “1) Smooth introduction of waste collection vehicles” and “2) sustainable maintenance of the introduced vehicles” are indispensable for an increase in waste collection. Since waste collection with compactors, in particular, requires understanding and cooperation of the primary waste collectors and residents, the increase in the waste collection cannot be achieved only with the procurement of the equipment. While compactors have been provided to DNCC and DSCC in the EGAP, CCC shall have the first opportunity to use compactors in this Project.

In the EGAP, the Soft Component on the maintenance of waste collection vehicles including not only compactors but also other types of waste collection vehicles was implemented in Dhaka North and South Cities. The subjects of the Soft Component included the inspection and maintenance by drivers before and after the daily operation, regular maintenance at the workshops and establishment of an in-house training system. As a consequence, washing of vehicles and inspection of the vehicles every three months have been practiced at the workshops. However, the knowledge and motivation of the drivers and mechanics on the vehicle maintenance shall have to be improved further. Although results of the regular inspection and the maintenance/repair work conducted at the time of breakdown are entered in the register, spare parts for repair are not procured in an orderly and systematic manner. Instead, they are ordered after their stocks have run out. Such a system may make the time required for repair long and, thus, reduce the operation rates of vehicles. In addition, a system for the labor management, including the management of the work shifts of mechanics, etc., has not been fully developed and the awareness to the occupational safety and health in the maintenance work is low. Meanwhile, CCC was not included in the EGAP. Therefore, the Japanese side has not provided guidance on the vehicle maintenance to CCC. At present, the workshop of CCC does not conduct regular inspection. It is still operated with an unsystematic way of repairing vehicles when they have broken down.

The Soft Components to be implemented against the background mentioned above shall consist of the activities for the two major purposes mentioned below:

- Assistance Activity-1: Assistance to facilitate the introduction of compactors and guidance on their safe operation
- Assistance Activity-2: Assistance to the establishment of a sustainable maintenance (management) system

2. Objective of the Soft Component

The project purpose is to strengthen the capacity to collect and transport waste of DNCC, DSCC and CCC. The objective of the Soft Component, a component of the Project, is to increase the waste collection capacity as planned by facilitating the use of the equipment to be procured by this Project and assisting the establishment of a system for their appropriate operation and maintenance.

3. Expected Outcomes of the Soft Component

The implementation of the Soft Components is expected to improve the capacity to use and maintain the

equipment to be procured and increase the amount of waste collection. The specific outcomes expected from the Soft Component are as follows:

3.1 Assistance Activity-1: Assistance to facilitate the introduction of compactors and guidance on their safe operation

- 1) Staff members of the three CCs concerned become able to prepare plans for the allocation of compactors including collection time and collection points based on the characteristics of the service area.
- 2) Drivers of the waste collection vehicles and waste collectors become able to collect waste safely and hygienically after receiving safety education and guidance on loading waste on the compactors.

3.2 Assistance Activity-2: Assistance to the establishment of a sustainable maintenance system

- 1) The management systems at the maintenance workshops are strengthened.
- 2) The skill of the mechanics in automobile maintenance is improved and vehicles are maintained appropriately.

4. Methods to Verify the Achievement of the Outcomes

Table 4-1 and Table 4-2 show the criteria for the verification of the achievement of the outcomes in Assistance Activities-1 and -2, respectively.

Table 4-1 Verification Criteria for Outcome Achievement of Assistance Activity-1

Outcome	Criterion	Description of criterion
Staff members of the three CCs concerned become able to prepare plans for the allocation of compactors with the difference in the characteristics of areas within the service areas taken into consideration and operate the vehicles in accordance with the plans.	Preparation of plans for the allocation of vehicles	Plans for the allocation of compactors have been prepared. Reference materials to explain the use of compactors to the residents and primary waste collectors have been prepared. (to be confirmed by the materials)
	Introduction of the vehicles	Discussions with the residents and primary waste collectors have been held. Waste collection with compactors is expanding in accordance with the plans for the allocation. (to be confirmed by interview with staff)
Drivers of the waste collection vehicles and waste collectors become able to collect waste safely and hygienically after receiving safety education and guidance on loading waste on the compactors.	Safety education	The trainees become able to understand the safety and operation manuals for collection work by the compactor correctly. (to be confirmed by observation)
	Guidance on loading waste on compactors	

Table 4-2 Verification Criteria for Outcome Achievement of Assistance Activity-2

Outcome	Criterion	Description of criterion (to be confirmed by the materials)
The management systems at the maintenance workshops are strengthened.	Establishment of working conditions	A manual for the staff members on the working conditions has been prepared.
	Strengthening of the inventory management of consumables and spare parts	A manual on the management of spare parts for repair works has been prepared.
	Establishment of systems for safety control and training	Systems for safety control and training have been established.
The skill of the mechanics in automobile maintenance is improved and vehicles are maintained appropriately.	Improvement of the skill of the mechanics	The forms for the records of daily and regular inspection have been prepared and records are being entered in the forms.

5. Activities in the Soft Component (Input Plan)

5.1 Assistance Activity-1

(1) Description of the Soft Component

The Soft Component assistance shall be provided for (1) the preparation and implementation of compactor allocation plans and (2) the provision of safety education and guidance on waste loading to the waste collectors in Assistance Activity-1. In the Technical Cooperation Project, assistance was provided for the introduction of the

compactors procured in the EGAP project in accordance with the workflow shown in Figure 5-1.

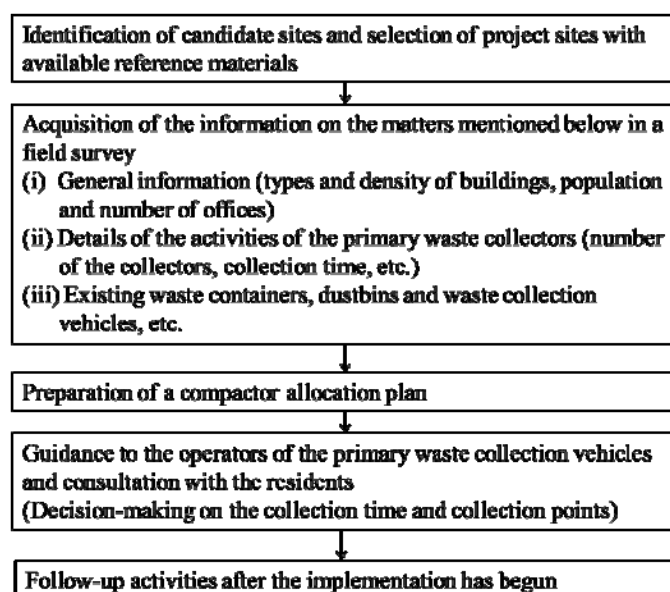


Figure 5-1 Preparation and Implementation of Compactor Allocation Plan

The same approach as the one mentioned above shall be used in this Soft Component. The numbers of the compactors for which allocation plans are to be prepared in this Soft Component shall be three for DNCC and DSCC combined (3 compactors x 2 trips = 6 areas) and three for CCC (3 compactors x 2 trips = 6 areas). For the rest of the compactors, DNCC, DSCC and CCC shall prepare allocation plans by themselves using the experience in the preparation of the plans with the Consultant. As compactors were already procured for DNCC and DSCC in the Technical Cooperation Project, most of the time of this Soft Component shall be spent on the activities in CCC.

A “Leaflet for the Explanation of Collection Time and Collection Points” and a “Leaflet for the Safety Instruction” shall be prepared by revising and updating the reference materials prepared in the Technical Cooperation Project.

Table 5-1 Detailed Activity Plan for Assistance Activity-1

No.	Classification	Description of activity	Required input
1.	DNCC and DSCC		
(1)	Plans for allocation of and introduction of waste collection vehicles (approx. 3 vehicles)		
	Assistance in the preparation for the introduction	Selection of candidate areas	2 days
		Field surveys of the candidate areas (six areas)	6 days
		Preparation of the plans for allocation of vehicles	3 days
		Preparation of a leaflet explaining collection times and points (revision of the one prepared in the TCP)	2 days
	Assistance in the introduction of vehicles	Guidance to the primary waste collector, discussion and coordination on collection times and points with the residents	6 days
		Follow-up activities after the introduction	5 days
(2)	Safety education/guidance on waste loading		
	Preparation of an explanatory leaflet	Preparation of leaflets for safety guidance (prepared from the one created in the TCP)	2 days
	Safety education and guidance on operation to the drivers and waste collectors	Safety guidance to the drivers, guidance on the waste loading to the waste collectors	2 days
2.	CCC		
(1)	Plan for allocation of and introduction of waste collection vehicles (approx. 3 vehicles)		
	Assistance in the preparation for the	Lecture on the preparation of a vehicle allocation plan	2 days

	introduction	Selection of candidate areas	4 days
		Field surveys of the candidate areas (six areas and two reserve sites)	16 days
		Preparation of the plan for allocation of vehicles	6 days
		Preparation of an explanatory leaflet (to be prepared using the one created for DNCC and DSCC)	2 days
	Assistance in the introduction of vehicles (total of 28 days)	Guidance to the primary waste collector, discussion and coordination on collection times and points	18 days
		Follow-up activities after the introduction	10 days
(2)	Safety education/guidance on waste loading		
	Preparation of an explanatory leaflet	Preparation of an explanatory leaflet (the same as the one for DNCC and DSCC)	0 days
	Safety education and guidance on operation to the drivers and waste collectors	Safety guidance to the drivers, guidance on the waste loading to the waste collectors	2 days
3.	Conclusion of the Soft Component	Preparation of a report	2 days
Total			90 days

(2) Implementation resource

The details of the instructor in the Assistance Activity-1 in the Soft Component are as follows:

Job description:	Consultant to assist allocation and introduction of compactors
Quantity of work:	3.00 man-months (1.50 man-months x 2 times)
Time of the dispatch:	Before the arrival of the vehicles in Bangladesh and after the handover of the vehicles
Description of the duties:	Selection of the candidate areas for the allocation of compactors, field survey of the candidate areas, preparation of compactor allocation plans, preparation of leaflets to explain the waste collection with compactors, discussions with the residents and Primary Collection Service Provider (PCSP) regarding collection time and collection points, and safety education and instruction on waste collection to drivers and waste collectors etc.

(3) Trainees (Target Groups)

Table 5-2 shows the trainees in Assistance Activity-1.

Table 5-2 Trainees in Assistance Activity-1

CC	Allocation plan and introduction of compactors	Safety education and guidance on waste loading
DNCC and DSCC	Engineers, Conservation Officers (COs) and Conservation Inspectors (CIs) of the Waste Management Department	Drivers and waste collectors
CCC	Engineers and CIs of the Health and Mechanical Engineering Departments	Drivers and waste collectors

5.2 Assistance Activity-2

(1) Description of the Soft Component

Soft Component assistance shall be provided to (1) the strengthening of the management system and (2) the improvement of the maintenance skill in Assistance Activity-2. An expert in the mechanical engineering prepared technical manuals including those for daily inspection and regular inspections and constructed an inventory management system for spare parts for repair in the software component of the EGAP project. Assistance shall be provided to prepare of the manual for the staff members on the working conditions for the staff members of the workshops and to prepare plans of the safety control and to establish training systems for the strengthening of the management systems in this Soft Component. The manual for the staff members on the working conditions shall provide the scope of work of each staff member, work shift and budgetary management plan, among others. As the inventory management system for spare parts for repair established in the EGAP project has not been utilized fully, a study shall be conducted to identify the reasons why the system has not been used and a manual on the use of the system which includes measures against the identified reasons shall be prepared. The manuals for the daily inspection and regular inspections prepared in the EGAP project shall be applied to the workshop of CCC and the guidance shall be provided to the staff members of the workshop on the preventive maintenance.

For the improvement in the maintenance skills, training on basis of daily and regular inspections and

management of spare parts for repair shall be provided in the form of OJT, utilizing local resources.

Table 5-3 Detailed Activity Plan for Assistance Activity-2

No.	Classification	Description of activity	Required input	
			Japanese consultant	Local subcontractor
1.	Preparation in Japan	Preparation of the draft management manual Preparation of a draft training system design on safety management and other subjects Preparation of the specifications for the subcontracting	15 days	
2.	Travel (Round trip from Tokyo to Dhaka)		3 days	
3.	DNCC and DSCC			
(1)	Strengthening of the management system			
	Staff manual	Field surveys/problem analysis, lectures/discussions	7 days	
		Preparation of the manual (including definition of the duties of individual staff members, work shifts, and budget management plans)	7 days	
	Spare parts management manual	Analysis of the problems found in the inventory management system developed in the EGAP, lectures/discussions	3 days	
		Preparation of the manual	3 days	
	Systems for safety management and training	Field surveys/problem analysis, lectures/discussions	3 days	
		Designing of the systems	2 days	
(2)	Improvement of the maintenance skills			
	Implementation of OJT	OJT		14 days
4.	CCC			
(1)	Strengthening of the management system			
	Staff manual	Field surveys/problem analysis, lectures/discussions	7 days	
		Preparation of the manual (including definition of the duties of individual staff members, work shifts, and budget management plans)	7 days	
	Spare parts management manual	Field surveys/problem analysis, lectures/discussions	4 days	
		Preparation of the manual	4 days	
	Systems for safety management and training	Field surveys/problem analysis, lectures/discussions	3 days	
		Designing of the systems	2 days	
	Daily/regular inspections	Sharing of and guidance on the manual prepared in the EGAP	3 days	
(2)	Improvement of the maintenance skills			
	Implementation of OJT	OJT		14 days
5.	Conclusion of the Soft Component	Preparation of a report	2 days	2 days
Total			75 days	30 days

(2) Implementation resource

The details of the instructor in the Assistance Activity-2 in the Soft Component are as follows:

Job description: Consultant for workshop management
 Quantity of work: 2.50 man-months (Preparatory work in Japan: 0.5 man-months, work in Bangladesh: 2.0 man-months)
 Time of dispatch: After the handover of the equipment
 Description of the duties: See the table below.

Duty		Description of the duty
Strengthening of the management	Manual for the staff members on the working conditions	Study of the actual state/analysis of problems, lectures/consultation Preparation of the manual (on verification of the scope of work of each staff member, work shift, budgetary management plan, etc.)

system	Manual on the management of spare parts for repair works	Study of the actual state/analysis of problems, lectures/consultation Preparation of the manual
	Safety control and training systems	Study of the actual state/analysis of problems, lectures/consultation Designing of the systems
	Daily inspection/ regular inspections	Introduction of the manuals prepared in the EGAP project and training on the manual (only in CCC)
Improvement of the maintenance skill		Employment of local workers for the implementation of OJT for the mechanics of the workshops.

(3) Trainees (Target groups)

Table 5-4 shows the trainees in Assistance Activity-2.

Table 5-4 Trainees in Assistance Activity-2

CC	Strengthening of the management system	Improvement of the maintenance skill
DNCC and DSCC	Workshop managers (Executive Engineers, Assistant Engineers and Sub-Assistant Engineers)	Sub-Assistant Engineers and Mechanics of Sub-Assistant Engineers and the workshops
CCC	As above	As above

6. Methods for the Procurement of Resources Required for the Implementation of the Soft Component

6.1 Assistance Activity-1

This activity is to assist introduction of the compactors to be procured in this Project to the actual waste collection and transport. Compactors were provided to DNCC and DSCC in the EGAP and assistance to their introduction was provided in the TCP. Therefore, a person involved in the TCP shall be the ideal person to be the consultant of this Soft Component. In addition, because of the detailed discussion and coordination with the residents and primary waste collectors on collection times and points required for the implementation of the Soft Component, a local consultant involved in the TCP is better suited to be the consultant of the Soft Component than a Japanese counterpart. This local consultant is to implement and supervise this assistance activity by him/herself in consultation with the Project Manager.

6.2 Assistance Activity-2

This assistance activity is for the following two objectives: 1) strengthening of the management system and 2) improvement of skills of mechanics at the workshops where the vehicles to be procured are to be maintained. With regard to the strengthening of the management system, the mechanics at the workshops in the target CCs are not fully aware of the importance of the prevention of breakdowns of the vehicles or the systems at the workshops are not sufficient for the prevention, as the maintenance work currently conducted at the workshop is mainly *ad hoc* maintenance in which measures are taken after vehicles have broken down. A labor management system, including work shift management of the mechanics, etc., has not been established or the mechanics do not pay sufficient attention to occupational safety and health in the maintenance work either. Practices and the management system in use at the workshops are the causes of these problems and the solution of such problems shall require guidance of a Japanese consultant with experience in management of and designing of systems for workshops.

Employment of local human resources is recommended for the improvement of the skills of the mechanics, because of their capacity to communicate directly with the mechanics, which will be useful in the OJT to be conducted for the improvement of their skills. Through local subcontracting, engineers will be dispatched from a private maintenance workshop for the implementation of OJT for the mechanics.

7. Implementation Schedule of the Soft Component

Table 7-1 shows the implementation schedule of the Soft Component. In Assistance Activity-1, assistance shall be provided for the preparation of compactor allocation plans before the handover and for the introduction of compactors in accordance with the plans after the handover. Assistance Activity-2 shall be implemented after the handover.

Table 7-1 Soft Component Implementation Schedule

Item	August 2016	September	October	November	December
Handover of the equipment			←→		
1) Assistance Activity-1: Assistance to facilitate the introduction of compactors and guidance on their safe operation					
DNCC and DSCC					
(1) Allocation plans and introduction of the vehicles					
Assistance to the preparation for the introduction	←→				
Assistance to the introduction of vehicles				←→	
(2) Safety education and guidance on waste loading					
Preparation of explanatory leaflets	↔				
Safety education and guidance on waste loading to drivers and waste collectors				↔	
CCC					
(1) Allocation plans and introduction of the vehicles					
Assistance to the preparation for the introduction		←→			
Assistance to the introduction of vehicles					←→
(2) Safety education and guidance on waste loading					
Preparation of explanatory leaflets		↔			
Safety education and guidance on waste loading to drivers and waste collectors					↔
2) Assistance Activity-2: Assistance to the establishment of a sustainable maintenance system					
Preparatory work in Japan					
DNCC and DSCC					
(1) Strengthening of the Management system					
Preparation of a manual for staff members on working conditions				←→	
Preparation of a manual on management of spare parts for repair				↔	
Establishment of systems for safety management and training					◇
(2) Improvement in maintenance skills					
Implementation of OJT				←→	
CCC					
(1) Strengthening of the Management system					
Preparation of a manual for staff members on working conditions					←→
Preparation of a manual on management of spare parts for repair					↔
Establishment of systems for safety management and training					◇
Guidance of daily and periodical inspection					◇
(2) Improvement in maintenance skills					
Implementation of OJT					←→

8. Tangible Outputs of the Soft Component

The consultants of the Soft Component shall submit the outputs mentioned in the table below to the implementing organizations and JICA.

Table 8-1 List of Tangible Outputs

Assistance	Item	Output
Overall Soft Component		Soft Component Progress Report (both in English and Japanese)
		Soft Component Completion Report (both in English and Japanese)
Assistance Activity-1	Plans for the allocation of and introduction of waste collection vehicles	Vehicle allocation plans
		Explanatory leaflet for the residents (300 copies = 100 copies/city x 3 cities)
	Safety education and guidance on waste loading	Leaflet explaining safety and waste loading (100 copies)
Assistance Activity-2	Strengthening of the management system	Staff manual
		Spare part management manual
	Improvement of the maintenance skills	Record of the training (OJT)

9. Estimated Cost of the Soft Component

The Cost for the Soft Component is estimated at 15,511 thousand JPY. Table 9-1 shows the breakdown of the estimated cost.

Table 9-1 Estimated Cost of the Soft Component

Item	Amount (in thousand yen)
Direct labor cost	4,810
Direct cost	4,545
Overhead cost	6,156
Total	15,511

10. Obligations of the Recipient Country

The responsible organization of this Project, LGD, shall have to appoint one of its staff members to manage the overall Soft Component. Meanwhile, the implementing organizations, DNCC, DSCC and CCC, shall have to appoint engineers in 1) waste collection and transport and 2) vehicle maintenance as the persons in charge, who are to take the responsibility for the introduction of the compactors, establishment of vehicle maintenance systems and improvement of the waste collection/transport work in cooperation with the Consultant. In addition, DNCC and DSCC shall have to complete the on-going process of employing new mechanics for the workshop. On this issue, both of them have stated that they shall employ new mechanics in the near future. Since it is assumed to take approx. two years for the equipment to be delivered to them at present, this process is not likely to affect the implementation of the Soft Component.

(1) Feasibility

The demand for the objective of this Soft Component, “to increase the waste collection capacity as planned by facilitating the use of the equipment to be procured in this Project and assisting the establishment of a system for their appropriate operation and maintenance,” of DNCC, DSCC and CCC is high.

LGD has not appointed the person in charge of the Soft Component. However, as its intention to appoint one of its staff members as the project manager for the overall management of the project has been confirmed, it is also considered likely that LGD shall appoint a person in charge of the Soft Component. As DNCC, DSCC and CCC already have the engineers in charge of 1) waste collection and transport and 2) vehicle maintenance, they may be appointed as the engineers in charge in the Soft Component in the respective fields. Public announcements for the employment of the new mechanics had been made in newspapers by the end of September 2014, followed by the commencement of the process of employment. LGD is continuously monitoring the progress of the process as it is also aware of the importance of employing the new mechanics. Therefore, it is expected that, although it may take time, the new mechanics shall eventually be employed and, thus, that the employment of the new mechanics is not likely to become a factor affecting the implementation of the Soft Component.

(2) Obstacles and measures required against them

No obstacle has been found for the implementation of Assistance Activity-1 (Assistance to facilitate the introduction of compactors and guidance on their safe operation). Meanwhile, unless the new mechanics mentioned above have been employed, it will not be possible to implement the OJT of the mechanics at the workshops in Assistance Activity-2 (Assistance to the establishment of a sustainable maintenance system). There is a risk of delay in the process of employing the new mechanics in DNCC because of internal problems. The continuous monitoring of the process by LGD, the responsible organization of this Project and the organization supervising DNCC, is considered as a measure against such a risk. Meanwhile, the Consultant shall maintain close contact with LGD on the progress of the process of the employment and request LGD to give instruction when a risk of delay in the employment has been found.

(3) Measures to be taken continuously for the achievement of the objective of the Soft Component

DNCC, DSCC and CCC shall continue to allocate and introduce the waste collection vehicles not used in the OJT to the waste collection and transport using the knowledge and expertise acquired in Assistance Activity-1 after the completion of this Project. They shall also have to maintain the waste collection vehicles in accordance with the manuals to be prepared in Assistance Activity-2.

6. Existing Vehicle List

Existing Vehicle List

DNCC

Type	Model	Manufacture Year	Volume [ton]	Working Number
AR	Hino	2010	7	8
CC	Ashok Leyland	1994	5	1
CC	Ashok Leyland	1995	3	21
CC	Hino	2010	3	3
CC	Hino	2010	5	11
CC	Tata 909	1995	5	4
CC	Volvo	1999	5	5
CC	Unknown	2008	5	12
CM	Ashok Leyland	2010	5	3
CM	Hino	2010	2	3
CM	Hino	2010	5	15
CM	Hino	2014	7	4
DT	Hino	2014	7	4
OT	Awlas	1999	3	2
OT	Isuzu NHR	1989	1.5	3
OT	Isuzu NKR	1990	1.5	1
OT	Tata 1613	1999	5	8
OT	Tata 407	1997	1.5	2
OT	Tata 608	1994	3	9
OT	Tata 609	1996	3	4
OT	Tata 709	1999	3	14
OT	Volvo	1999	5	2
Total				139

DSCC

Type	Model	Manufacture Year	Volume [ton]	Working Number
AR	Hino	2010	7	12
CC	Ashok Leyland	1995	3	15
CC	Hino	2010	3	12
CC	Hino	2010	5	19
CC	Tata	2008	5	8
CC	Volvo	1999	5	9
CM	Hino	2010	2	10
CM	Hino	2010	5	5
CM	Hino	2010	5	2
CM	Tata	2010	5	2
DT	Hino	2014	7	4
DT	Unknown	1999	3	1
OT	JMC	2014	3	10
OT	NHR-555 L	1983	1.5	0
OT	NHR-555 L	1990	1.5	3
OT	NKR	1983	3	1
OT	NKR	1990	3	3
OT	TATA	1994	3	11
OT	TATA	1996	3	3
OT	TATA	1997	1.5	7
OT	TATA	1999	1.5	28
OT	TATA	1999	3	28
OT	TATA	1999	5	2
OT	Volvo	1999	5	2
OT	Yujin	2000	5	3
Total				200

CCC

Type	Model	Manufacture Year	Volume [ton]	Working Number
CC	Container mover	2011	5	10
DT	Aisar D T	2013	3	9
DT	Aisar D T	2013	5	10
DT	Bedford truck	2011	5	2
DT	Compactor(china) truck	2000	2	4
DT	Forland truck	2011	3	21
DT	Hino D. T.	2006	3	4
DT	Oshok liland covered truck	2014	3	19
Total				79

AR – Armroll
 CC – Container carrier
 CM – Compactor
 DT – Dump truck
 OT – Open truck

7. References

References

Name of Survey: The Project For Improvement of Solid Waste Management Equipment in The People's Republic of Bangladesh

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	Annual Plan on Activities on Solid Waste Management during 2012-2013 (DSCC / DNCC)	Book	Original	Dhaka City Corporation	2012
2	National 3R Strategy	Book	Copy	Department of Environment Ministry of Environment and Forests	2010
3	Bangladesh Environment Conservation Rule 1997	Book	Copy	Department of Environment Ministry of Environment and Forests	1997
4	Bangladesh Environment Conservation Act 1995	Book	Copy	Department of Environment Ministry of Environment and Forests	1995
5	Detailed Area Plan / Chittagong metropolitan Master Plan	Book	Original	Chittagong Development Authority	2011
6	Chittagong Guide Map	Book	Original	The Mappa Ltd.	2008
7	Rajuk Plan (Detailed Area Plan / Dhaka City Guide Map North and South)	Book	Original	OYSHI Products	2012

