

Annex R

*Manual for Collection Route
Improvement*

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R Manual for Collection Route Improvement

This section is divided into three parts:

- Aim and objective,
- How to improve collection route, and
- Example of collection route improvement.

R.1 Aim and Objective

Aim of Manual

This manual aims to provide a tool that allows the improvement of collection routes with a minimum effort and maximized effects for municipalities in AMSS (San Salvador Metropolitan Area).

Objective of Collection Route Improvement

Objective of improving collection routes is **to minimize collection cost without deteriorating the sanitary aspect** (serve the whole population in a sanitary manner and with the adequate frequency). In order to achieve the objective, the improvement should pursue the followings.

- fully utilize capacity of collection vehicles,
- minimize non-productive runs (runs without collecting wastes) as possible, and
- utilize manpower (drivers, collection workers, etc.) efficiently.

R.2 How to Improve Collection Route

A way of improving collection route proposed in this manual consists of four steps as schematically shown in Figure R-1. That is:

- Step 1 Information Gathering,
- Step 2 Diagnosis of Collection Route,
- Step 3 Improvement, and
- Step 4 Monitoring

Each step is explained step by step in detail below.

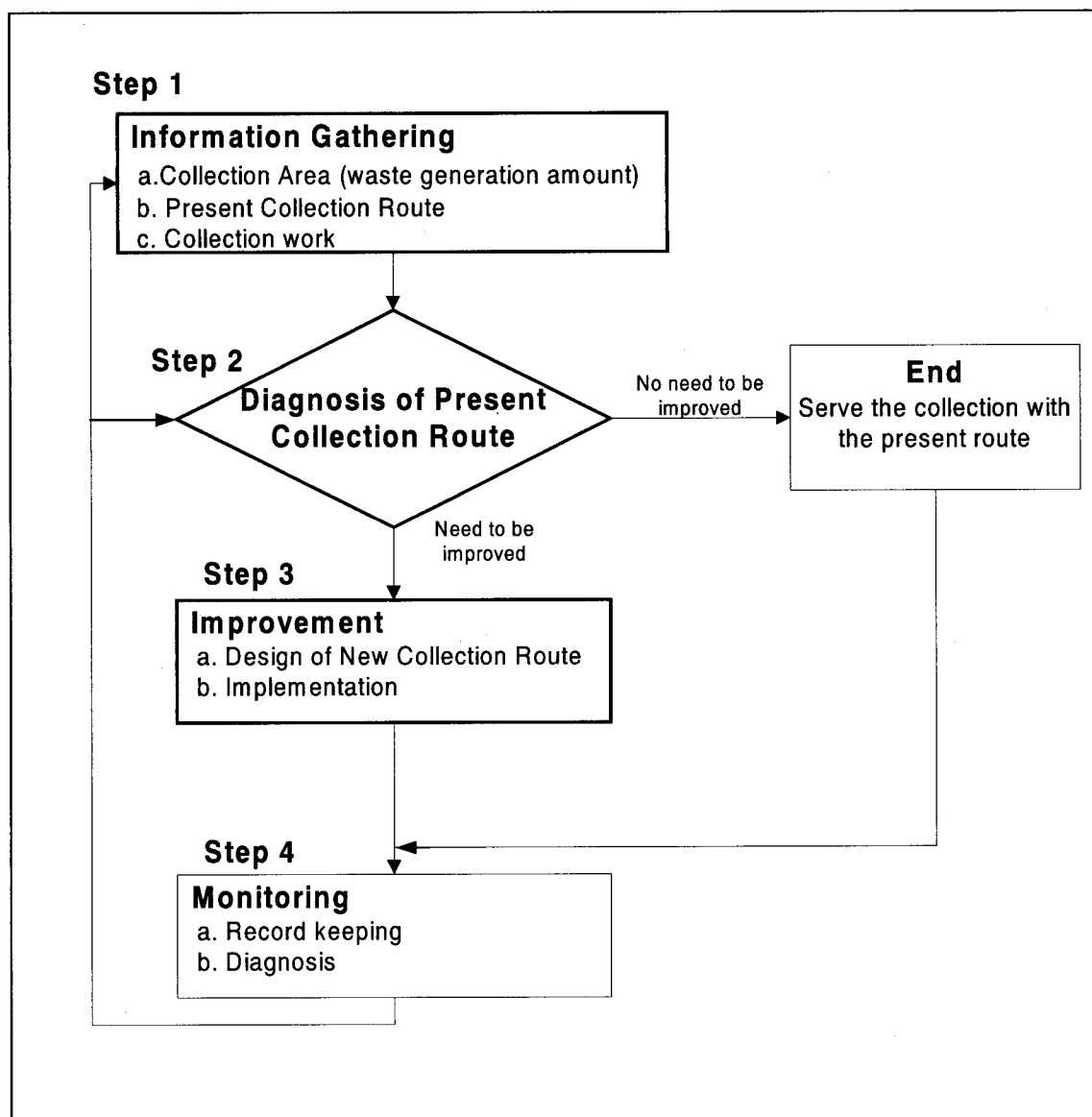


Figure R-1: Flow Chart of Collection Route Improvement

Step 1: Information Gathering

This step aims to obtain information for diagnosing a targeted present collection area(s) and route(s).

a. Collection Area (waste generation amount)

For diagnosing whether the size of collection area is appropriate or not, waste generation amount needs to be estimated. In order to obtain an estimation of waste amount generated from a targeted collection area(s), number of houses is counted and significant waste generation sources are identified with a relatively large-scale map. This work is carried out as follow.

a.1 Counting Number of Houses and Estimating Waste Generation Amount

Count number of houses at every street with the map and a sheet "Form 1." In this manual, minor business entities such as small restaurants, shops and offices are regarded as houses.

Waste generation amount is estimated as below by using generation ratio acquired by Waste Amount and Composition Survey (WACS).

Table R-1: Waste Generation Ratio

Type of waste	Ratio
Residential	0.5 kg/capita/day
Restaurant	0.5 kg/seat/day
Other commercial	0.5 kg/employee/day
Institutional	0.2 kg/employee/day
Market	1.7 kg/stall/day
Road sweeping	0.2 kg/m/day

Note: Accurate values obtained by WACS are: 0.475kg/capita/day for residential (weighted average of 0.600kg/capita/day for high income, 0.540 kg/capita/day for middle income and 0.420 kg/capita/day for low income), 0.466 kg/seat/day for restaurant, 0.482 kg/employee/day for other commercial, 0.196 kg/employee/day for institutional, 1.674 kg/stall/day for market and 0.198 kg/m/day for road sweeping waste. However, those are rounded off to the first decimal place in order to simplify the estimation.

Example

number of houses: 20 houses

collection frequency: 3 times a week

$20 \text{ houses} \times 5 \text{ occupants/house}^1 \times 0.5 \text{ kg/capita/day} = 50 \text{ kg/day}$

$50 \text{ kg/day} \times 7 \text{ days} / 3 \text{ times} = 117 \text{ kg/time}$

¹ It is assumed that one family has 5 members.

a.2 Identifying Significant Waste Generation Sources

If there is a waste generation source(s) that generates large amount of waste such as markets and large government offices, those should be identified on the map and the waste amount generated from them need to be known. The waste amount would be known empirically. In case that the waste amount can not be known empirically, the waste generation ratios are able to be used to estimate waste generation amount.

Example

In case that the waste amount is known:

A government office discharges approximately 300 kg/time of waste. This is known empirically.

In case that the waste amount is unknown:

If the waste amount is unknown, number of employees should be counted and the generation ratio of 0.2 kg/employee/day as given above is adapted to estimate the waste amount.

number of employees: 500 employees

waste generation ratio: 0.2 kg/employee/day

collection frequency: 3 times a week

$500 \times 0.2 \times 7/3 = 233 \text{ kg/time}$

a.3 Checking Waste Amount

The waste generation amount calculated above should be checked by actual collection amount measured by a weighbridge. If there is a significant differences between them, there would be a serious mistake(s) or an oversight(s) when counting houses or identifying significant waste generation sources. So, need to clarify the differences.

b. Collection Route

b.1 Drawing the Present Collection Route

Making a copy of the map, which has information of number of houses and significant waste generation sources, draw the present collection route on the copy as well as traffic information such as one-way streets. It should be noted that productive run and non-productive run would need to be differentiated from each other (Refer Table R-2).

productive run: where collection is carried out

non-productive run: where collection is not carried out

b.2 Measuring the Productive and Non-productive Runs

Measure the length of productive run and non-productive run respectively, then obtain ratio of them as follows.

$$\frac{\text{length of productive run}}{\text{total length (productive run + non productive run)}}$$

Example

productive run: 20km
non-productive run: 10km

$$\frac{20}{20 + 10} = 0.67$$



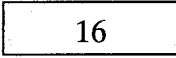




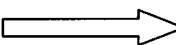
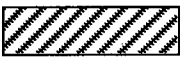




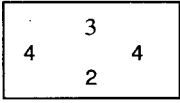

c. Collection Work

Record the present collection work such as collection weight per trip and distance and time from a depot to a collection area according to a sheet "Form 2" From the data recorded, productivity of the collection work is obtained as below. This productivity becomes a base line for estimating productivity of the future collection work.

$$\text{Productivity} = \frac{\text{waste collection amount}}{\text{collection time}} (\text{kg / hour})$$

Note: In case that the collection vehicle and number of workers are the same, the higher productivity, the less collection cost.

Table R-2: Symbols for Route Improvement

Symbol	Description	Color
	Productive run	
	Non-productive run (when the truck does not collect and just traveling)	
	Apartments	Yellow
	Businesses	Red
	Educational center, public or private institutions	Blue
	Health centers, medical clinics, laboratories	Purple
	Industry	Green
	One-way street	
	Street through which collection truck cannot access	Brown
	High spot in the land	Brown
	Low spot in the land	Brown
	Containers	Red
	Spots used as dumping sites and where service is not provided	Red
	Number of houses per side of the block, or per side where wastes will be delivered to the collection truck	
	Spots used as dumping sites and where service is provided	Blue

Step 2: Diagnosis of Collection Route

By using data obtained at Step 1, appropriateness of the collection area size and efficiency of the collection route are diagnosed at this step.

a. Collection Area

Appropriateness of the collection area size is diagnosed by comparing the waste collection amount and payload of collection vehicle serving the area. If the waste amount is significantly smaller or larger than the payload, it can say that the collection area is not appropriate for the vehicle and need to be expanded or reduced. Proposed optimum ratio is in range of between 0.9 to 1.05.

Example

waste collection amount: 12,000 kg/time (26,400 pound/time)

payload of 18yd³ compactor: 7,500 kg (16,500 pound)

$$\frac{\text{waste collection amount}}{\text{payload of collection vehicle}} = \frac{12,000}{7,500} = 1.6$$

1.6 is significantly high ratio, so that the collection area should be reduced.

Example

waste collection amount: 3,000 kg/time (6,600 pound/time)

payload of 11yd³ compactor: 4,500 kg (99,000 pound)

$$\frac{\text{waste collection amount}}{\text{payload of collection vehicle}} = \frac{3,000}{4,500} = 0.67$$

0.67 is considerably small, so that the collection area should be expanded.

b. Collection Route

Efficiency of collection route is diagnosed by a ratio of productive run length to total run length. If the ratio is significantly small, it can say that the collection route is not efficient and need to be modified. It is generally said that the ratio is between 0.6 to 0.9. Proposed ratio here is to be more than 0.7. Therefore, the collection route needs to be modified when the ratio is less than 0.7.

Step 3: Improvement

Improvement is necessary, when the collection area size is found as inappropriate and/or the collection route is judged as inefficient at Step 2. Procedure is shown below.

a. Design of New Collection Route

a.1 Adjustment of Collection Area

If the collection area is found as too large or too small for a corresponding collection vehicle, the area needs to be reduced or expanded to suit to the payload of the vehicle prior to designing a new collection route.

a.2 Design of New Collection Route

There is no established method to design an effective and efficient collection route for any situation. The design generally needs a series of trials. Prepare some pieces of copy of the map, which has traffic information, and draw several collection routes considering the followings:

- Route improvement is aimed at decreasing the non-productive run.
- If plural trips are made, those must not overlap each other.
- The beginning of a route must be close to the depot and the end of it also close to a disposal site.
- In places with steep slopes or hills, the collection should be carried out from the higher to the lower part. If hollows are present and the truck must go up and then down, it would be recommended that this part be served at the beginning of the trip, when the truck is not so loaded.
- Whenever possible, wastes on both sides of the street will be collected simultaneously. However, this is not recommended for very wide or heavy-traffic avenues.
- It is convenient to avoid left turns or U-turns because they waste time, they are dangerous and hinder traffic. Right turns are preferable.
- Heavy-traffic streets must be traveled at those hours when it is less intense.
- In the case of short dead-end streets, it is preferable that collection trucks do not enter, but rather wait at the corner and the crews fetch wastes. This will save a lot of time.
- Those sources that generate a large amount of wastes should be served in the first part of the day or in special routes.

a.3 Selection of a New Route

The alternative collection routes can be assessed by the ratio of productive run length to total run length.

Example

$$\text{Alternative 1: } \frac{\text{length of productive run}}{\text{total length (productive run + non productive run)}} \\ = 0.7$$

Alternative 2: 0.65

Alternative 3: 0.75

Then, the alternative 3 is selected as a new collection route.

b. Implementation

b.1 Actual Trial and Adjustment

A proposed new route(s) must actually be traveled by the route designer prior to delivering it to the driver, in order to make some adjustments necessary to deal with some details that might not have been found in Step 1. It will also be important that a supervisor follows the vehicle on a new route during the first week, so that this is done as planned.

b.2 Notifying Residents

If there is a major alternation from the previous collection service such as collection day, the responsible municipality must notify it to the corresponding residents.

b.3 Notifying Drivers and Workers

Prior to actual implementation of the new route, the route designer must inform corresponding drivers and workers of the new route and make them understand it fully.

b.4 Implementation

Implement collection service with the new route.

Step4 Monitoring

a. Record Keeping

With the implementation, waste amount collected and collection work are to be recorded. This is done by a driver with a sheet "Form 2."

b. Diagnosis

Appropriateness of the collection area size and efficiency of the collection route should be diagnosed on the basis of the data compiled every year.

b.1 Collection Area

If the waste collection amount has become much smaller or larger, cause of it should be found and certain measures, i.e., expand or reduce the collection area, should be taken to make the collection area match the collection vehicle. The cause might be such as inflow or outflow of a major discharger(s).

b.2 Collection Route

If the productivity of collection work is significantly declined compared with it obtained at Step 1, cause of this should be found. This time, the cause may not be a longer non-productive run. It may exist in other places, as the non-productive run had already minimized at Step 3. Therefore, observation by the driver or the supervisor should be taken up importantly for modifying the collection route.

Conclusion

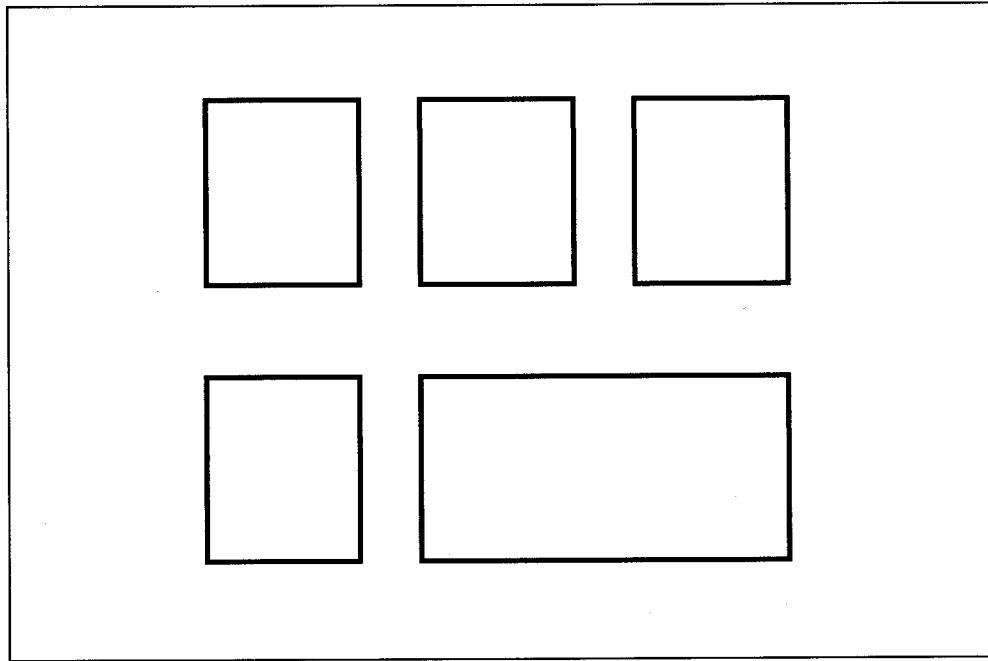
Although there is no almighty way of collection route improvement which suites to any situation, this manual shows a guideline for each municipality to establish their own way of route improvement in order to cope with their peculiarities.

R.3 Example of Collection Route Improvement

Step 1: Information Gathering

a. Collection Area (waste generation amount)

Prepare a relatively large-scale map encompassing the targeted collection area.



Map 1: Relatively large-scale map of collection area

a.1 Counting Number of Houses and Estimating Waste Generation Amount

a.2 Identifying Significant Waste Generation Sources

Count numbers of houses and identify large waste generation sources with the map and Form 1

Form 1:

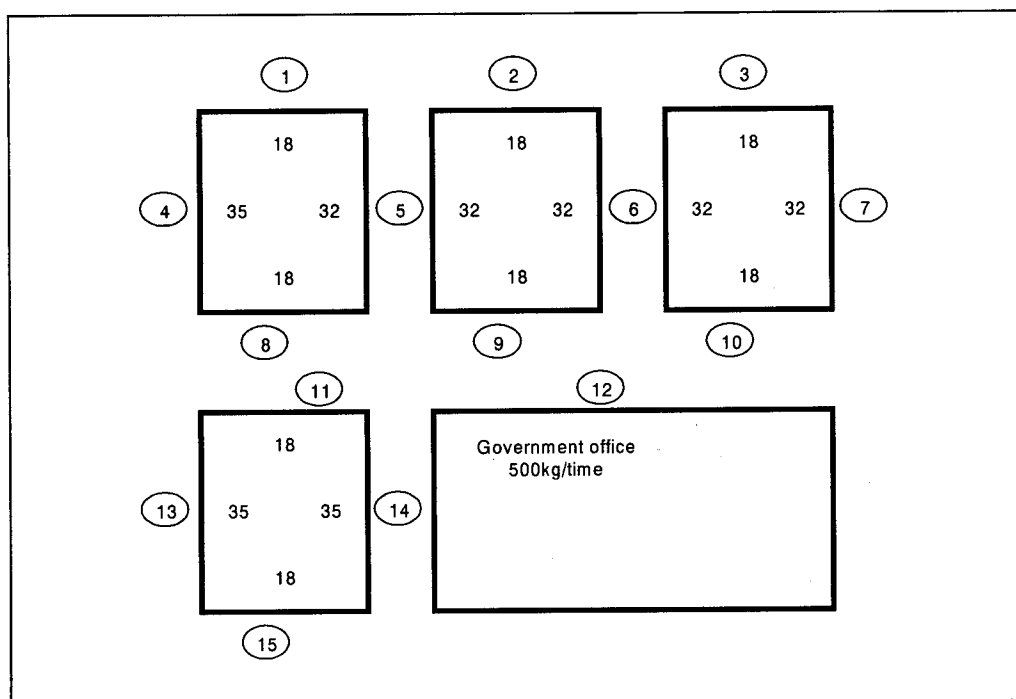
Number of houses and significant waste generation sources

Frequency: 3 times a week

No.	Houses			Others			remarks
	Nos.	waste amount		Nos.	waste amount		
		kg/day	kg/time		kg/day	kg/time	
1	18	45.0	105.0				
2	18	45.0	105.0				
3	18	45.0	105.0				
4	35	87.5	204.2				
5	64	160.0	373.3				
6	64	160.0	373.3				
7	32	80.0	186.7				
8	18	45.0	105.0				
9	18	45.0	105.0				
10	18	45.0	105.0				
11	18	45.0	105.0				
12		0.0	0.0	1		500	Government office
13	35	87.5	204.2				
14	35	87.5	204.2				
15	18	45.0	105.0				
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
sub-total	409.0	1,022.5	2,385.9	1.0	0.0	500.0	

Total: 2,385.9 + 500 =2,885.9 kg/time

Put the number of houses and identified significant waste generation sources on the map as shown below.



Map 2: Collection area map with the information of the number of houses and significant waste generation sources

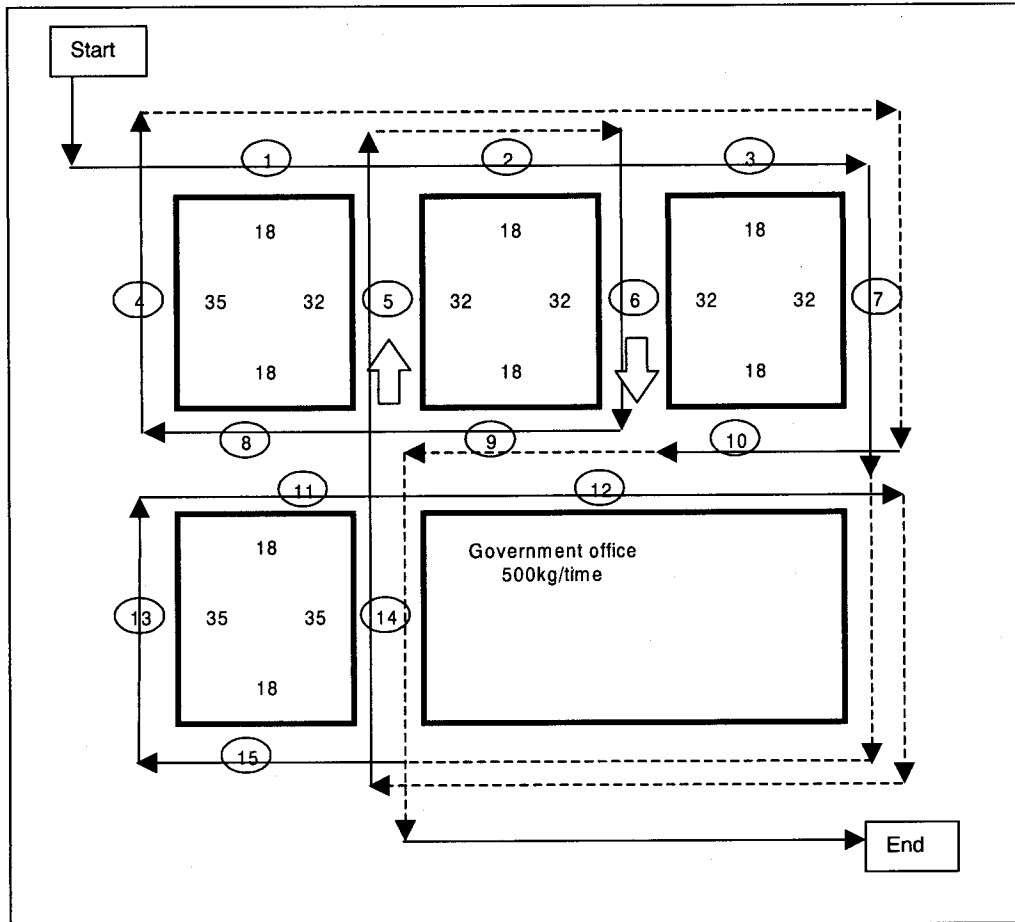
a.3 Checking Waste Amount

Suppose that the average collection amount is 3,000kg/time according to data kept in a responsible section. In this case, the figure actually measured 3,000kg/time is not different from the figure 2,885.9 kg/time estimated above. Then, it can say that there are no serious mistakes and oversights on counting houses and identifying significant waste generation sources.

b. Collection Route

b.1 Drawing the Present Collection Route

Draw the present collection route as well as traffic information on Map 2.



Map 3: Present collection route map

b.2 Measuring Productive and Non-productive Runs

Measure the productive and non-productive runs on Map 3 respectively. The productive runs are shown by solid lines and the non-productive runs are by broken runs.

According to Map 3

productive run: 18 km

non-productive run: 12 km

therefore,

$$\frac{18}{18 + 12} = 0.6$$

c. Collection Work

Record collection work according to Form 2 at least for a month prior to the improvement. Suppose that 1,800kg/hour of average productivity is obtained from the data recorded.

Form 2 Collection Work Recording Sheet

Date: _____ / _____ / 20____

Name of driver: _____

Ruta No.: _____

Type of vehicle: _____

Payload: _____

Nos. of crew: _____

Activities	time	distance (km)
Departure from depot		
Start of 1st collection		
End of 1st collection		
Arrival at disposal site		
Departure from disposal site		
Start of 1st collection		
End of 1st collection		
Arrival at disposal site		
Departure from disposal site		
Arrival at depot		

Supervisor use only

Collection	weight(kg)	time(hour)	productivity (kg/hour)
1st			
2nd			

Step 2: Diagnosis of Collection Route

a. Collection Area

Waste amount obtained at Step 1 is 2,885.9 kg/time. On the other hand, a vehicle serving this collection area is 11yd³, and its payload is 4,500kg. Therefore, the ratio between them is 0.64.

$$\frac{2,885.9}{4,500} = 0.64$$

This ratio shows that the collection area is considerably small compared with the vehicle capacity. Therefore, the present collection area needs to be expanded.

b. Collection Route

The ratio of productive run length to total run length is 0.6 (productive run length 18km, total run length 30 km, 18/30=0.6). As the ratio is less than 0.7, the collection route needs to be improved.

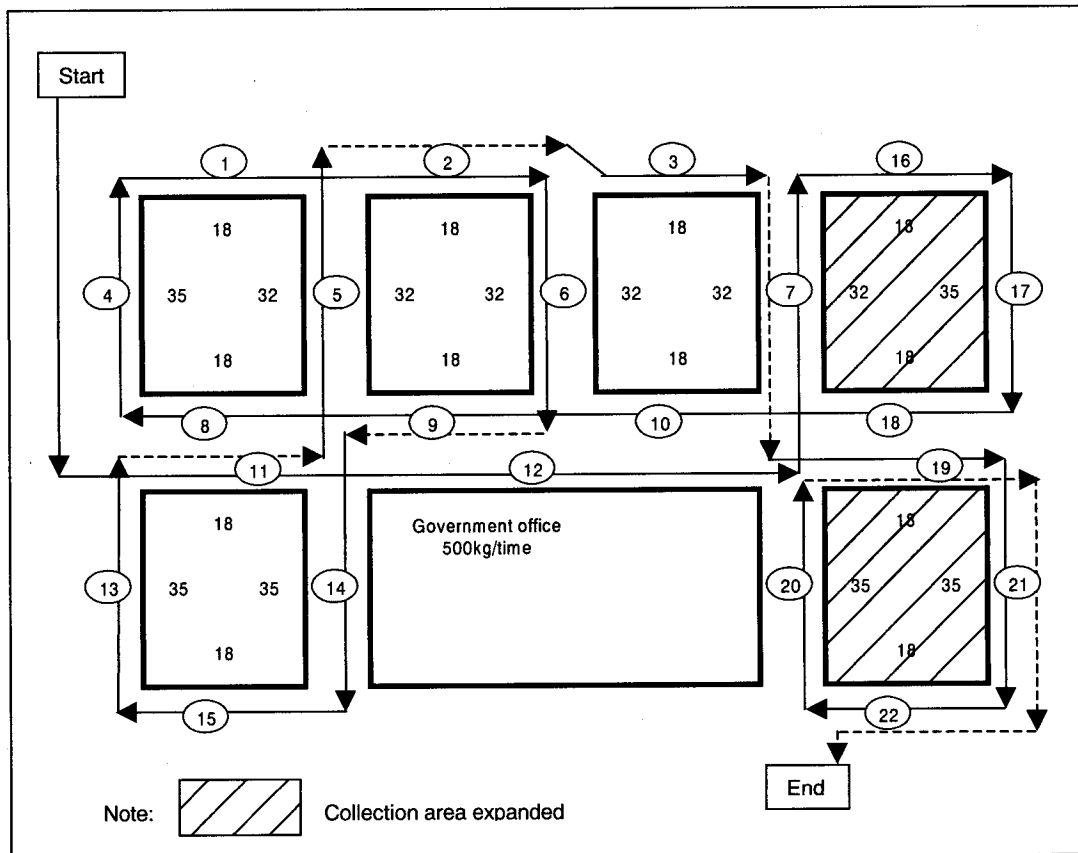
Step 3: Improvement

b.1 Adjustment of Collection Area

b.2 Design of New Collection Route

b.3 Selection of a New Route

According to the results of the diagnosis, the collection area is expanded and the collection route is improved. The improved new collection route is shown below, and the ratio of productive run length to total length results in 0.8.



Map 4: Expanded collection area and improved collection route

b. Implementation

Implement the collection service with the new collection area and route according to the instruction mentioned in R.2.

Step 4: Monitoring

Monitor the collection work according to the instruction mentioned in R.2.

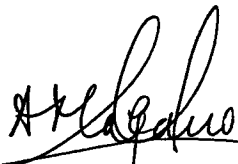
Annex S

Minutes of Meetings

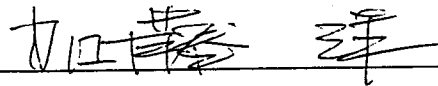
**MINUTES OF MEETING
FOR
THE STUDY
ON
REGIONAL SOLID WASTE MANAGEMENT
FOR
SAN SALVADOR METROPOLITAN AREA
IN
THE REPUBLIC OF EL SALVADOR**

**AGREED UPON BETWEEN
MINISTRY OF ENVIRONMENT AND NATURAL RESOURCES,
MAYOR COUNCIL FOR SAN SALVADOR METROPOLITAN
AREA,
PLANNING OFFICE FOR SAN SALVADOR METROPOLITAN
AREA,
AND
THE JICA STUDY TEAM**

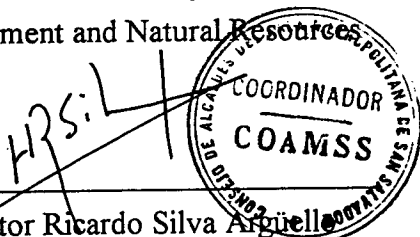
San Salvador, December 16th, 1999



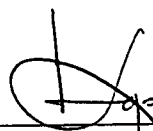
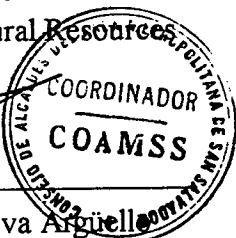
Mrs. Ana Maria Majano
Minister of the Ministry of
Environment and Natural Resources



Mr. Hiroshi Kato
Leader of the JICA Study Team



Dr. Héctor Ricardo Silva Argüello
Coordinator of the Mayor Council for
San Salvador Metropolitan Area
(COAMSS) and Mayor of San Salvador



Arq. Mario Lungo
Executive Director of the Planning Office
for San Salvador Metropolitan Area
(OPAMSS)



MINUTES OF MEETING ON THE INCEPTION REPORT OF THE STUDY ON REGIONAL SOLID WASTE MANAGEMENT FOR SAN SALVADOR METROPOLITAN AREA IN THE REPUBLIC OF EL SALVADOR

1. INTRODUCTION

- 1.1 The Study Team has submitted the Inception Report (10 copies in English and 20 copies in Spanish) to the Government of the Republic of El Salvador. Consequently, a series of meetings were held from December 14th to 16th in San Salvador, El Salvador to discuss the report submitted. A list of officials attending in the above meetings is given in the Annex-3.

2. ISSUES AND DISCUSSIONS

- 2.1 Various issues were discussed and clarifications on the Inception Report (IC/R) were made. Subsequently appropriate consensus was reached during the meetings. These issues, clarifications and consensus are outlined in the following paragraphs.

2.2 Steering Committee

The Salvadoran side informed that a Steering Committee is established and the members of the Committee are given in the Annex-1.

2.3 Counterpart Team

The Salvadoran side informed that the Counterpart team is organized, and the members of such Team are given in the Annex-2. Mr. Mario Lungo, Executive Director of OPAMSS, was named the Chief of the Counterpart Team.

The Study Team appreciated such information.

2.4 Continuity of Joint Study

The Study Team proposed to have a weekly meeting for promoting the joint study and technology transfer, and requested the Salvadoran side to provide the continuous participation of the same Counterpart members throughout the Study Period.

The Salvadoran side replied that they would commit to do their best effort.

2.5 Assignment of Office and Vehicle with Driver

The Study Team confirmed and appreciated the office and the vehicle with driver assigned for the Team.

2.6 Pilot Projects

The following have been selected as Pilot Projects:

- a) Inspection of collection route improvement
- b) Sanitary education, and public awareness promotion Campaign about SWM issues
- c) Collection service experiment.

The Salvadoran side agreed in such projects.

2.7 Counterpart Training

In response to the Salvadoran side request, JICA Head Office decided to provide training for a person during the First Study Work in Japan (around August 2000).

The Salvadoran side appreciated the comment.

2.8 Technology Transfer Seminar

In response to the Salvadoran side request, JICA Head Office decided to carry out two seminars: the first one to be held in the beginning of July 2000, and the second one by the end of September 2000.

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The Salvadoran side appreciated and accepted the suggestion made by the Study Team for their active participation in both seminars.

3. CONCLUSION

- 3.1 With the above clarifications and modifications, the IC/R was approved by the Salvadoran side.

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Annex-1
Members of the Steering Committee

Mrs. Ana María Majano

Minister of the Ministry of Environment
and Natural Resources (Chairman)

Dr. Hebert Betancurt

Vice-minister of the Ministry of Public
Health and Social Assistance

Dr. Héctor Ricardo Silva Argüello

Coordinator of the Mayor Council for San
Salvador Metropolitan Area (COAMSS)
and Mayor of San Salvador

Mr. Mario Lungo

Executive Director of the Planning Office
for San Salvador Metropolitan Area
(OPAMSS)

Handwritten signatures and initials in the bottom right corner, including a circled signature and the initials "HRSA" and "AM".

Annex-2

Members of the Salvadoran Counterpart Team

Name	Position
Ministry of Environment and Natural Resources	
Violeta Lardé de Rodríguez	Specialist of Bilateral Cooperation, Direction of International Cooperation & Projects
Mercedes Herrera	Technical officer, Environmental Quality Direction
Ministry of Public Health and Social Assistance	
Plácido Lemus	Coordinator of Hospital waste, Department of Environmental Sanitation
Planning Office for San Salvador Metropolitan Area (OPAMSS)	
Mario Lungo	Executive Director (C/P Team Leader)
Celina Cruz	Coordinator, Environmental Unit
Ronald Wilfredo Ruiz	Technical officer, Environmental Unit
San Salvador Municipality	
Jorge Ernesto González	Director, Department of Environment and Sanitation
Benjamín Funes	District No. 1
Francisco Burgos	District No. 2
Carlos Eduardo Linares	District No. 3
Luis Romero	District No. 4
Manuel de Jesús Olivares	District No. 5
Other 13 municipalities	
Eva R. Linares	Ayutuxtepeque Municipality
Saúl Portal	Nejapa Municipality
José Gilberto Pérez	Antiguo Cuscatlán Municipality
Luis Alonso Ramírez Reyes	Ciudad Delgado Municipality
Rafael Merino	Ilopango Municipality
Ricardo Hernández Jordán	Mejicanos Municipality
Saúl Antonio Benítez Morales	Soyapango Municipality
Vladimir Chanchan	San Marcos Municipality
Guillermo Antonio Coreas Monge	Tonacatepeque Municipality
Miguel Gutiérrez	Nva. San Salvador Municipality
Luis Alberto Romero	Apopa Municipality
Mario E. Aguilar Palma	Cuscatancingo Municipality
Pedro Arnulfo Casco	San Martín Municipality

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Annex-3

Members attending the Minutes of Meeting

Name	Position
Dra. Ana María Majano	Minister of the Ministry of Environment and Natural Resources
Dr. Héctor Ricardo Silva	Coordinator of the Mayor Council for San Salvador Metropolitan Area (COAMSS) and Mayor of San Salvador
Arq. Mario Lungo	Executive Director of the Planning Office for San Salvador Metropolitan Area (OPAMSS)
Pedro Benjamín Funes	San Salvador Municipality (District No. 1)
Luis Alfonso Ramírez Reyes	Ciudad Delgado Municipality
Jorge Ernesto González Sara	Director of the Department of Environment and Sanitation
Luis Alberto Romero	Apopa Municipality
Rafael Merino	Ilopango Municipality
Saúl Antonio Benítez	Soyapango Municipality
Eva R. Linares	Ayutuxtepeque Municipality
Luis Humberto Romero Fernández	San Salvador Municipality (District No. 4)
Manuel de Jesús Olivar	San Salvador Municipality (District No. 5)
Manuel Francisco Burgos	San Salvador Municipality (District No. 2)
Rosa Amalia Peña	OPAMSS
Ronald Wilfredo Ruiz	OPAMSS
Ricardo Hernández Jordán	Mejicanos Municipality
Mario E. Aguilar	Cuscatancingo Municipality
Héctor Romilio Guevara	Cuscatancingo Municipality
Mercedes Herrera	Ministry of Environment and Natural Resources
Guillermo Antonio Coreas Monge	Tonacatepeque Municipality
Pedro Arnulfo Casco	San Martín Municipality
Kayo Minagawa	JICA
Hiroshi Kato	Kokusai Kogyo Co., Ltd.
Tadaya Yamamoto	Kokusai Kogyo Co., Ltd.
Ikuo Mori	Kokusai Kogyo Co., Ltd.

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HRS. H
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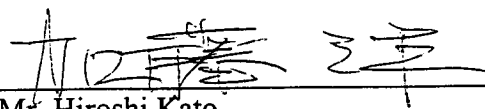
**MINUTES OF MEETING
ON
THE PROGRESS REPORT (1)
OF
THE STUDY ON REGIONAL SOLID WASTE MANAGEMENT
FOR
SAN SALVADOR METROPOLITAN AREA
IN
THE REPUBLIC OF EL SALVADOR**

**AGREED UPON BETWEEN
MINISTRY OF ENVIRONMENT AND NATURAL RESOURCES,
MINISTRY OF PUBLIC HEALTH AND SOCIAL ASSISTANCE,
MAYORS COUNCIL FOR SAN SALVADOR METROPOLITAN AREA,
PLANNING OFFICE FOR SAN SALVADOR METROPOLITAN AREA,
AND
THE JICA STUDY TEAM**

San Salvador, April 27th, 2000



Dr. Ana María Majano
Minister, Ministry of Environment and
Natural Resources



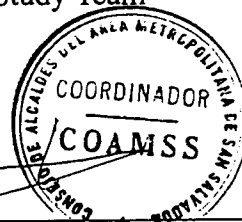
Mr. Hiroshi Kato
Leader of the JICA Study Team



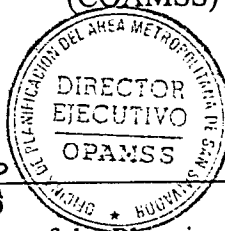
Dr. Herbert Betancurt
Vice-minister, Ministry of Public Health
and Social Assistance



Dr. Héctor Ricardo Silva Argüello
Coordinator of the Mayors Council
for San Salvador Metropolitan Area
(COAMSS) and Mayor of San Salvador



Mr. Mario Lungo
Executive Director of the Planning
Office for San Salvador Metropolitan
Area (OPAMSS)



MINUTES OF MEETING ON THE PROGRESS REPORT (1) OF THE STUDY ON REGIONAL SOLID WASTE MANAGEMENT FOR SAN SALVADOR METROPOLITAN AREA IN THE REPUBLIC OF EL SALVADOR

1. INTRODUCTION

1.1 The Study Team has submitted the Progress Report (1), 10 copies in English and 20 copies in Spanish, to the Government of the Republic of El Salvador. Consequently, a series of meetings were held from April 11th to 27th 2000 in San Salvador, El Salvador to discuss the report submitted. A list of officials attending in the above meetings is given in the Annex-1.

2. ISSUES AND DISCUSSIONS

2.1 Various issues were discussed and clarifications on the Progress Report (P/R) (1) were made. Subsequently appropriate consensus was reached during the meetings. These issues, clarifications and consensus are outlined in the following paragraphs.

2.2 Comments on the P/R (1)

Team explained that the P/R (1) describes the present situation of Solid Waste Management (SWM) in San Salvador Metropolitan Area (AMSS) and based on such data figures on the present situation, projection for future (e.g., waste generation ratio, service coverage target, municipal income projection, etc.) will be attempted in order to formulate a SWM master plan with the target year 2010. Observation by counterpart on the present dimensions in later stage of the study will greatly impinge a smooth advancement in formulating the master plan. Therefore, Team requested the Salvadoran side to confirm the data figures on present situation and/or give final comments on those data figures in a short period.

The Salvadoran side agreed that they will soon confirm the data figures and give final comments, if any, in writing by May 5th, 2000.

Team appreciated the thoughtful cooperation by the Salvadoran side for the Study.

2.3 Environmental Legislation

Counterpart members from the Ministry of Environment (MARN) informed that the General Regulation of the Law on Environment (Ley General del Medio Ambiente) is issued on the Official Gazette on March 29th, 2000, and that the Regional Agreement on Hazardous Waste Trans-boundary among Central-American countries was subscribed since 1992.

Team appreciated the advancement on environmental legislation in El Salvador and valuable information given by the MARN.

2.4 First Seminar of the Study

Team informed that the first seminar of the Study is planned to be held on July 4th 2000 (Tuesday) in San Salvador metropolitan area. Details of seminar program would like to be discussed with C/P. Team added that the second seminar of Study will be held for one day at around September 26th 2000.

The Salvadoran side agreed the seminar dates and showed their interests in it.

2.5 Counterpart Visit in Japan

As clarified in the previous Minutes of Meeting, one person of Salvadoran side is invited to Japan at around August 2000.

Salvadoran side named Arq. Mario Lungo for this visit, who is the chief counterpart and the director general of OPAMSS. His visit will be about 2 weeks from end of August to beginning of September 2000.

Team appreciated that this nomination comes from strong interests for this Study by Salvadoran side and active participation by the counterpart institution.

2.6 Framework for the Formulation of the Master Plan

P/R (1) gave diagnosis on municipalities' financial ability to bear the SWM costs and suggested that dimensions of financial capability varies depending on municipalities. In response to that, Salvadoran side requested the Team to examine whether or not each municipality in AMSS has feasibility to use MIDES landfill based on of geographical features (i.e. distance) and financial capacity of each municipality.

Team responded that it is not clear to date whether when where and by whom a transfer station be constructed and operated closer to the waste generation center, which supposedly will reduce the municipalities' transportation costs to a great length. Unless it is clarified, examination on financial sustainability till target year 2010 for 14 municipalities is hardly possible or it becomes unrealistic because there should be too many hypotheses when such examinations are attempted. Team added that if the status quo (i.e., baseline) is not clarified, projection for future situation and examination on its financial sustainability is not possible.

Salvadoran side understands the Team's comments and stated that the status quo (baseline) is changeable and variable because some municipalities have already been requesting MIDES to discount the disposal fee, since the initial commitments of the COAMSS-CINTEC agreement have not been complied with yet. On the other hand, the Salvadoran side explained that MIDES is requesting the required permissions before the corresponding authorities to execute the construction of a recycling plant with transfer facility in the

municipality of Apopa, which is located far away from the solid waste generation center.

Besides, the Salvadoran side and the Team agreed that in order to achieve a better understanding between the contracting parties, COAMSS and CINTEC should review the agreement in the following items: terms of reference, technical specifications and work schedule with defined execution terms, which the current original document lacks.

Salvadoran side clarified that it is not defined by whom a transfer station closer to the solid waste generation center be constructed and operated. Hence, irrespective of what entity will be in charge of construction/operation of transfer stations, Salvadoran side assumes the baseline for the Study as follows.

- The transfer station is located near to the waste generation center of AMSS, which will operate exclusively as a transfer station.
- If a municipality transport the waste to a near transfer station, disposal fee should be US\$18.0/ton plus VAT as a maximum, if all the commitments of the reviewed agreement are complied with.
- If a municipality transports the waste as far as to the MIDES landfill or Apopa recycling facility with transfer, disposal fee should be US\$12.0/ton plus VAT approximately.

Accordingly, the Salvadoran side requests the Team to examine whether or not each municipality in AMSS has feasibility to use MIDES landfill by taking into account the geographical features (i.e. distance), the financial capacity of each municipality and according to the above 3 conditions.

Team confirmed the above 3 assumptions by Salvadoran side as the given condition for the Study, and stated that lesser hypotheses will enable such examinations more realistic.

Team appreciated the indication by the Salvadoran side for establishing a frame for the M/P formulation.

2.7 Pilot Projects

Team explained the outline of 3 pilot projects of the Study and requested the Salvadoran side to actively cooperate and participate in them.

The Salvadoran side replied that they will actively cooperate and participate in these pilot projects.

3. CONCLUSION

- 3.1 With the above clarifications and modifications, the P/R (1) was approved by the Salvadoran side.

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HRS. L

Annex-1
List of Meeting Attendants

Name	Position
Dra. Ana María Majano	Minister of the Ministry of Environment and Natural Resources
Dr. Herbert Betancurt	Vice-minister of the Ministry of Public Health and Social Assistance
Dr. Héctor Ricardo Silva	Coordinator of the Mayors Council for San Salvador Metropolitan Area (COAMSS) and Mayor of San Salvador
Arq. Mario Lungo	Executive Director of the Planning Office for San Salvador Metropolitan Area (OPAMSS)
Ana Yanci Ortiz	Assistant of COAMSS
Celina Cruz	Coordinator of the Environmental Unit, OPAMSS
Ronald Wilfredo Ruiz	Technical Officer, Environmental Unit, OPAMSS
Violeta Lardé de Rodríguez	Technical officer, Direction of International Cooperation & Projects, MARN
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Plácido Lemus	Coordinator of Medical Waste, Department of Environmental Sanitation, MSPAS
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Manuel de Jesús Olivares	Municipality of San Salvador (District No. 5)
José Gonzalo Castillo	Municipality of Mejicanos
Luis Alfonso Ramírez Reyes	Municipality of Ciudad Delgado
Mario E. Aguilar	Municipality of Cuscatancingo
José Manuel Ramírez	Municipality of Cuscatancingo
Eva R. Linares	Municipality of Ayutuxtepeque
Mauricio Antonio Balcáceres	Municipality of San Marcos
Miguel Ángel Gutiérrez	Municipality of Nueva San Salvador
Juan Roberto Martínez Escapini	Municipality of Nueva San Salvador
Saúl Antonio Benítez	Municipality of Soyapango
Francisco Cruz Sorto	Municipality of Ilopango
Pedro Arnulfo Casco	Municipality of San Martín
Luis Alberto Romero	Municipality of Apopa
Alfredo Barbarena	Municipality of Nejapa
Germán Iván Canjura Lemus	Municipality of Tonacatepeque
Hiroshi Kato	Leader of the JICA Study Team
Tadaya Yamamoto	Member of the JICA Study Team
Carlos Meléndez	Member of the JICA Study Team
Ikuo Mori	Member of the JICA Study Team
Guido Acurio	Member of the JICA Study Team
Masaharu Kina	Member of the JICA Study Team
Tamotsu Suzuki	Member of the JICA Study Team
Ayako Ido	Member of the JICA Study Team

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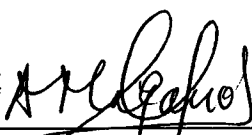
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**MINUTES OF MEETING
ON
THE PROGRESS REPORT (2)
OF
THE STUDY ON REGIONAL SOLID WASTE MANAGEMENT
FOR
SAN SALVADOR METROPOLITAN AREA
IN
THE REPUBLIC OF EL SALVADOR**

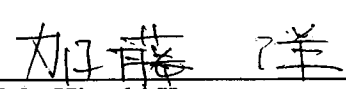
**AGREED UPON BETWEEN
MINISTRY OF ENVIRONMENT AND NATURAL RESOURCES,
MINISTRY OF PUBLIC HEALTH AND SOCIAL ASSISTANCE,
MAYORS COUNCIL FOR SAN SALVADOR METROPOLITAN AREA,
PLANNING OFFICE FOR SAN SALVADOR METROPOLITAN AREA,
AND
THE JICA STUDY TEAM**

San Salvador, July 6th, 2000



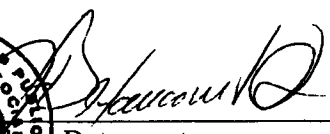


Dr. Ana María Majano
Minister, Ministry of Environment and
Natural Resources




Mr. Hiroshi Kato
Leader of the JICA Study Team

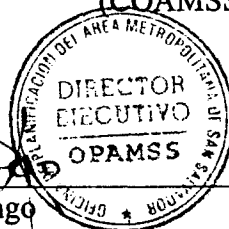





Dr. Hector Ricardo Silva Arguello
Minister, Ministry of Public Health
and Social Assistance



Dr. Hector Ricardo Silva Arguello
Coordinator of the Mayors Council
for San Salvador Metropolitan Area
(COAMSS) and Mayor of San Salvador





Mr. Mario Lungo
Executive Director of the Planning
Office for San Salvador Metropolitan
Area (OPAMSS)

MINUTES OF MEETING ON THE PROGRESS REPORT (2) OF THE STUDY ON REGIONAL SOLID WASTE MANAGEMENT FOR SAN SALVADOR METROPOLITAN AREA IN THE REPUBLIC OF EL SALVADOR

1. INTRODUCTION

- 1.1 The Study Team has submitted the Progress Report (2), 10 copies in English and 20 copies in Spanish, to the Government of the Republic of El Salvador. Consequently, a series of meeting were held from June 29th to July 6th 2000 in San Salvador, El Salvador to discuss the report submitted. A list of officials attending in the above meetings is given in the Annex-1.

2. ISSUES AND DISCUSSIONS

- 2.1 Various issues were discussed and clarifications on the Progress Report (P/R) (2) were made. The remarks were received and will be subject to analysis. These issues, clarifications and consensus are outlined in the following paragraphs.

2.2 Comments on the P/R (2)

Team explained that the P/R (2) describes the framework of Master Plan with the future projection (e.g., waste generation ratio, service coverage target, municipal income projection, etc.) until the target year 2010. If observation by counterpart on the projection methods and/or target figures is given in later stage of the study, it will greatly impinge a smooth advancement in finalizing the formulation of the Master Plan. Therefore, Team requested the Salvadoran side to confirm such projection methods and target figures, or to give final comments on those in a short period.

The Salvadoran side agreed that they will soon confirm the projection methods and target figures and give final comments, if any, in writing by July 20th, 2000.

Team appreciated the thoughtful cooperation by the Salvadoran side for the Study.

2.3 Second Seminar of the Study

Team informed that the second seminar of the Study is planned to be held on September 25th 2000 (Monday) in San Salvador metropolitan area. If the Salvadoran side has any specific request for the seminar topics, Team would like to respond to such request.

The Salvadoran side agreed the seminar dates and showed their interests in it.

2.4 Recommendation for Administration of Commercial/Institutional Waste Collection Services

The counterpart of the San Salvador municipality requested of the Team that recommendations be made for administration issues of commercial/institutional waste collection services.

Team replied that the P/R (2) outlines several recommendations on these issues, and the DF/R will attempt to respond to such request by amplifying said recommendations in the P/R (2).

The Salvadoran side appreciated the Team's reply.

2.5 Follow-up for the Master Plan Implementation

The Salvadoran side expressed strong interests in implementing the Master Plan with the initiative of COAMSS/OPAMSS, and requested of the Team to continue consulting support for COAMSS/OPAMSS even after the DF/R submission, by means of not only Japanese but Latin American Team members dispatch. This is why OPAMSS still lacks professional human resources and such training in the related issues.

Team appreciated their showing strong interests in implementing the Master Plan, but explained that Team is not in the position to reply such request.

Team replied to convey said request to the JICA headquarters, and recommended that COAMSS/OPAMSS should have closer communication with the JICA El Salvador office for the follow-up issues.

3. CONCLUSION

- 3.1** With the above clarifications and modifications, the P/R (2) was approved by the Salvadoran side.

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Annex-1
List of Meeting Attendants

Name	Position
Dra. Ana María Majano	Minister of the Ministry of Environment and Natural Resources
Dr. Herbert Betancurt	Vice-minister of the Ministry of Public Health and Social Assistance
Dr. Héctor Ricardo Silva	Coordinator of the Mayors Council for San Salvador Metropolitan Area (COAMSS) and Mayor of San Salvador
Arq. Mario Lungo	Executive Director of the Planning Office for San Salvador Metropolitan Area (OPAMSS)
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Celina Cruz	Coordinator of the Environmental Unit, OPAMSS
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Violeta Lardé de Rodríguez	Technical officer, Direction of International Cooperation & Projects, MARN
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José Gonzalo Castillo	Municipality of Mejicanos
Luis Alfonso Ramírez Reyes	Municipality of Ciudad Delgado
Mario E. Aguilar	Municipality of Cuscatancingo
José Manuel Ramírez	Municipality of Cuscatancingo
Miguel Argueta	Municipality of Ayutuxtepeque
Mauricio Antonio Balcáceres	Municipality of San Marcos
Víctor Mejía	Municipality of Nueva San Salvador
Jorge Schafik Handal	Municipality of Soyapango
Francisco Cruz Sorto	Municipality of Ilopango
Pedro Arnulfo Casco	Municipality of San Martín
Luis Alberto Romero	Municipality of Apopa
Alfredo Cruz Barberena	Municipality of Nejapa
Germán Iván Canjura Lemus	Municipality of Tonacatepeque
Hidetoshi Kitawaki	Chairman of the JICA Advisory Committee
Hiroshi Kato	Leader of the JICA Study Team
Tadaya Yamamoto	Member of the JICA Study Team
Carlos Meléndez	Member of the JICA Study Team
Ikuo Mori	Member of the JICA Study Team
Victor Ojeda	Member of the JICA Study Team
Masaharu Kina	Member of the JICA Study Team
Kozo Baba	Member of the JICA Study Team
Kunito Ishibashi	Member of the JICA Study Team

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MINUTES OF MEETING
ON
THE DRAFT FINAL REPORT
OF
THE STUDY ON REGIONAL SOLID WASTE MANAGEMENT
FOR
SAN SALVADOR METROPOLITAN AREA
IN
THE REPUBLIC OF EL SALVADOR

AGREED UPON BETWEEN
MINISTRY OF ENVIRONMENT AND NATURAL RESOURCES,
MINISTRY OF PUBLIC HEALTH AND SOCIAL ASSISTANCE,
MAYORS COUNCIL FOR SAN SALVADOR METROPOLITAN AREA,
PLANNING OFFICE FOR SAN SALVADOR METROPOLITAN AREA,
AND
THE JICA STUDY TEAM

San Salvador, September 25th, 2000



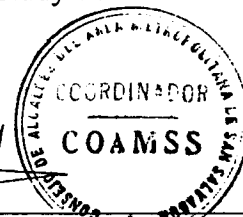
Dr. Ana Maria Majano
Minister of Environment and
Natural Resources

Mr. Hiroshi Kato
Leader of the JICA Study Team

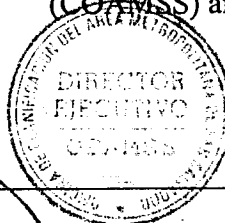
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(COAMSS) and Mayor of San Salvador



Mr. Mario Lungo
Executive Director of the Planning
Office for San Salvador Metropolitan
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MINUTES OF MEETING ON THE PROGRESS REPORT (2) OF THE STUDY ON REGIONAL SOLID WASTE MANAGEMENT FOR SAN SALVADOR METROPOLITAN AREA IN THE REPUBLIC OF EL SALVADOR

1. INTRODUCTION

1.1 The Study Team submitted the following copies of the Draft Final Report to the Salvadoran side.

Volume I	Summary (English Version)	10 copies
Volume I (S)	Summary (Spanish Version)	20 copies
Volume II	Main Report (English Version)	10 copies
Volume II (S)	Main Report (Spanish Version)	20 copies
Volume III	Annex (English Version)	10 copies
Volume III (S)	Annex (Spanish Version)	20 copies
Volume IV	Data Book (English Version)	10 copies
Volume IV (S)	Data Book (Spanish Version)	20 copies

A series of meeting were held from September 19th to 22nd 2000 in San Salvador, El Salvador to discuss the report submitted. A list of officials attending in the above meetings is given in the Annex-1.

2. ISSUES AND DISCUSSIONS

2.1 Various issues were discussed and clarifications on the Draft Final Report (DF/R) were made. Subsequently appropriate consensus was reached during the meetings. These issues, clarifications and consensus are outlined in the following paragraphs.

2.2 Comments on the DF/R

The team requested the Salvadoran side to make comments if any on the DF/R in writing to the JICA El Salvador office or the Team by 16th October 2000 in order to facilitate the smooth completion of the Final Report (F/R) of the study.

The Salvadoran side accepted the request.

Team appreciated the thoughtful cooperation by the Salvadoran side for the study.

2.3 Copies of the Final Report

The Salvadoran side requested the Japanese side to revise the number of copies of the Final Report to be submitted to the Salvadoran side as follows.

VOLUME	REPORT	ORIGINAL	REVISED
Volume I	Summary (English Version)	20 copies	10 copies
Volume I (S)	Summary (Spanish Version)	35 copies	45 copies

Handwritten signatures and initials, including "LRSK" and "AS".

Volume II	Main Report (English Version)	20 copies	10 copies
Volume II (S)	Main Report (Spanish Version)	35 copies	45 copies
Volume III	Annex (English Version)	20 copies	10 copies
Volume III (S)	Annex (Spanish Version)	35 copies	45 copies
Volume IV	Data Book (English Version)	20 copies	10 copies
Volume IV (S)	Data Book (Spanish Version)	35 copies	45 copies

The team replied that they would deliver this request to the JICA headquarters.

2.4 Publication of the Final Report

The Salvadoran side requested the Japanese side to maintain access to the Final Report restricted according to OPAMSS discretion for two (2) years, in order to allow a better implementation of the recommendations by the Study.

The team replied that they would deliver this request to the JICA headquarters.

The Salvadoran side appreciated the Team's reply.

2.5 Implementation of the Master Plan

The both sides agreed that it is vital for MARN, COAMSS/OPAMSS and the respective municipalities to continue their efforts in order to realize the M/P even after the termination of this study. The Salvadoran side stated that for this purpose, they would like to request the Japanese government to continue consulting support for COAMSS/OPAMSS by means of such as not only Japanese but Latin American Team members dispatch. This is because OPAMSS still lacks professional human resources and such training in the related issues.

Team appreciated their showing strong interests in implementing the Master Plan. Team replied to convey said request to the JICA headquarters, and recommended that COAMSS/OPAMSS should have closer communication with the JICA El Salvador office for the follow-up issues.

2.6 Implementation of the Master Plan

The Salvadoran side expressed their great gratitude to all who are concerned to the Japanese government cooperation for this study. They stated that contribution of this JICA study would be highly appreciable for the improvement of solid waste management of the San Salvador metropolitan area.

The team replied that they were also deeply grateful to the precious cooperation to the study provided by the Salvadoran side and the counterpart members in particular.

3. Conclusion


Handwritten notes and signatures on the right margin, including the initials "HPSK" and a signature.

3.1 With the above clarifications and modifications, the DF/R was approved by the Salvadoran side.

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Annex-1
List of Meeting Attendants

Name	Position
Dra. Ana María Majano	Minister of Environment and Natural Resources
Dr. Herbert Betancurt	Vice-minister of the Ministry of Public Health and Social Assistance
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Belfor Chávez	Municipality of San Salvador (District No. 4)
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Carlos Meléndez	Member of the JICA Study Team
Guido Acurio	Member of the JICA Study Team
Kozo Baba	Member of the JICA Study Team



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