

Japan International Cooperation Agency (JICA)
Ministry of Environment of the Government of Morocco

The Study on the National Guidelines for
Solid Waste Management for
the Kingdom of Morocco

Final Report

Book 2

Guidelines for Improvement of Solid Waste Management
for Urban Communes and Communities

August 1997

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PREFACE

In response to the request from the Government of the Kingdom of Morocco, the Government of Japan decided to conduct the Study on the National Guideline for Solid Waste Management for the Kingdom of Morocco and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA has sent to Morocco a study team headed by Mr. Masato Ohno, Director of Environmental Department, EX Corporation, Ltd., three times between January 1996 to May 1997.

The team held discussions with the officials concerned of the Government of Morocco and conducted field surveys in the study area. After the team returned to Japan, further studies were made and the present report was prepared.

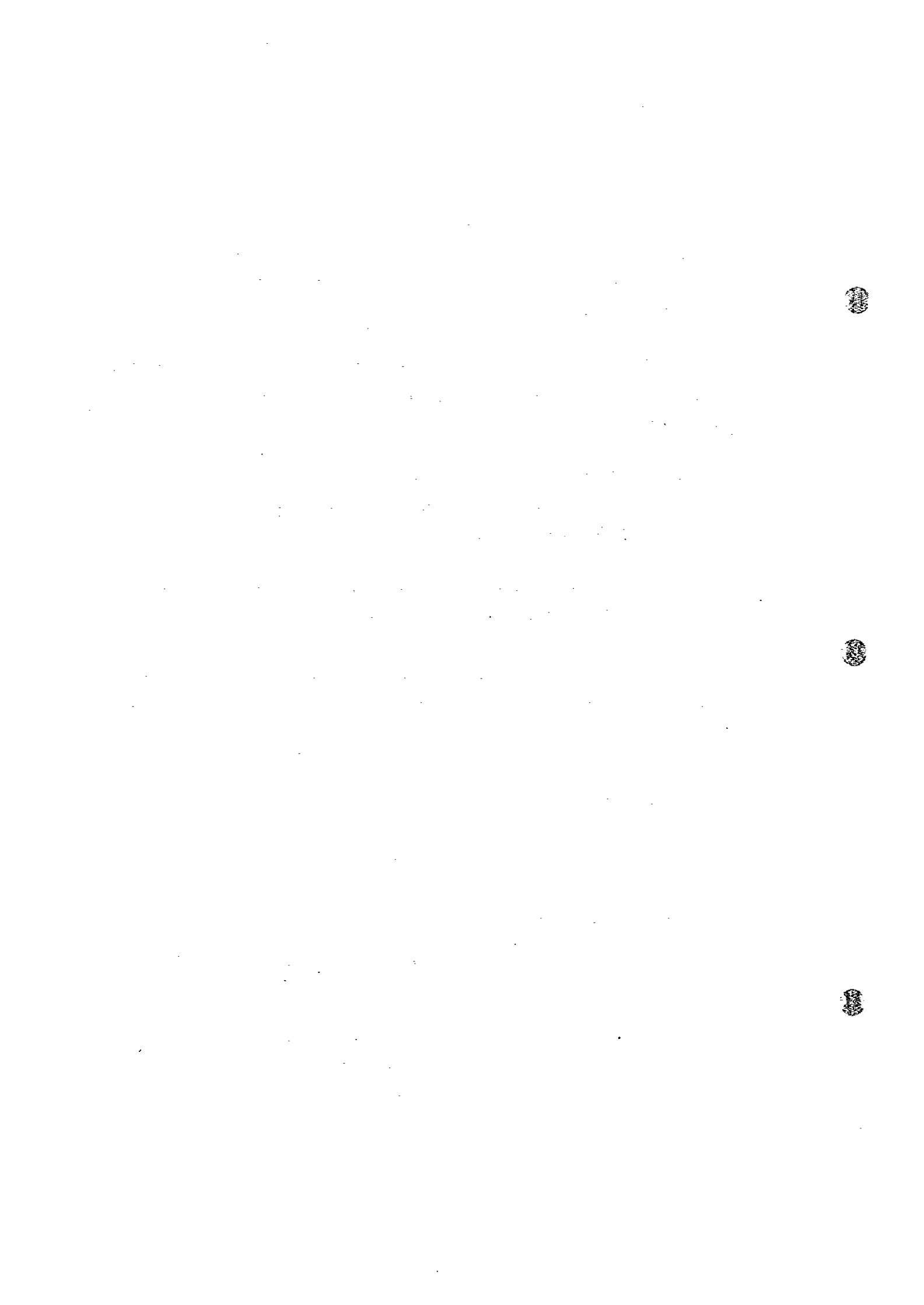
I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Kingdom of Morocco for their close cooperation extended to the team.

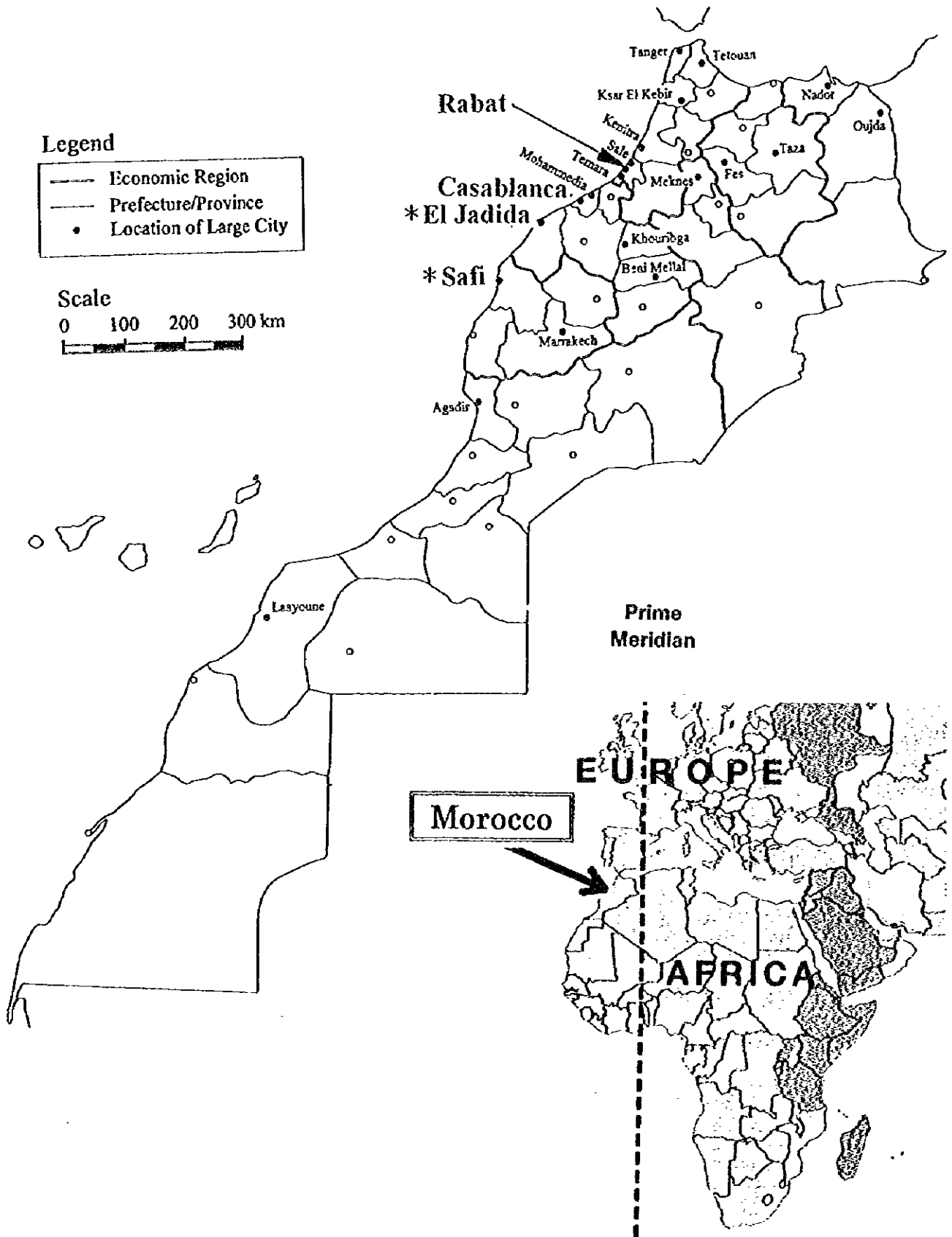
August 1997



Kimio Fujita
President
Japan International Cooperation Agency



Location Map of Morocco



* Safi and El Jadida were selected for the second year study of this project.



**Guidelines for Improvement of Solid Waste
Management for Urban Communes and
Communities**

**Part 1
Management and Institutions**

Exchange Rate (as of July 1997)

1 Dirham = 0.115 US dollars = 13 yen

Abbreviation List

BMH	Municipal Health Service
CNE	National Council for Environment (Conseil National de l'Environnement)
CRE	Regional Council for Environment (Conseil Régional de l'Environnement)
DAHIR	Law, Decree, or other legal document signed by the King
DH	Dirham
EU	European Union, E.E.C
FEC	Fond D'Equipement Communal Communal Fund for Equipment
GDLC	General Department of the Local Government, MoI
HCS	Haul Container System
MoA	Ministry of Agriculture
MoC&I	Ministry of Commerce and Industry
MoE	Ministry of Environment
MoEM	Ministry of Energy and Mines
MoH	Ministry of Health
MoI	Ministry of Interior
MoPW	Ministry of Public Works
NP	National Promotion
ONEP	National Office for Drinking Water
SWM	Solid Waste Management
USE	Under Secretariat for Environment, MoI
Veh.	Vehicle

Final Report

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Current Book and Part are marked with “*”.

- Book 1** **Guidelines for National Level Policies and Actions for Solid Waste Management**
- Part 1 National Strategy
 - Part 2 Laws, Institutions, and Finance
 - Part 3 Industrial and Hazardous Waste
 - Part 4 Infectious Waste
- *Book 2** **Guidelines for Improvement of Solid Waste Management for Urban Communes and Communities**
- *Part 1 Management and Institutions
 - Part 2 Technical Guidelines
- Book 3** **National Action Programs for Solid Waste Management**
- Book 4** **Solid Waste Management Plans for Safi and El Jadida**
- Part 1 Solid Waste Management Plan for Safi
 - Part 2 Waste Disposal Plan for El Jadida
- Book 5** **Summary**
- Book 6** **Supporting Report**
Current Conditions of Solid Waste Management in Morocco
- Book 7** **Data Book**
Appendices to Solid Waste Management Plan for Safi
- Book 8** **Japanese Summary**

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THE STUDY ON THE NATIONAL GUIDELINES FOR SOLID WASTE MANAGEMENT FOR THE KINGDOM OF MOROCCO

INTRODUCTION

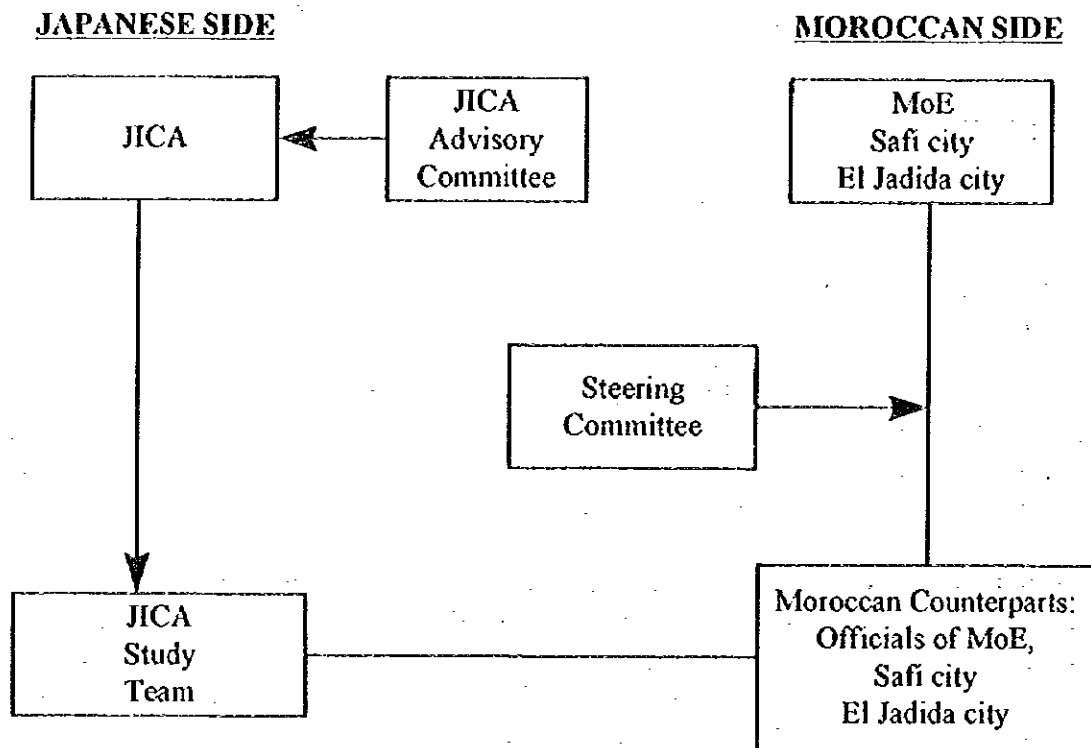
1. Objectives of the Study

The objective of the Study is to strengthen the capacity of solid waste management at both national and local levels. This study has been executed by Japan International Cooperation Agency (JICA) based on the request from the Government of Morocco. JICA commissioned the study to a joint venture comprising EX Corporation and Yachiyo Engineering Co., Ltd. The joint venture has organized a study team comprising of 11 specialists. The Study has been conducted jointly by Japanese consultants and their Moroccan counterparts.

The study period was about 18 months from January 1996 to July 1997. The Study is divided into two phases, the first phase being from the beginning up to September 1996, and the second phase being from October 1996 till the end. The objective of the first phase study is to formulate the guidelines and action plan for solid waste management at both national and local levels. The objective of the second phase is to apply the guidelines formulated and check their applicability. Two cities, i.e. Safi and El Jadida were selected for the second phase. The Study team in collaboration with the counterparts in Safi city have formulated a plan for improvement of solid waste management. In addition, we have implemented a public education campaign (demonstration project) aiming at strengthening citizens' understanding and cooperation concerning city cleansing. We have also formulated a plan for improvement of disposal of solid waste for El Jadida. It is expected that the plans will serve as a model for other local authorities in Morocco.

2. Study Organization

The study organization is shown in the figure below. This study has been conducted jointly by the Study Team led by Mr. Ohno and the Moroccan counterparts, i.e. officials of Ministry of Environment, Safi city and El Jadida city. A key counterpart agency on the Moroccan side is the Ministry of Environment. For the smooth execution of the study, the Moroccan side formed a steering committee comprising of representatives of the Ministry of Environment, Ministry of Interior, Ministry of Health, Ministry of Public Works, and Ministry of Commerce and Industry. Mrs. Layachi, Director, Department of Observation, Study and Coordination, Ministry of Environment served as chairman of the steering committee. On the Japanese side, an advisory committee was formed for the study. Dr. Masaru Tanaka, Director, Department of Waste Management Engineering, the National Institute of Health, served as chairman of the Advisory Committee.



MoE: Ministry of Environment

3. Reports

This study has produced the following reports:

1. Inception report
2. Progress report (1)
3. Interim report
4. Progress report (2)
5. Draft final report
6. Final report

The final report consists of the following Books:

- Book 1** Guidelines for National Level Policies and Actions for Solid Waste Management
 - Part 1 National Strategy
 - Part 2 Laws, Institutions, and Finance
 - Part 3 Industrial and Hazardous Waste
 - Part 4 Infectious Waste

- Book 2** Guidelines for Improvement of Solid Waste Management for Urban Communes and Communities
 - Part 1 Management and Institutions
 - Part 2 Technical Guidelines

- Book 3** National Action Programs for Solid Waste Management

- Book 4** Solid Waste Management Plans for Safi and El Jadida
 - Part 1 Solid Waste Management Plan for Safi
 - Part 2 Waste Disposal Plan for El Jadida

- Book 5** Summary

- Book 6** Supporting Report :
Current Conditions of Solid Waste Management in Morocco

- Book 7** Data Book:
Appendices to Solid Waste Management Plan for Safi

- Book 8** Japanese Summary

All the Book except for Book 8 has been prepared in English and French.

4. Guidelines for Improvement of Solid Waste Management for Urban Communes and Communities (Book 2)

The Guidelines consists of the following two parts:

- Part 1 Management and Institutions
- Part 2 Technical Guidelines

4.1 Purpose of the Guidelines

With urbanization and industrialization, needs for improvement of solid waste management (SWM) services have been growing. SWM services mainly include waste collection/transport, street sweeping, and disposal. Improvement of these services requires the examination of different aspects of SWM including institutions, management, finance, regulations, operation and technology, and public education.

It is hoped that these guidelines will be useful to local governments for examining these

aspects and finding ways to improve their SWM.

Populations of Moroccan communes vary from 10,000 to 300,000. Although an appropriate SWM system differs according to the size of commune, many recommendations given in the guidelines are directed to local communes irrespective of their size. For aspects where size of commune matters, recommendations and analysis are made accordingly.

4.2 Structure of the Guidelines

The Guidelines for Improvement of Solid Waste Management for Urban Communes and Communities consist of the following two parts:

- Part 1: Management and Institutions (this book)
- Part 2: Technical Guidelines (separate book)

Part 1 contains the following eight chapters:

- Chapter 1 Improvement in SWM and the Role of Senior Local Government Administrators
- Chapter 2 Formulation of a SWM Improvement Plan
- Chapter 3 Management Information and Indicators
- Chapter 4 Organizational Reforms
- Chapter 5 Privatization
- Chapter 6 Finance
- Chapter 7 Municipal Regulations
- Chapter 8 Public Education

4.3 Who Should Read the Guidelines ?

It is recommended that all senior local government administrators including Presidents, Vice Presidents, and Secretaries-General should read Part 1 (Chapter 1 at least). Municipal Engineers should read both Parts 1 and 2. Managers of SWM sections and Equipment Workshops should read Part 2.

CHAPTER 1 IMPROVEMENT IN SWM AND THE ROLE OF SENIOR LOCAL GOVERNMENT ADMINISTRATORS

1.1 Increasing Demand for SWM Services and Improvement Needs

SWM Is Not So Simple

Many people, including senior local government officials, tend to think that solid waste management consists of a series of very simple activities of collecting and dumping waste, and therefore that it does not require any modern technology or management skills. This idea is outdated now. Planning, engineering, and management techniques must be developed to ensure that communes will be able to satisfy future demands for SWM services.

Increasing Demand for SWM Service Improvement

SWM in Moroccan communes in the past has adapted to, and been appropriate for local socio economic conditions, but growing urbanization and industrialization are causing the demand for SWM services to increase. And the increasing demand makes the existing SWM unsuitable and insufficient.

Need to Upgrade Disposal Standards

The demand for the SWM services has been increasing not only quantitatively but also qualitatively. The need to improve SWM service quality is increasing. An example is the need to upgrade standards of waste disposal. At present, Moroccan communes practice open dumping at their disposal sites. Open dumping is the cheapest method of disposal, but environmentally not sound because it may cause environmental pollution and affect public health. In future, urban communes and communities should implement controlled landfills, as explained in the Technical Guidelines.

International Trends and Morocco

Waste disposal standards in the international community including the EU have been made more stringent to meet requirements of public health and environmental protection. It is the policy of the Moroccan government to be in conformity with international norms as much as possible in the field of environment protection. Narrowing the gap between Moroccan domestic disposal standards and international ones will make Moroccan exports more acceptable to foreign countries.

Efficiency Improvements and Necessity for Planning

SWM service costs will inevitably increase due to the increase in demand. Therefore, it is very important for communes to improve service efficiency, and save costs wherever possible. Improvement of efficiency in waste collection requires planning expertise as well as sound technical and management judgment.

1.2 Types of SWM Services and Aspects Studied for Improvement of SWM Services

1.2.1 Types of SWM Services

Types of SWM services provided by urban communes and communities are as follows:

1. Collection and transport (including transfer if feasible)
2. Street sweeping
3. Disposal and intermediate treatment (if feasible)

Urban communes that are not integrated into an urban community are responsible for all the above activities, while other urban communes are responsible for waste collection and transport as well as street sweeping. The urban communities are generally responsible for waste disposal, intermediate treatment and transfer.

The latter two services (waste transfer and intermediate treatment) should be provided only if they prove feasible. Transfer and intermediate treatment are discussed in Book 2-Part 2.

1.2.2 Aspects Studied for Improvement of SWM Services

Improvement of SWM services involves the following aspects:

1. Institutional and organizational aspect
2. Management aspect
3. Financial aspect
4. Legal aspect (municipal regulations concerning SWM)
5. Citizens' cooperation
6. Technical and operational aspect

These Guidelines (Book 2-Part 1) discuss all aspects except for the technical and operational aspect which is discussed in Book 2-Part 2.

The urban Communes and Communities should study all the aspects for the improvement of the SWM services. It is suggested that senior local government administrators should look into all the aspects except for the technical aspect, which should be mainly examined by municipal engineers.

1.3 SWM Service Objectives and Actions

1.3.1 SWM Service Objectives

The objective of solid waste management is to improve environmental sanitation in the commune and the citizens' comfort through the removal of solid waste from living areas, and disposal of waste in a sanitary manner.

To achieve the above objectives, urban communes and communities must provide adequate levels of SWM service in an efficient manner. Adequacy and efficiency are the two essential criteria for judging SWM services.

The above objectives may be summarized in such motto as More and Better (services) with Less (money), which is a motto for any private company.

1.3.2 Actions Required to Achieve the Objectives

The urban communes and communities should take the following actions:

A. To improve the adequacy of service

- 1) Expand coverage of waste collection service
- 2) Improve quality of waste collection service
- 3) Reduce illegal dumping
- 4) Upgrade waste disposal standards (introduce controlled landfill)

B. To increase service efficiency

- 5) Increase efficiency of waste collection and street sweeping

The above items are explained respectively as follows.

1) Expansion of Coverage of the Collection Services

From view points of both environmental sanitation and democracy (equal access to environmental sanitation), it is desirable that urban communes should provide all the citizens with waste collection service of sufficient frequency.

In general, Moroccan urban communes provide good waste collection services in the central urban areas, while collection services in fringe areas are poor.

An important issue is the expansion of service coverage. (See note below for the definition of service coverage.) The urban communes should:

1. investigate and know the collection service coverage by area (sub-district), and
2. study factors leading to the service deficiency.
3. plan for improvement

Possible causes for urban communes not collecting waste in certain areas include:

- narrow streets which prevent access by collection vehicles,
- low density of houses in fringe areas,
- rapid urbanization

The urban communes should consider some methods of collection including:

- use of communal containers in fringe areas
- use of small trucks for narrow streets
- improvement of roads

Note on Waste Collection Coverage

There are 2 main indicators used for measuring the waste collection coverage:

1) Waste collection coverage in terms of population = a/b

where,

- a. Population who receive waste collection service once a week or more frequently
- b. Total population of a commune

2) Waste collection coverage in terms of waste quantity = c/d

where

- c. Waste quantity (weight) actually collected by a commune
- d. Waste quantity generated

(Note: To use weight of waste for measurement is better than using volume because waste volume changes very much depending on the bulk density of waste.)

This indicator is an environmental indicator. The lower the ratio, the greater the amount of illegal dumping, which pollute the environment.

2) Improvement of Quality of Waste Collection Services

Frequency and regularity of the collection service are two major factors affecting service quality, which is closely related to the level of satisfaction of the service recipients.

Appropriate Collection Frequency

Waste collection frequency in Morocco varies greatly between communes and different types of area. Moroccan urban communes typically provide daily collection service in urban areas, while collection services in fringe areas are none or very poor. The provision of collection service of equal quality should be considered as a goal of the SWM service for the democratic communes.

Appropriate Collection Frequency

In European and Japanese cities, twice a week collection is dominant. From view points of both public health and citizens' comfort, twice a week collection service causes no problems if the citizens use appropriate waste containers. There is no reason why Moroccan communes cannot apply twice a week collection. It is

necessary for the urban communes to carry out public education campaigns when they change the collection frequency.

It is strongly recommended that the Moroccan communes should re-consider appropriate collection frequency. Reduction of collection frequency in the central urban areas would contribute to cost saving through which the urban communes can improve the collection service for the fringe areas and other areas where the service is not sufficient.

3) Reduction in Illegal Dumping

Illegal dumping places (black points) exist in most communes including those communes which claim that they collect 100 % of waste. Illegal dumping places are eyesores and sources of public health risk, and therefore should be eliminated.

Typical locations of black points are open spaces in residential areas, places along railway lines, slopes behind houses, and in fringe areas.

It is necessary for the communes to increase the waste collection coverage and frequency to reduce illegal dumping.

The communes should study why black points are created. They should also investigate locations of black points, and put them on a map. Reduction in the number of black points can be used as an indicator of improvement in waste collection service.

4) Upgrading of Waste Disposal Standards (Introduction of Controlled landfill)

Most Moroccan communes practice open dumping at waste disposal sites. Open dumping is the cheapest method of disposal. It leads to generation of fire, smoke, and leachate (waste water generated from waste deposit), which threatens public health and environment. Leachate may contaminate ground water resources used as drinking water by the citizens living nearby the disposal site.

It is strongly recommended that urban communes and communities should consider the introduction of controlled landfills. The required level of controlled landfill depends on the distance between the site and the nearest water resource or residential area or other conditions including topographic, and hydro-geological conditions. See Part B of Book 2-Par 2 for details of controlled landfill.

The cost of controlled landfill would be several times higher than that of the open dumping currently practiced in Morocco. However, such higher cost will increasingly be justified as growth in population density and industrial and economic growth place increasing pressure on the environment, and as the environmental and health costs of uncontrolled dumping also increase

Once the ground water is polluted by leachate generated from disposal sites, it takes a long time to clean the water. Pollution of well water may necessitate the provision of costly piped water for affected people. Smoke, smell and flying waste which are

generated from open dumping sites affect the quality of life of the people if not their health. The continuation of such conditions will be more and more unacceptable to affected citizens with the increasing awareness for the human rights in a democratic society, and an increase in living standards.

5) Improvement of Service and Cost Saving

The actions 1) to 4) discussed above require increases in costs. This section discusses possible cost saving, without lowering the level of the services, through improvement of service efficiency.

a. How is Service Efficiency Measured ?

There are two interrelated indicators of efficiency, i.e.,

- operational efficiency and
- cost efficiency.

In order to know the efficiency of the collection service, each commune should use some indicators.

Indicators Used for Measuring Operational Efficiency

Typical indices used for measuring operational efficiency include:

- waste quantity (tonnage) collected per truck per day,
- waste collected per person per day or per minute,
- length of street swept per person per day, etc.

Chapter 3 explains how to prepare these indicators.

The urban communes should use these indicators for measuring the operational efficiency of the collection service and street sweeping. Measurement of operational efficiency is helpful for the communes to identify inefficient activities.

Indicators Used for Measuring Cost Efficiency

The best indicator to measure cost efficiency is the unit cost spent for collection of 1 ton of waste (Dirham/ton). The urban communes should use this indicator. The administrators and municipal engineers should know the unit cost. To estimate the unit costs, we must know both waste collection against quantity and waste collection. Both investment and operation costs should be included. Method calculating unit cost is shown in Chapter 3.

To measure either operational efficiency or cost efficiency, the urban communes must know the quantity of waste collected. The only way to accurately estimate the waste collection quantity is to use a truck scale. It is strongly advised that urban communes or communities should purchase a truck scale, or make arrangements to share one with another municipality.

Necessity for Developing a Capacity to Estimate SWM Costs

Most Moroccan communes do not know unit costs of waste collection. The best way to accurately estimate SWM costs is to have a separate accounting system for SWM. However, the introduction of a separate accounting system would be extremely difficult under the current financial system. However, it is possible and strongly advised that the Moroccan commune should estimate SWM costs by using existing cost information and assumptions. This is the task of municipal engineers.

b. What are Possible Areas the Communes and Communities Should Examine to Increase Efficiency and Save Costs ?

Administrators and municipal engineers of the Communes and Communities should examine the following areas to increase service efficiency and save costs.

Institutions and Management

1. Use of contractors for SWM services, particularly waste collection and street sweeping services.
2. Elimination of redundancy in manpower and re-organization of a SWM section
3. Improvement of work discipline of employees
4. To require citizens to comply with waste discharge manner requested by the communes
5. Introduction of waste collection at night and two work shifts (if budget for truck purchase is limited.)

Operation/Maintenance and Equipment Choice

6. To choose efficient operation system and equipment (trucks and containers)
7. Improvement of maintenance system of trucks

Each area (activity) is discussed below:

(I) Use of Contractors for SWM Services

Administrators of the urban communes should seriously study the use of contractors for SWM services

- a. Use of contractors for SWM services has been increasing in many countries because contractors have proved more efficient than local governments. Judging from experience of some countries including Malaysia, Indonesia, Japan and France, it is estimated that costs of using contractors for waste collection range between 60 % - 90 % of the costs of the service directly provided by local governments. The average would be about 70 %.
- b. In Morocco, there are no data available on the cost of using contractors for waste collection because Moroccan communes have no experience of using contractor for waste collection. The urban communes of Ain Sebaa and Hay Hassami in Casablanca intend to use contractor. The future experience of Ain

Sebaa would be useful for other Moroccan communes.

- c. SWM contractors grow and become increasingly efficient as the demand for contractors' services increases and market competition sets in. This would be the case in Morocco.
- d. Administrators of many Moroccan communes have an impression that the use of contractors is more costly than using own equipment and employees. However, it would not be the case. First, cost comparison should be made on the same conditions concerning service coverage and frequency. Second, most communes do not know costs of their service. SWM costs should include not only operational expenditures but also depreciation cost of trucks and other equipment evaluated at the current price. Overhead costs (salary of communes' employees indirectly involved in SWM) should also be partly included.

(2) Elimination of Redundancy in Manpower and Re-organization of a SWM Section

- a. It is useful for communes to compare the number of workers involved in collection and street sweeping services with those of other communes with similar population.
- b. Re-organization is discussed in Chapter 4.

(3) Improvement of Work Discipline of Employees

- a. In general, a large difference between contractors and communes exists in the level of workers' discipline, which depends on the work incentive system provided by the organization.
- b. Communes should design and introduce some incentives as well as a system of evaluation of workers' performance.

(4) To Require Citizens to Comply with the Manner of Waste Discharge Requested by the Communes

- a. Waste collection efficiency can be greatly improved with increases in citizens' cooperation with respect to waste discharge; types and sizes of waste bin, time of discharge and location of bins.
- b. Communes should prepare a regulation which specifies details concerning waste discharge.
- c. Communes should carry out a campaign to inform citizens of appropriate manner of waste discharge.

(5) Introduction of Waste Collection at Night and Two Work Shifts

- a. There are cases and places where night collection is more efficient than day time collection due to less traffic on the roads at night.
- b. Some Moroccan communes including Taza have already introduced night collection and two work shifts (day and night). The results are generally successful.

(6) To Choose Efficient Operating System and Equipment (trucks and containers)

- a. There are various operational and technical aspects to be reviewed by municipal engineers, including waste collection methods, equipment, routes, collection zoning. Optimum operation systems and equipment differ by characteristics and size of collection zones as well as quantity and quality of waste collected.
- b. Choice of an efficient operation system can be made based on a comparison of the efficiency of the different equipment/operation systems currently used. Knowing the waste collection amount by types of equipment/operation system is a prerequisite for the comparison of efficiency. A truck scale is needed to measure the amount of waste collected.
- c. A time and motion study of collection activity is useful to evaluate its efficiency. See Par A of Book 2-Part 2 for time and motion study.

(7) Improvement of Maintenance System of Trucks

- a. Truck operation rates (measured in terms of the average number of days trucks are available per period) depend very much on the condition of the trucks. To maintain trucks in good condition, both preventive maintenance and daily maintenance are required. See Part A of Book 2-Part 2 for truck maintenance.
- b. Communes should consider the use of private workshops for preventive maintenance. This is the case in many countries.

1.4 Planning and Decision Making

1.4.1 Interrelationships in the Planning Process

Analysis and planning are essential to improve SWM. Formulation of an improvement plan requires analysis of alternatives and interrelationships among essential and desirable actions and the funds available. In formulating a SWM improvement plan, the following activities are required:

1. Setting improvement goals and targets
2. Planning technical means to achieve targets
3. Estimation of funds needed to achieve the targets
4. Estimation of and negotiation for funds available

The relationships among these activities can be schematically shown below:

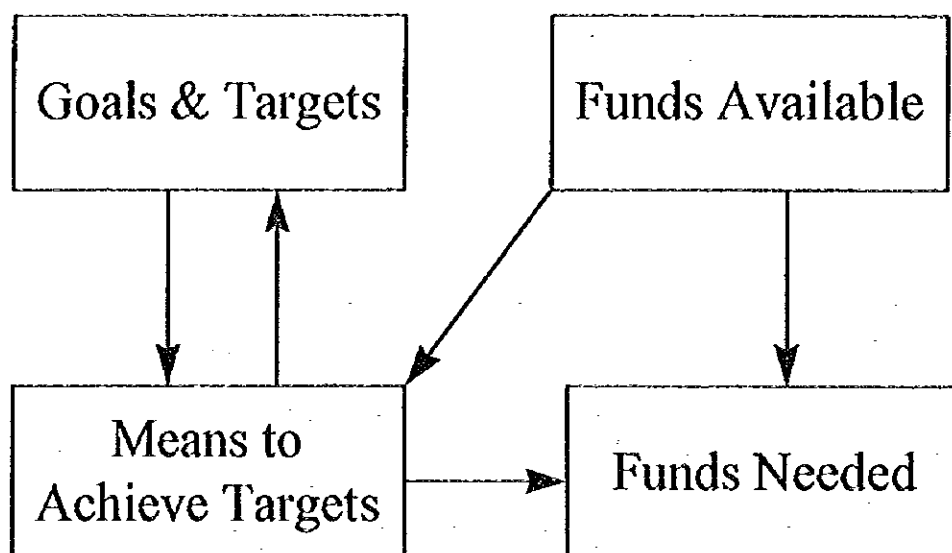


Fig. 1.4-1 Interrelationships Among Different Activities in the Process of Formulation of a SWM Improvement Plan

Refer to Section 2.3 of Chapter 2 for explanation of each activity.

1.4.2 Administrators' Tasks - Understanding, Judgment and Decision Making

As can be seen from the above section, the various planning activities are linked to each other. An implementable plan cannot be formulated without analysis of the alternative measures and interrelationships among the different activities in the planning process.

The involvement of high level local government officials in the planning process is essential. They should understand the contents of the plan, and make judgments and decisions on important matters such as setting targets and level of expenditures. To set feasible and appropriate targets requires not only technical judgment on the impacts of investment on public health and environmental protection, but judgment on suitable investment levels and financial affordability. The latter judgment can be made only by high level officials (with assistance from a financial expert), because this type of judgment requires policy and judgment on prioritization between different sectors. An improvement plan will remain just a paper plan if there is no commitment and involvement of senior local government officials.

1.5 Strategic Issues

Strategic issues for Moroccan local governments in connection with SWM are:

1. Privatization of SWM Services
2. Upgrading of Disposal Standards (Introduction of controlled landfill) and financing
3. Level of SWM costs

It is strongly advised that the Administrators of local governments should seriously consider the above issues. The following sections discuss briefly the issues.

1.5.1 Privatization of SWM Services

It is strongly advised that all communes should seriously consider the feasibility of use of contractors for SWM service because in many countries the use of contractors has proved to be the most effective way to reduce the service cost and improve the service quality. In many countries, average costs of using contractors typically is about 70 % of the cost of using own equipment and manpower.

In Morocco, during the first few years of the privatization, the use of contractors for waste collection/transport service might be higher than the above typical averages because there is almost no market for this type of service, and there are not many experienced contractors in Morocco. It is however expected that the costs of using contractors would decrease as the market expands and competition among contractors sets in.

Use of contractors is often opposed by workers involved in waste collection. Therefore, some compromise (such as slow privatization or transfer of workers to contractors) would be necessary. Interested communes should study the experience of Ain Sebaa Commune.

If the population of a commune is too small to use contractors, joint use by a few adjacent communes should be considered.

In England, France, and other countries, there are many disposal sites owned and operated by private companies. Such private companies are generally very good in the sense that they comply with the environmental standards required by regulations, and are also cost-efficient. BOO (build, operate and own) and BOT (built, operate and transfer) are other options for privatizing waste disposal service. Chapter 5 discusses privatization in detail.

1.5.2 Upgrading of Disposal Standards (Introduction of Controlled landfill) and Financing

Moroccan local governments should seriously consider upgrading their waste disposal standards, and introduce controlled landfill in the near future to minimize environmental pollution and public health risks, which have been increasing with the expansion of urbanization, increasing waste generation, and increasing toxicity of waste.

It is necessary for Moroccan local governments to prepare for the investments required to upgrade of disposal standards. Controlled landfill is probably several times more costly than open dumping. Financing of controlled landfill will thus be a big issue. Local governments should study some financing options including:

- revenue enhancement including introduction of user charges discussed in Chapter 6

- use of FEC loans
- reallocation of budgets among different sectors
- use of private companies (BOO or BOT) discussed in Chapter 5

Inter-communal landfill (developed jointly by two or more communes) should also be considered if there exist constraints on land acquisition or if the communes are too small.

1.5.3 Level of SWM Costs

1) Relationships between Economic Growth, Waste Generation, and SWM Costs

Municipal waste generation increases with economic growth. Generally, the rates of increase in municipal waste generation are less than economic growth rates. For example, Japanese economic growth (GDP growth) during the 20 years from 1965 to 1985 was 4.3 % per year on average, while the municipal waste quantity increased by 3 % per year on average during the same period. The Japanese ratio of the latter to the former (coefficient) is about 0.7 (3 %/4.3%).

Once the system for waste collection and transport service is established and remains unchanged, costs of service will increase in proportion to the increase in waste generation, which is less than the rate of economic growth.

However, disposal costs will increase not only because waste generation increases but also due to application of higher disposal standards (controlled landfill) which will be required in the near future with further urbanization and economic growth. In Morocco, there is a possibility that the ratio of the disposal cost to that of waste collection/transport would increase to 1 to 5 or 1 to 4 in the future.

The global tendency is that the ratio of total SWM costs to GDP will decrease with the economic growth in spite of application of higher SWM standards. This implies that the economic burden of SWM cost for a citizen would not increase but rather decrease in the long run, which is a very happy situation. This ratio in Japan is 0.31 %. The ratios in several cities of different countries are shown below:

- France	0.19 % (1994)
- Japan (average):	0.31 % (1993)
- Surabaya (Indonesia):	0.50 % (1992)
- Bangkok (Thailand)	0.60 % (1991)
- Penang (Malaysia)	0.67 % (1990)

2) Moroccan Case

It is tentatively estimated that SWM services costs per capita spent by the Moroccan local governments is about 0.5 % of GDP per capita at present. (See below for the assumptions used and calculations.) The current estimates are based on an assumption that the current collection service coverage is 75 % on average in urban communes, which however may be higher than the reality.

In Morocco, the ratios will increase in the future when urban communes expand waste collection service coverage and apply higher disposal standards. However, in the long term, the increase of the ratios would stop, and the ratios would even start decreasing with the economic growth. Decision about investments for upgrading disposal standards should be made with this in mind.

Assumptions Used

1. Average per capita municipal waste collection (waste collected by communes) in urban areas is 0.6 kg/capita/day
2. Collection coverage is 75 %
3. Waste collection cost is DH 300 per ton
4. Ratios of waste collection cost, street sweeping cost, and disposal cost are 1 : 0.33 : 0.07, i.e., total SWM cost is 140 % of the waste collection cost alone
5. Moroccan GDP per capita in urban communes is DH 14,000/year

Calculation

1. Per capita waste collection quantity is 0.256 ton/year
(0.6 kg/capita/person x 365 days/year = 219 kg/capita/year = 0.219 ton/capita/year)
2. Per capita waste management cost is DH 69
- DH 300/ton x 0.219 ton/capita/year x 75 % x 1.4 = DH 69/capita/year
3. Ratio of SWM cost to GDP is 0.49%
- DH 69 / DH 14,000 per capita per year = 0.49 %



CHAPTER 2 FORMULATION OF A SWM IMPROVEMENT PLAN

2.1 Need for a SWM Improvement Plan

The existing Moroccan solid waste management (SWM) system is fairly representative of other countries at a similar stage of development. While in the past this has been appropriate given the country's socio-economic conditions, the system is rapidly becoming inadequate as population growth and density increase, as incomes grow and as industrialization proceeds. Increasing volumes of solid waste pose a growing threat to human health and the environment at the same time as the demand for higher standards of service increases. Improvement is thus required.

The improvement of the SWM services requires:

1. re-setting target levels for SWM services from the viewpoints of both citizens' needs and environmental needs
2. changes in organizational and institutional arrangements including better financial management, cost-efficiency, and privatization
3. acquiring the necessary budget

Detailed actions required to facilitate the above objectives include:

1. selection of efficient equipment (trucks, etc.),
2. design of efficient operation system and organization
3. use of optimum number of workers
4. control of workers
5. introduction of a controlled landfill

None of the above listed jobs is easy. It is obvious that those jobs cannot be properly done without an understanding, diagnosis and evaluation of current SWM conditions. To select the most appropriate targets, equipment, operational system, and institutional arrangement, available options for each subject must be examined. These activities are all included in the planning process.

The usefulness of a good improvement plan can be re-stated as follows:

1. find appropriate ways to improve SWM
2. serve as an instrument to convince local councilors and lending institutions such as FEC, and justify investments necessary for planned improvements,
3. promote citizens' confidence in the administration of a local government, which will increase if a plan is publicized and accepted by the citizens

The urban communes are strongly recommended to formulate a SWM improvement plan.

Feasibility Studies

As distinct from the improvement plan, urban communes or communities should

conduct feasibility studies in case they wish to make large investments or acquire loans from FEC or other lending institutions.

Typical investment projects include construction of disposal sites and procurement of trucks.

The purpose of a feasibility study for the project proponents (local governments) is to prepare an investment project, and to determine the justification of investments and financing plan. A feasibility study is used by lending institutions to evaluate the feasibility and loan-worthiness of proposed projects.

A typical feasibility study report on a SWM investment project should include:

1. Purpose of the investment project
2. Benefits expected from the project
3. Detailed content of the investment project (quantity, types and specifications of equipment to be purchased; design of facilities in case of construction of a disposal site)
4. Environment Impact Assessment (EIA) in case of construction of a disposal site
5. Institutional and other arrangements influencing the effectiveness of the projects (Examples include public education and strengthening of the organization.)
6. Implementation schedule
7. Estimated costs
8. Economic and financial evaluation including affordability of the project proponent

It is advised that urban communes or communities should consult with FEC regarding its lending criteria and conditions, as well as methods and contents of a feasibility study required.

2.2 Who Should Formulate a Plan ?

The president of the urban communes and communities should appoint a municipal engineer as task manager responsible for the formulation of a SWM improvement plan. The appointed municipal engineer should formulate the plan.

Administrators should also involve themselves in the planning process because the finalization of an improvement plan requires a series of tasks of understanding, evaluation, judgment and decision making, which cannot be done by the municipal engineer alone.

It is advisable that the president of the local government should organize a SWM committee comprising of a few councilors. This committee should examine the SWM improvement plan, and monitor its implementation, and discuss any matters related to SWM.

It is common for cities in industrialized countries to use SWM consultants for the formulation of a SWM improvement plan and for conducting feasibility studies because

these tasks require professional skills in the fields of planning, engineering and management. It is advisable for urban communes or communities to consider the use of SWM consultants, if available, to have assistance in the formulation of a plan. When urban communes or communities use consultants, the former should involve themselves heavily in the planning process, and review the appropriateness of the plan carefully and thoroughly.

2.3 What Should a SWM Improvement Plan Contain ?

A SWM improvement plan should contain the following:

1. Diagnosis of the conditions related to the existing SWM services
2. Goals and targets of SWM services
3. Technical and managerial means to achieve the goals and targets
 - 1) Equipment, facilities and manpower required
 - 2) Operating systems
 - 3) Organizational arrangements
4. Funds needed to achieve the goals and targets
5. Availability of funds
6. Implementation schedule
7. Responsible persons involved in the implementation

Each activity is explained below:

1. Diagnosis and Evaluation of Conditions related to Existing SWM Services

This section should include the following:

Diagnosis and Evaluation of SWM Service Outputs

1. Waste collection service coverage (ratio of population served to the whole population) in each sub-district
2. Waste collection coverage in terms of waste collection quantity (ratio of waste collected to waste generated)
3. Evaluation of the level of citizens' satisfaction (judging from complaints, etc.)
4. Needs for citizens' cooperation
5. Evaluation of impacts of the existing disposal sites on citizens and environment

Chapter 3 shows methods of estimation of waste collection coverage (the above items 1 and 2).

Diagnosis and Evaluation of Equipment, Operation Systems and Manpower

The following information should be included:

1. Costs of each type of activity: collection, street sweeping, and disposal
2. Unit cost (per ton) spent for collection and disposal
3. Operational efficiency (example: waste quantity transported according to type of truck)
4. Utilization rates for equipment
5. Number of workers and attendance rates

Book 2-Part 2 shows the technical details.

2. Goals and Targets for SWM Services

Goals may be stated qualitatively from the viewpoint of public health and environmental protection. For example, "Make all parts of the city clean and beautiful" or "Eliminate all black points by the year 2000". Quantitative targets should be set for:

- future waste collection service coverage
- level of disposal
- year by which targets should be achieved (step by step improvement should be considered.)

In setting goals and targets, Administrators and municipal engineers should consider the following aspects:

1. Citizens' needs and satisfaction
2. Improvement of public health,
3. Avoidance of environmental pollution
4. Promotion of tourism
5. Funds needed and available

3. Technical and Managerial Means to Achieve the Goals and Targets

Examples include:

1. quantity and types of equipment (trucks and container, etc.) to be purchased
2. operating systems for collection, transport and street sweeping
3. plan for new disposal sites which should include:
 - location and size of the planned site
 - design of the disposal sites
 - types and specifications of facilities
 - landfill operation system
4. managerial and organizational arrangements (See Chapter 4)

A few options should be studied when selecting equipment, operative and management/organization systems.

See Book 2-Part 2 for technical details.

4. Funds Needed to Achieve Targets

Both investment costs (procurement and construction) and additional operation costs should be estimated for each type of activity. Required funds should be estimated for each year of implementation.

5. Availability of Funds

This is a very important aspect, and should be examined before finalizing plan. Not only the financial director, but also the Administrator should study the availability of funds for the execution of an improvement project. Amounts of funds available are not automatically decided. Both the Administrators and a financial director should:

- examine the relative priority of different municipal investments
- examine possible ways to reduce expenditures
- examine ways to increase revenues
- negotiate with FEC for loans if necessary

After having completed the above analysis, information on the following should be stated in the plan:

1. sources of funds
2. amounts of funds to be acquired by sources of funds
3. annual amounts available

If there is a serious gap between the funds needed and funds available, a revenue enhancement plan must be prepared. Such a plan should include target revenues and means to achieve the targets. Chapter 6 reviews possible means of revenue enhancement.

6. Implementation schedule

An implementation schedule should contain the following information:

1. schedule of feasibility study if needed
2. schedule for the preparation of design and specification of equipment and facilities
3. schedule for preparation of tender documents
4. schedule for procurement or construction tendering (including tender announcement, date of tender submission, evaluation and award)
5. schedule for procurement and construction

7. Responsible Persons Involved in Implementation

Implementation failure is often caused by lack of clarity in the sharing of responsibility among involved persons. Responsibility and the role of involved persons should be clearly stated in an improvement plan.

2.4 Interrelationships in the Process of Plan Formulation

Interrelationships between different planning elements are vital for the formulation of a workable plan. The planning elements explained above are not independent of each other. They are very much linked. For example, the availability of funds must be taken into consideration when setting goals and targets for service improvement. However, increasing the SWM budget must be sought if achievement of certain targets is considered necessary. The process of the formulating and finalizing an improvement plan is a process in which choices and interrelationships between necessary and desirable expenditures, and available funding must be continually assessed.

The following figure schematically illustrates a typical process for a SWM improvement plan.

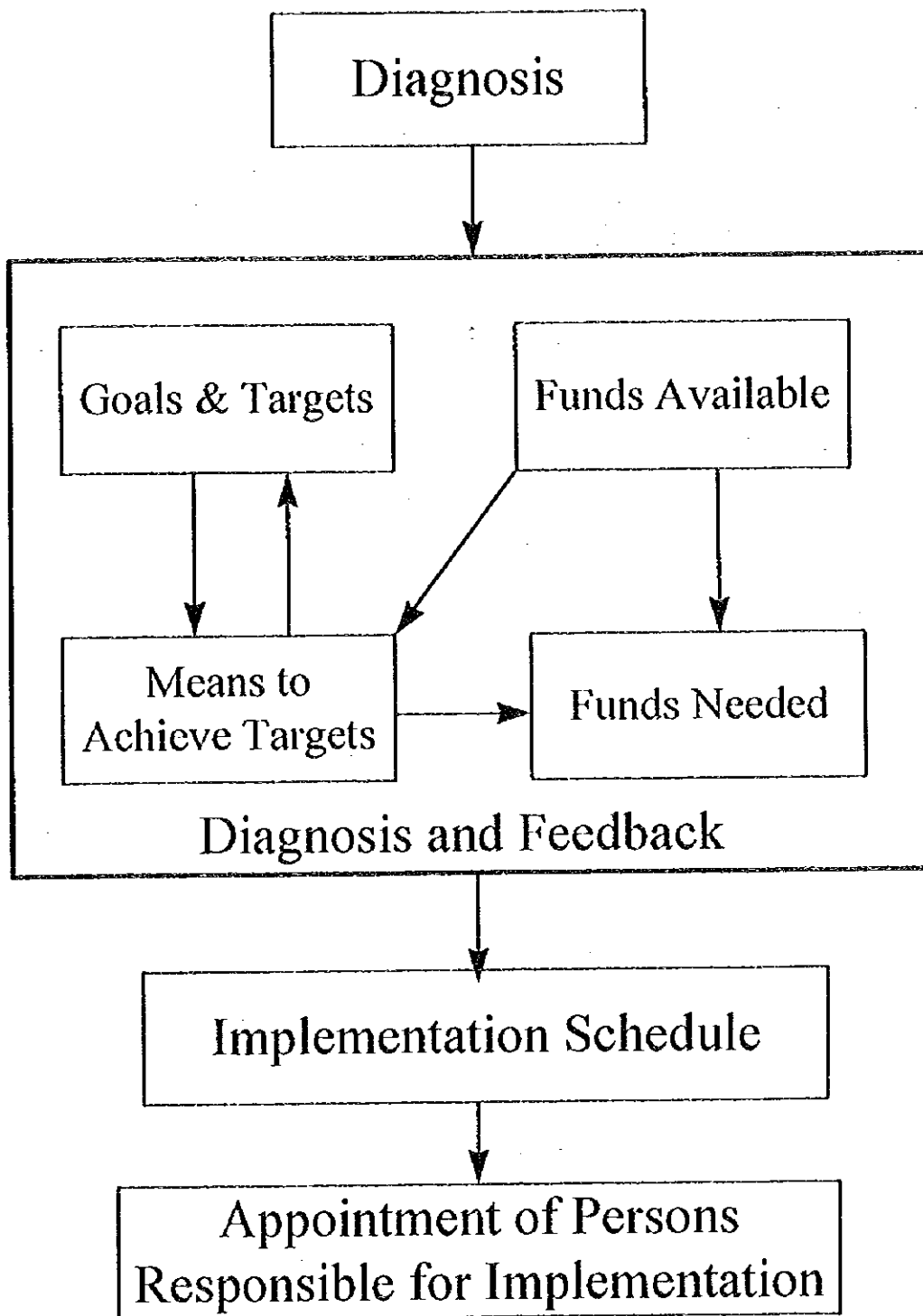


Fig. 2.4-1 Process of Formulating a SWM Improvement Plan

2.5 Planning Cycle - Plan, Do, See

For urban communes or communities, the formulation of an improvement plan is just the first step in bringing about improvements. The usefulness of an improvement plan is appreciated only if and when it is implemented. The implementation of an improvement plan is not the final step, but part of a long-term strategy. Its implementation should be monitored and evaluated to identify further improvement needs and options.

“Plan, do, see” (monitor and evaluate) is a general planning cycle, and applicable for SWM improvement activities.

As long as the demand for SWM improvements are increasing, periodic “plan, do and see” activities are needed.

CHAPTER 3 MANAGEMENT INFORMATION AND INDICATORS

3.1 Two Major Monitoring Aspects for Management - Adequacy of Service and Efficiency of Delivery

Service adequacy and efficiency are two major aspects to which a SWM manager has to pay attention. The SWM service (output) must be adequate not only for the citizens but also from an environmental viewpoint. Efficiency has to be checked in terms of such inputs as money, equipment and labor.

1. Service Adequacy
 - 1) Adequacy for the citizens
 - 2) Adequacy from an environmental viewpoint
2. Service efficiency
 - 1) Cost efficiency
 - 2) Operational efficiency
 - 3) Workers' discipline

3.2 Performance Indicators Relating to Service Adequacy and Efficiency

To evaluate adequacy and efficiency, a SWM manager must use performance indicators. The following table shows a list of indicators used to measure SWM service adequacy and efficiency.

Table 3.2-1 Major Indicators Used for Measuring SWM Service Adequacy and Efficiency

Monitoring Items	Major Indicators
1. SWM Service Adequacy	
1) Adequacy for Citizens	a. Service coverage * (Ratio of population receiving waste collection service to the total population)
	b. Frequency of waste collection service by area (Number of waste collections per week)
	c. Complaints from citizens
2) Adequacy from an environmental viewpoint	a. Service coverage in terms of waste quantity * (Ratio of waste collection amount to the waste generation amount)
2. SWM Service Efficiency	
1) Cost efficiency	a. Unit cost of SWM service * (Unit cost spent for collection and transport of waste of one ton)
2) Operational efficiency	a. Waste amount collected per truck per day
	b. Waste amount collected per worker per day
	c. Waste amount collected per worker per second
3) Workers discipline	a. Attendance rates

The indicators with “*” are of particular importance. The following sections explain the respective indicators except for operational efficiency indicators which are explained in Part A of Book 2-Part 2.

Service Coverage in terms of Population

Service coverage in terms of population is estimated by the following formula:

Service coverage in terms of population = A/B

where,

A: Population in an area served with waste collection service with frequency of at least once a week

B: Population in the area

Waste collection service coverage should be estimated for each sub-district of a commune to identify sub-districts with insufficient collection service. It is useful for the communes to make a map showing the level of the coverage by sub-district.

Generally, central parts of the communes are well served. In the future, provision of the service for peripheral areas will be a major issue. The urban communes should consider some economical waste collection system such as using large containers for collection in peripheral areas.

According to the answers to the questionnaires sent to 22 urban communes by the JICA Study Team in 1996, the majority of the communes (70 %) answered that collection coverage is more than 90 %. 50 % of the communes that answered stated that coverage is 100 %. These answers contradict the fact that there are no communes without black points (illegal dumping). It seems therefore that most urban communes overestimate the waste collection coverage.

It is the responsibility of each commune to estimate the service coverage more accurately. Knowing the real situation is the first step for improvement of the service.

Service Coverage in terms of Waste Quantity

Uncollected waste is mostly illegally dumped. Illegal dumping is an eyesore and a source of environmental pollution, and poses public health risks.

Communes must know two figures to know the service coverage in terms of waste quantity. First, the quantity of waste collected by the commune. Second, the quantity of waste generated. The waste collection coverage can be estimated by dividing the former figure by the latter. The service coverage in terms of waste quantity is defined as follows:

Service coverage in terms of waste quantity = C/D

where,

C: Waste quantity (weight) actually collected in an area for a certain period

D: Waste quantity (weight) generated in an area for a certain period

The best way to know the waste collection quantity is to use a truck scale which should be placed at the disposal site. Some Moroccan communes estimate the waste collection amount by multiplying truck capacity by the number of trips made by trucks assuming that the trucks are full, which however is not always the case. Therefore, the waste collection quantity tends to be overestimated. Communes should make certain assumptions about the extent to which trucks are fully loaded; which cannot be always 100 %.

It is advised that an urban commune which does not have a truck scale should make an arrangement to use a truck scale owned by an enterprise for one week or so for measurement. The commune must ask the enterprise and drivers to cooperate for the measurement. Drivers are required to visit a place where the truck scale is located before going to a disposal site, and visit again the place of the truck scale to have the empty truck weight measured. The difference in weight measured before and after dumping waste is the weight of waste transported.

To know the household waste generation amount, it is advised that an urban commune should carry out a household waste generation survey, which is explained in Part A of Book 2-Part 3.

A practical way to estimate waste generation amount per capita is to use data on waste collection quantity in an area where 100 % of waste is collected. In such an area, the waste generation amount is equal to the waste collection amount.

In Moroccan communes where there are not much industrial waste, the collection service coverage in terms of waste quantity is approximately the same as collection service coverage in terms of population.

Technical Notes on Estimation of Waste Quantity

1. Waste generation quantity changes by day and season. These changes have to be considered in deciding on the required waste collection capacity.
2. In Morocco, the weight of collected waste may decrease by 5 - 10 % as water is drained or evaporated from the collected waste during storage or transport of waste.
3. Those decreases have to be considered in estimating waste collection coverage in terms of weight.

Unit Cost of SWM Service

The importance of knowing the actual unit cost of SWM service cannot be

overemphasized. This is the most relevant indicator of service efficiency. By knowing the actual unit cost of the service provided by a commune, the commune can compare the unit cost with unit costs of other communes or contractors. Judgment on the use of contractors cannot be made without comparison of the unit SWM costs between the commune and a contractor. The unit cost can be estimated by the following formula:

$$\text{Unit cost of SWM service} = A/B$$

where,

A: total costs of SWM incurred for certain period (preferably 1 year)

B: total weight (ton) of waste collected and transported to a disposal site for the same period

Costs should be estimated for each type of service, i.e., waste collection, disposal and street sweeping.

The communes have a tendency to underestimate unit costs by 1) underestimating the real SWM costs (A), and overestimating the quantity of waste collected (B).

There may be cases where some communes underestimate SWM costs by 50 %, and overestimate the waste collection quantity by 50 %, the resulting effect being an underestimation of unit cost by one third (1/3) of the true cost. (Underestimated cost 50 % divided by overestimated quantity 150 % equals to 0.33).

A wrong estimation of waste collection quantity and costs may lead to a wrong judgment on the efficiency and adequacy of SWM service, the commune's budget allocation, and use of contractors. To avoid this situation, use of a truck scale is strongly recommended. A truck scale is a strong weapon for the urban communes and communities for evaluation of the existing situation and for identification of improvement needs. (Note: A truck scale would cost about DH 200,000 per unit.)

Estimation of SWM Costs

SWM costs (A) include not only:

1. Operational costs such as salaries, fuel, spare parts, but also
2. Capital costs (amortization of purchase costs of trucks, containers and other equipment; and depreciation of construction costs of maintenance workshop and administration buildings (partial); as well as interest payments), and
3. Overhead costs (a part of salary of personnel indirectly involved in SWM, such as clerks, accountants, engineers and administrators in proportion to a ratio of time spent for SWM relative to the total work time)
(For example, if a municipal engineer spends 25 % of his time for SWM, 25 % of his salary should be added to the SWM cost.)

It is not easy for the urban communes to estimate the SWM costs under the existing accounting system where SWM costs are not separated from other costs. However, the communes can estimate the SWM costs by making some assumptions on various costs including amortization costs of trucks and indirect costs.

CHAPTER 4 ORGANIZATIONAL REFORMS

4.1 Introduction

This chapter addresses improvement in SWM through organizational strengthening. It is an over-simplification to assume that SWM problems solely relate to inadequacy of financial resources. In fact, a clear definition of functions, and adoption of a rational organization are also necessary. There are many challenges and constraints, such as an increase in the production of waste, lack of available space for disposal sites, lack of discipline on the part of the users, and so on. All require an organizational ability to respond if SWM operations are to be satisfactory.

The basic conditions which govern the need for SWM must be taken into account. These conditions, such as evolution of the population, nature of waste, and socio-economic circumstances, should be evaluated in order to propose SWM objectives and resources. A rural commune, or an urban commune with low population, requires very simplified structure for its SWM, while for an agglomeration such as that of Casablanca or Rabat, it will have to choose a much more elaborate organizational structure.

To define guidelines for these structures, we will successively analyze the operational functions necessary for the optimal management of solid waste, the structure which may strengthen management capability, and the structure required for human resource development. Since we know that there is no unique typical organization, we will describe the organizational criteria needed to improve the present situation whenever this should be required according to the area or population of the municipality.

4.2 Strengthening Operational Functions

SWM is carried on at two operational levels. Collection takes place at the commune level while in the 14 main urban agglomerations, transfer and disposal is carried out by the urban communities. Our proposals will involve functions concerning SWM at these two levels.

4.2.1. Functions of SWM at the Commune Level

To give a good definition of the optimal functioning of SWM in the communes, we propose the following methodology :

1. Listing the different functions required for efficient SWM at the commune level,
2. Analysis of differences between the required functions and the existing situation,
3. Identification of the differences which may exist between the existing functions and those which are necessary, and the possible approaches for strengthening the functions of SWM
4. Preparation of an organizational plan for an improved SWM system.

4.2.1.1 Listing the Different Functions Necessary for Efficient Functioning of SWM at the Commune Level

We must also distinguish between a hierarchy of functions : functions of management and operational functions, and a hierarchy of decisions.

(1) The Functions of Management

The functions of management concern the administration and strategic choices; it comprises the following headings.

- Planning
- Conception and implementation of activities
- Administration and supervision
- Coordination
- Personnel management
- Definition of tasks, procedures and internal rules
- Cost management
- Information function
- Training
- Public relations

Each of these functions is defined as follows :

a. Planning Function

This should be based on the following information : population census, regional development, land-use plan, and other plans drawn up by the commune. From these elements, it prepares short, middle, and long term plans. It is at this level that the administrators should define the objectives assigned to SWM. It is then advisable, according to these objectives, to evaluate the human and material means necessary for its implementation.

b. Conception and Implementation of Activities

According to the constraints and alternative scenarios identified in the short, middle and long term plans, local decision-making bodies should select the policies and plans of action for SWM that are appropriate for their commune.

c. Administration and Supervision

If the plan of action is enforced at the operational level, the management task is to explain its objectives, and to motivate the personnel in order to achieve them. It controls the right application of actions provided in the plan from the viewpoint of quality as well as from that of quantity (evaluation of results and the productivity of services). It participates in actions of quality control and of prevention of accidents. It centralizes the data available on the evolution of services and the operational statistics which result from this. It also includes the consideration of users' complaints.

d. Coordination Function

It coordinates between the different services of SWM, and also between the other services of the commune, the urban community, the Province, the Prefecture, the Wilaya, even the Region.

e. Personnel Management

It consists of recruiting personnel according to the procedures appropriate to the status of the municipal workers. To look after the evolution of their careers. To give at least once a year an evaluation of each member of personnel. To penalize offenses.

f. Definitions of Tasks, Procedures and Internal Rules

These are the rules which permit the different services to work in harmony, and without conflict of responsibility.

g. Cost Management

Cost management is to plan, record and analyze the expenses and the potential benefits of SWM activities. It displays in summary form the key financial indicators for each SWM service. It presents a connection between budgeted and actual expenditures.

h. Information Function

This function consists of collecting the information distributed by the services of the commune, by the specialized publications, and the organs of the government, concerning SWM. It sends these data in synthetic form to the concerned persons and services. It contributes via its action to the permanent training of personnel.

i. Training Function

Through programs of training adapted to the various levels of qualification and task, this function contributes to improving the efficiency of SWM personnel. It enables the personnel to improve their qualifications, and consequently an increase of vocational motivation. It also is a means of preventing accidents at work.

j. Public Relations

It organizes campaigns intended for the public to inform it of the actions carried out in the field of SWM, and to educate it in order to get its assistance in punctual actions of cleansing. It informs the media (newspapers, radio, television) of the significant actions in the field of SWM.

(2) Operational Functions

The operational functions cover the activity of SWM services, namely.

- Service planning
- Operational management

- Logistics
- Inspection
- Reports

Each of these headings should be defined as follows.

k. Service Planning

This is the definition of the truck collection routes, and the sweeping sectors, and the assignment of human and material resources.

l. Operational Management

It is for the operational management to implement the SWM plan of action in the communal territory. For this it selects the human and the material means defined in the plan of action. It implements the operational organization of the human and material means as efficiently as possible and according to the collection routes and the sweeping sectors. It conducts the execution of actions provided in the plan. It faces up to the inescapable imponderables which cannot be taken into account at the planning level.

m. Logistics

This function is the technical support of the previous one, using technologies and methods appropriate for the circumstances of the commune and to the objectives of the plan. It provides maintenance and repair services. It participates in improvement of operational efficiency through appropriate technical innovation. It informs the other functions of its findings, including the performance of equipment being used.

n. Inspection

This has several aspects, including the control of actions provided for in the plan quantitatively as well as qualitatively. It includes quality control and the prevention of accidents, and evaluation of productivity and performance. It should also examine the users' complaints and find a remedy for them.

o. Reports

It is the responsibility of the operations manager to receive the reports of the different SWM services, in particular the daily record of each truck. A synthesis of these reports should be made and given to the communal executives to permit them to estimate the qualitative and quantitative evolution of SWM.

(3) Function of Decision-making

This function is different from the two previous ones. Decision-making should permit the resolution of solutions to the problems which will be posed at the level of the different functions. The conclusions to which the practice of SWM may lead will give rise to many decisions. We must distinguish between three sorts of levels of

decision according to the level of decision-makers.

- Top management decision
- Middle management decision
- Operational management decision

4.2.1.2 Analysis of SWM Functions Represented in Moroccan Communes

In the inquiry carried out in 22 urban communes and 5 urban communities, the trends of SWM organization in Morocco, and in particular the functions of SWM existing in these communes, are taking shape. However, it is advisable to emphasize that the analysis has involved the most populated communes in order to have a good quantitative evaluation of the extent of the problems. From an institutional viewpoint, these communes are a priori the most structured, so it is therefore likely that certain functions described below would not apply in communes with less population.

To analyze the situation of his commune, the President should ask himself the following questions.

- In your commune, have SWM functions been identified ?
- Have you defined the tasks of each function?
- Do these functions give satisfactory results?
- If the answer is no, it is advisable to analyze each function to remedy the identified inadequacies.

To help analyze the functions, it is useful to answer the questions related to each of them.

(1) The Function of Top Management

a. Planning

Do the communal officials practice planning? To answer this question, it is useful to ask these officials if the following functions are fulfilled in their commune :

- Is there any plan for the establishment of new services of waste collection?
- Is there any program for purchasing new equipment?
- Is there any planned improvement program?
- Is it planned to consult private companies?
- Is there any plan for financing SWM?
- Is there any plan for treating waste, including selection of sites, and treatment processes?
- Is there any program for developing human resources and or for resource recovery?

If the answer to these questions is no, this means that SWM planning is not yet a part of communal policy.

b. Conception and Implementation of Activities, Administration and Supervision, Coordination

- Is there any policy and any plan for SWM?
- If yes, do SWM services follow the established plan?
- Are objectives and priorities defined for SWM?
- If yes, are SWM objectives achieved?
- Is there any supervision of SWM services?
- Do SWM services function adequately?
- Is there any evaluation system for the quality of services?
- If so, what are evaluation criteria are used?
- Is there any system of data collection?

c. Personnel Management

- What are the criteria for personnel selection and recruitment?
- Are these criteria based on objective appreciation of the nature of the work?
- Is there any personnel evaluation?
- Is the system of personnel evaluation efficient?
- What are the means of promotion used to motivate personnel?
- Are the penalties provided for in the statutes of the communal function actually enforced?

d. Definition of Tasks, Procedures, and Internal Rules

- Is there any definition of tasks for each category of SWM job?
- Is there any book of procedures?
- Are there any internal rules?

e. Cost Management

- Is there any analytical accounting for the management of the commune's budget?
- Is there any analytical accounting for the different SWM services?
- What are the costs of SWM?
- What is the cost of each truck per day? Per hour? Per km?
- What is the cost of SWM per inhabitant?
- Is there any provisional budget of investments for the year? For the next five years?

f. Making Reports

- Who collects information concerning SWM?
- Is there any newspaper for SWM?
- What documentation is available in the commune concerning SWM?
- Is there any information for the commune's workers on news which concerns them?

g. Training

You should ask the following questions.

- Is a driver able to fill the circuit form for his own truck?
- Have any directions been written to complete the circuit forms?
- Do the workers execute the directions given to them by their chiefs?
- Is discipline respected? For example, punctuality during working hours?
- What is their knowledge of security instructions?
- If this is not the case, training courses on security should be organized.
- Is there any person in charge of security in a position to provide these courses?
- What are the training courses necessary for the drivers and the unskilled workers?
- Are there any internal regulations which fix the rules to be respected, and the offenses not to be committed?
- Is there any available guide for the prevention of accidents?

h. Public Relations

- Are any information campaigns organized by the commune to educate users on SWM?
- Is there any SWM education in the schools?
- Have any pamphlets been distributed which urge people to keep the commune clean?
- Have any messages on SWM been broadcast by radio and/or television?

(2) Operational Functions

i. Service Planning

- Is there any planning of routes for collection trucks?
- Is there any planning for sweeping sectors?
- Is there any plan for cleaning according to festivals and other events?
- Is there any plan for cleaning the markets?

j. Operational Management

- Are you satisfied with the functioning of your services?
- If the answer is no, it is advisable to analyze each item of each function.
- If it is an organizational problem, the level at which the problem exists should be identified.
- Is the head of the service competent?
- Is he qualified to give orders?
- Is discipline respected?
- Are the available resources adequate?
- Is there any daily report which accounts for the services?
- Is the service organization established by an operation plan?
- What happens in case of absence of one or several drivers or workers?

- What happens in case of breakdown of one or several trucks?

k. Logistics

- Is there any preventive maintenance of trucks?
- Are there repair records for each truck?
- Is there any management of spare parts?
- Is there any stock inventory of spare parts, at least once a year?
- Is there any record of in-goings and out-goings of spare parts?
- Is there any logistic consultation in case of purchasing parts for collection trucks?

l. Inspection

- Who controls SWM services?
- What means of transport do the persons in charge of this control have?
- Is there any P.O Box for users' complaints?
- Is there any free phone number for the users?
- Is there any inquiry in case of complaint by members of the public?

m. Reports

- Is there any record of routes for each truck to be filled everyday?
- Is there any truck scale at the entrance to the disposal site?
- If yes, is there any weighing record?

(3) The Function of Decision-making

Is there any satisfactory preparation for decision-making?
What is the instruction procedure which leads to a decision?

The commune should decide who should make decisions. Is it the President? Or his vice president who is in charge of SWM? Or else, is it the municipal engineer? As mentioned above, there are three levels of decision-making : top management decisions, decisions relating to the heads of services or departments, and decisions relating to the operational officials.

Top management should decide for important cases :

- The policy and the objectives related to SWM,
- The strategy and priorities to be respected,
- Investments amounting to more than 20 000 DH,
- Employment and assignment of personnel : executives and foremen.

Once these questions are raised, the answers may be analyzed. Certain functions may not be represented in the commune, however, they do not seem to be essential. Other may need to be created. Alternatively, the function may exist but should be redefined.

4.2.1.3 Identification of improvement needs in the existing functions

In answering the questions raised above, it is possible to identify the level of organization achieved for SWM in your commune. It is then possible to intensify the solutions necessary for improving SWM. In order to bring these solutions into operation, there are many measures that should be taken. Many of them can be determined by the motivation of the personnel at little extra cost. In a commune that is not overpopulated, the hiring of a high quality executive will permit the resolution of most of the functional problems..

a. Planning

The lack of this function for SWM leads to irrational investment decisions. When waste collection trucks are not replaced in time, their operating costs become very high. On the other hand, a vehicle that is purchased before the one to be replaced is out of service may be underused or not used.

In order to put this function in place, you should:

- hire an official to assume this function.
- constitute a working group including the persons involved in SWM planning.
- monitor operations.

A five-year plan should be drawn up to evaluate the needs for personnel, equipment and facilities for SWM. This plan will be brought up to date every year so as to take into consideration the information and new data obtained during the previous year. According to the size of the commune, the completion of this plan requires work that can last from some days to several months. It may also be subcontracted to a consultant.

b. Conception and Implementation of Activities, Administration and Supervision, Coordination

This function is the responsibility of administrators and technical officials. In order to measure the quality of SWM services, management should set itself some targets:

- Productivity measured by the ratio of the number of the collected tons per number of employees,
- Effectiveness measured by the ratio of the number of the served users per employee of SWM,
- Performance : 100 % of population covered by collection service,
- Increase of the recycling rate of paper-cardboard, plastic and organic materials,
- Reduction of discharged waste,
- Repair workshop always functioning ,
- For the whole service minimization of complaints from users.

It is also necessary to coordinate with the urban community in terms of transfer stations and disposal. We will analyze it in 4.2.2. "the functions of SWM at the level of the urban community".

c. Financial

A major obstacle in the way of SWM improvement is the lack transparency with regard to costs. Due to the inability to evaluate them, the drawing up of short and middle-terms plans presents a problem. It is difficult to draw a distinction between proposals from the private sector and the costs of public services.

In order to take into consideration all SWM costs, its activities should be gathered in a single center of costs comprising : collection, transport, cleaning, maintenance and disposal. We will develop in 4.3 the possible structures namely public service or service contracted with a private company.

d. Public Relations

Experience proves that information campaigns implemented in schools by teachers have strong impact on pupils. These latter afterwards become the real originators of cleansing within families. The impact of these campaigns on the effectiveness of collection is positive.

e. Training

Training of sewerage workers or street sweepers has not been thought of as important in Morocco. Measures taken in Paris for improving the status of this profession has had two results : on the one hand, the demand for jobs in this field has increased by 10%, and on the other hand, the quality and the effectiveness of the cleansing service has improved.

Section 4.4 "development of human resources" provides training at the communal level. At the national level, the development of human resources has been presented in Chapter 6 of Book 1-Part 2.

f. Operational Functions

The main tasks of SWM are clearly identified: collection, transport, street sweeping, treatment and maintenance of green spaces. On the other hand, the special required actions are typically not the object of precise definition ; these include construction of platforms, installation of security barriers, flags, decoration, elimination of intermediary spots, etc. As a result, this function is disorganized and lacks cost transparency.

Every operational function should correspond to precise specifications. The tasks that are not represented in these specifications should be entrusted to one or several structures which are in charge of carrying them out. The privatization of SWM services is also a means to avoid activities which are not consistent with operational objectives since the company is required to follow the specifications laid down in its contract.

g. Logistics

As we have seen before, this function has an advisory role for the selection of equipment. The heterogeneity of equipment causes problems for maintenance and requires considerable stocks of spare parts, which substantially operating increase costs.

h. Control

The existence of black spots where waste is accumulated is one of the manifestations of a lack of control on the part of the commune in charge of waste collection. The agents of the Municipal Bureau of Hygiene should be able to penalize violators of municipal decrees regarding hygiene, for example, uncontrolled discharges, with the help of fines, the amount of which should be sufficiently dissuasive.

Decision-Making Function

This function is not always carried out at the level at which problems are raised. The survey completed for 22 urban communes reveals that for the communes that answered this question, purchase of spare parts is the responsibility of the financial or accounting service of the commune. Non-routine replacement of spare parts may arise due to unexpected events such as accidents. The decision to purchase replacement parts and thus the degree of urgency rests with the financial department. In practice this often leads to delay in obtaining the parts and thus reduces the efficiency of SWM service.

Proposition

Non-strategic decisions should be decentralized at the operational level, within strict budgetary limits and according to well-defined procedures. The bigger the size of the commune, the further decentralization should be carried by establishing management by objective for each decentralized activity.

4.2.1.4 A Proposed Organizational Plan for the Improvement of SWM

The last stage is the implementation of the appropriate solutions to your commune. In case the problems that you should deal with are not numerous, and for the size of your commune is reasonable, it would not be necessary to change your organization. The reinforcement of your personnel's responsibilities would be enough.

It would be advisable to :

- define clear objectives for SWM and a plan for their implementation,
- put in place two major functions,
- give every official a written definition of his responsibilities according to SWM objectives,
- appoint a decision-maker for every decision level,
- divide tasks between the two functions,
- assign these functions to high level managerial staff.

Concerning the case of a commune in which issues are more consistent, four major options for reorganization present themselves :

- conserve management functions within the communal administration and subcontract the operational functions to one or many private companies,
- privatize services management,
- create a municipal public company,
- modify the current organization (see 4.3.1. Proposed Structure for the Communal Organization of SWM).

The SWM functions at the communal level are extended by those of the urban community for the management of transfer stations and disposal facilities.

4.2.2 SWM Functions at the Urban Community Level

We will follow the same methodology as that adopted at the level of the commune :

1. Listing the different functions necessary for the good operation of SWM at the level of the urban community,
 2. Comparison between the necessary functions, referred to in 1, and the existing situation,
 3. Identification of the differences which may exist between the existing functions and those that are necessary, and for possible approaches for the reinforcement of SWM functions,
 4. A proposed organizational plan for the functions necessary for the improvement of SWM.
- a. **Listing the Different Functions Required for Efficient Operation of SWM at the Urban Community Level**

The same functions exist at both the community and commune levels, namely planning, decision-making, operational, logistic, control, information, training, financial and coordination.

b. **Comparison Between the Functions Necessary for SWM and the Current Situation**

At the urban community level, the above-mentioned functions are often brought together for only one or two persons are in charge of this activity. Planning, operational, logistic and control functions are carried out by the person in charge of SWM. This latter follows up the activity of the private service providers and the efficient execution of the service contract, if any, which is the case in Casablanca.

Information, training and financial functions are followed up by the urban community or the Wilaya. The education campaign for the cleansing of the urban community of Rabat "Rabat: Clean City" was organized in June 1996 by the Wilaya of Rabat-Sale Urbanism and Environment Department.

The decision-making and coordination functions are assumed by administrators and technical officials through delegation.

c. Identification of the Differences Between the Existing Functions and Those that are Necessary, and Possible Approaches for Reinforcement of SWM Functions

Every function is important but it is advisable not to create additional structures, which may increase the costs of the urban community. We will focus our recommendations on the priority functions for SWM, which are planning, training and financial.

Waste disposal is an activity which requires long-term action. Investments are large. A good knowledge of the nuisances which pollute environment leads to the adoption of more efficient technologies, but which are expensive. The function of planning is therefore indispensable in this field and should be one of the priorities of the technical officials of SWM.

The evolution of techniques, already referred to, renders the training of SWM personnel necessary. It should be given to all decision-makers as well as to executives. It must be underlined that the management of facilities, which represent investments amounting to several millions of DH, requires a thorough knowledge of the way in which they should be operated. We will give more details concerning the implementation of training in the Section "Human Resources Development".

The financial function should give a transparent view of the costs of every facility, transfer station or disposal site. Every facility should be considered as an autonomous center of costs. It is therefore indispensable that this financial function, even if it deals with other aspects of the urban community, or the Wilaya, shall analytically analyze the costs of individual SWM investments.

4.3 Proposed Structure for SWM Organization

In the previous section, we have reviewed the functions necessary for SWM. We will study in this section the organizational structure which may improve efficiency at the level of the commune, then at the level of the urban community.

4.3.1 Proposed Structure for SWM Communal Organization

In order to allow you to make a choice concerning the optimal structure for your commune, guidelines are given for you. Three structures are possible: optimization without change in the existing structure, putting new structures in place, and privatization. These three structures can be equally appropriate to small, middle, and large communes. Whatever the size of the commune, it would be advisable to recall that it is more efficient for SWM to have a more autonomous organization in comparison with the communal structure because comparing with other functions of the commune results in administrative heaviness, adversely affecting the efficient operation of SWM. We will examine successively:

1. Division of SWM responsibilities and tasks,
2. Optimization of SWM organization without changing the existing structure,
3. Putting in place new structure for SWM.

1) Assignment of SWM Responsibilities and Tasks

Two organizations are possible for SWM, namely direct management by the commune and subcontracting to a private company by means of a service contract.

a. Assignment of Tasks and Responsibilities in the Case of Municipal Operation

In this case, the commune directly assumes the different tasks of SWM. In Table 4.3-1, we will present the assignment of these tasks and their periodicity, and in Table 4.3-2, the level according to which the decisions concerning SWM should be taken.

Domestic waste collection, haulage and disposal are mainly the responsibility of the commune. The communal council and its president are entitled to define the objectives, the priorities and the plans as concerns SWM. Through delegation of authority, the municipal engineer makes operational decisions about SWM, such as frequency of collection trips, schedule of trips, assignment and routes of collection trucks. He is responsible for personnel carrying out collection and transport, street sweeping, watering and disposal services. The municipal engineer and his assistants are also in charge of evaluating these services personnel and promoting them according to their performance.

Table 4.3-1 Assignment of Tasks of SWM and Their Periodicity

Appointment of tasks	Assignment	Periodicity of tasks
Collection and transport	Collection department	Daily
Sweeping and watering	Department of cleansing	Daily
Treatment and disposal	Department of the disposal site or/and of treatment plant	Daily
Maintenance of equipment	Municipal workshop	Daily
Middle and long term plans	Department of plan	Annual
Complaints	Municipal bureau of hygiene	As required
Information/education	Municipal bureau of hygiene	As required
Enforcement of SWM regulations	Municipal bureau of hygiene	As required
Training	Continuing training	As required
Construction and maintenance of buildings and facilities	Department of new works	As required
Budget	Financial department	Annual
Budgetary control	Financial management	As required
Operational control	Technical management	As required
Coordination	Technical management	As required

Table 4.3-2 Level According to Which Decisions Concerning SWM Should Be Taken

Decisions Concerning SWM	Level at They should be Taken
Objectives, priorities and plans of SWM at the level of the commune	President of the commune and the communal council
Budget of SWM	President of the commune and the communal council
Assignment of an executive according to the budget of SWM	President of the commune
Investments over 20 000 DH within the limits of SWM budget	President of the commune
Current expenses below 20 000 DH within the budget	Municipal engineer
Definition of the objectives and the operational organization	Municipal engineer
Assignment of non-executive staff within the budget	Municipal commission of assumption presided by the general secretary
Purchase of spare parts for amounts below 10 000 DH within the budget, and stock management	Head of the workshop
Operational modifications as required	Head of exploitation and corporals

Tables 4.3-1 and 4.3-2 correspond to a highly-structured commune such as the agglomerations of Casablanca and Rabat. In a small commune, several tasks may be gathered within one service, or may be absent like the sweeping and watering service which does not exist within a number of communes.

b. Assignment of Tasks and Responsibilities in the Case of Subcontracting Entrusted to a Private Company

Table 4.3-3 Assignment of SWM Tasks and Their Periodicity

Appointment of tasks	Assignment	Periodicity of tasks
Collection and transport	Private company	Daily
Sweeping and watering	Private company	Daily
Treatment	Private company	Daily
Maintenance of material	Private company	Daily
Middle and long term plans	Planing department	Annual
Complaints	Municipal bureau of hygiene	As required
Information/education	Municipal bureau of hygiene	As required
Enforcement of SWM regulations	Municipal bureau of hygiene	As required
Training	Continuing training	As required
Construction and maintenance of buildings and facilities	Department of new works	As required
Budget	Financial service	Annual
Budgetary control	Financial manager	As required
Operational control of the private company	Technical manager	As required
Coordination	Technical manager	As required

In table 4.3-4, we will present the level according to which decisions concerning SWM should be taken.

Table 4.3-4 Level According to Which SWM Decisions Should Be Taken

Decisions Concerning SWM	Level According to Which They Are Taken
Objectives, priorities, and plans for SWM at the level of the commune	President of the commune and the communal council
Budget of SWM	President of the commune and the communal council
Assignment of an executive for the control of the private companies	President of the commune
Invitation of tenders for the selection of the private company or companies	President of the commune and ratification of the decision by the MoI

Tables 4.3-3 and 4.3-4 correspond to the organization of SWM in the same way as in the case when the commune makes a contact with one or several private companies.

2) Optimization of SWM Organization within the Existing Structure

In communes which do not have a highly-structured organization, it is possible to improve the efficiency of the existing structure by the following principles:

- define clear objectives for SWM and a plan for their achievements,
- put in place two major functions,
- give every official a written definition of his or her responsibilities according to SWM objectives,
- appoint a decision-maker for every decision level,
- divide tasks between the two functions,
- assign these functions to high level managerial staff.

SWM needs to be coordinated with other services of the commune. The general secretary of the commune should lay down, or draft, procedure notes defining the course to be followed for each operation. These procedures will permit avoidance of misunderstandings between the services, hence pointless arbitration and waste of time.

As far as possible, the activities related to SWM should be clearly identified in order to take into account all the costs concerning SWM. If this creates a problem because of the size of the existing facilities, it is convenient to specify the components of SWM. If for example SWM has only a few trucks, which are maintained with the other vehicles of the commune (site vehicles, fire vehicles, ambulances, etc.) in the municipal workshop, such expenses must be charged per vehicle, as it is done by a private garage.

3) Establishment of a New Structure for SWM

For optimal management of solid waste, a decentralized structure is required, as we have just shown. A structure of this type should therefore be looked for whenever the size and the organization of the commune allow for its establishment. We will present the case of a communal organization and that of a private subcontractor.

a. Establishment of a New Communal Structure for SWM

The structure necessary for SWM varies from one commune to another according to objective criteria : number of inhabitants, quantity of waste produced per inhabitant, income of the population, revenues of the commune, existence or lack of industries and hospitals. The analysis of these criteria suggests that the number of inhabitants is the common denominator. Production per inhabitant is lower in smaller communes. Labor intensive industries and hospitals are located in big cities. The existence of these industries contributes to the increase of the population's average income, and represents directly and indirectly a source of wealth for the commune.

We will present in table 4.3-5 the classification of the 248 communes in Morocco according to their population. From the data which we have on the production of the 22 urban communes which have answered the questionnaire on SWM, we have been able to evaluate the production of domestic waste of these 248 urban communes and to calculate a theoretical fleet of vehicles to be managed.

In table 4.3-5 the figures are indicative only. Production has been calculated with an average of 0.6 kg per day. Vehicle fleets are not homogeneous with more small vehicles in towns with less population, and large capacity in larger cities.

Table 4.3-5 Distribution of the Production of Domestic Waste in the 248 Urban Communes

Population	No of Communes	Production/day/T	Fleet of vehicles
Less than 50 000	164	24	6 to 8
50 000 to 99 999	37	45	8 to 10
100 000 to 149 999	26	75	14 to 17
149 000 to 199 999	16	105	20 to 25
More than 200 000	5	300	More than 25

According to this analysis, we are led to recommend three possible structures :

- For communes which run a fleet of vehicles of more than 14 collection trucks, i.e. 20 % of the 248 urban communes (see table 4.3-5),
- For communes which run a fleet of vehicles of less than 14 collection trucks, i.e. 80 % of the 248 urban communes (see table 4.3-5),
- For communes of less than 10 000 inhabitants which do not assign equipment specifically for waste collection.

Structure for Communes which Operate a Fleet of Vehicles of more than 14 Collection Trucks

For communes which have a population of more than 100 000 inhabitants, and /or run a fleet of vehicles of more than 14 collection trucks, a specific structure maybe employed for SWM. Its sole object would be waste collection, transport, sweeping, the maintenance of SWM parking, and solid waste treatment. It can be a division with a budget annex (earmarked budget). It gives SWM autonomy of management, and permits in all transparency of costs. Management is decentralized, which facilitates decision-making, the definition of responsibilities and the coordination among services.

Structure for Communes which Operate a Fleet of Vehicles of less than 14 Collection Trucks and Have a Population of more than 10 000 Inhabitants

In the case of a commune having a population between 100 000 and 10 000 inhabitants, and/or a fleet of vehicles of less than 14 trucks, we propose to entrusting SWM to a special department within the commune. It will be in charge of the main functions of SWM : collection, transport, sweeping, and treatment. The maintenance of SWM equipment will be given to either the municipal workshop or a private garage in the commune. In respect of the regulations and the procedures of the commune, the widest autonomy will be given to this service. The president of the communal council will assign to the designated SWM Department the objectives and responsibilities corresponding to the means provided for in the SWM budget. An evaluation of the

costs of this activity will be obtained by taking into account the cost of each vehicle or heavy equipment (including depreciation of capital costs and financial expenses if necessary), and the staff expenses.

Structure for Communes of less than 10 000 Inhabitants

Communes of less than 10 000 inhabitants cannot be endowed with a specific structure for SWM. The recommendations shown in item 2) "Optimization of SWM Organization without changing the existing structure", should be applied here. Even though the structure is minimal, the main functions of SWM may be carried out by the commune's departments. It is advisable not to neglect staff training, public education, and SWM planning. Through an evaluation of the cost of vehicles, machines, and the staff assigned to this activity, the transparency of its costs will be revealed.

For this last structure it is strongly recommended to create an inter-communal syndicate of communes to operate SWM. This possible structure is featured in the 1976 law. Accordingly communes are in a position to implement SWM services with the same characteristics of the two previous structures.

The common characteristics of the three structures recommended above are summarized in the following five guidelines :

- Specific definition of the organization and objectives of SWM,
- The action of SWM executives is evaluated according to the realization of the fixed objectives,
- Delegation of decision-making as part of the budget and according to the objectives,
- Decentralization of SWM in relation to the other functions of the commune and coordination with them,
- Transparency of SWM costs.

b. Subcontracting to a Private Company

Subcontracting to a private company permits fulfillment of all the conditions mentioned in the previous paragraph. Privatization is strongly recommended as it fit exactly with the following criteria for good communal SWM.

- The organization and objectives should be clearly defined in the specifications of tender documents issued to select the private.
- For the survival of his company, to expand into other markets, and renew those already obtained, the private contractor is highly motivated to achieve SWM objectives.
- The operational liability of the commune is delegated to the private company.
- The commune coordinates and controls the execution of performance and can at any time substitute for the subcontractor in case of failure.
- The costs of SWM are specified in the service contract.

4.3.2 Proposed Structure for SWM Organization for the Urban Community

We will successively examine the division of tasks and responsibilities for SWM, and the organization of a structure which permits optimization of SWM.

1) SWM Tasks and Responsibilities at the Level of the Urban Community

Table 4.3-6 Assignment of SWM tasks and their periodicity

Appointment of tasks	Assignment	Periodicity of tasks
Disposal/transfer stations	Department responsible for disposal site or/and treatment plant	Daily
Middle and long term plans	Technical management	Annual
Complaints	Technical management	As required
Information/education	Technical management	As required
Enforcement of SWM regulations	Same as commune level	As required
Training	Continuing training	As required
Construction and maintenance of buildings and facilities	Town Planning Department	As required
Budget	Financial department	Annual
Budgetary control	Financial management	As required
Operational control	Technical management	As required
Coordination	Technical management	As required

Table 4.3-7 Level According to Which the Decisions Concerning SWM Should Be Taken

Decisions Concerning SWM	Level According to Which They Are Taken
Objectives, priorities and plans for SWM at the level of the urban community	President and council of the urban community
SWM budget and purchase of lands necessary for treatment facilities	President and council of the urban community and land department
Assignment of an executive according to the budget of SWM	President of the urban community
Current expenses below 20 000 DH within the budget	Technical manager
Definition of objectives and the operational organization	Technical manager
Assignment of non-executive staff within the budget	Municipal commission for personnel assignment presided by the general secretary of the urban community
Purchase of spare parts for an amount below 10 000 DH within the budget, and stock management	Person responsible for disposal site and/or treatment plant
Operations, as required	Person responsible for disposal site and/or treatment plant

2) A Proposed Optimum Structure for SWM

At the level of the urban community, the functions of SWM are centered on disposal and transfer stations. It is therefore quite easy to specify them and to create a structure responsible for the management of these two activities. The 14 Urban communities in Morocco cover all the large agglomerations. Therefore, SWM requires a specialized service whose size will be much more in accordance with the number of facilities to be run than with the size of the concerned agglomeration. In order to optimize SWM, this service should satisfy the following criteria :

- Precise definition of the organization and objectives of SWM of urban community,
- Action of the executives in charge of SWM evaluated according to the realization of objectives,
- Delegation of decision-making within the budget and according to specified objectives,
- Decentralization of SWM in relation to other functions of urban community and coordination with them,
- Transparency of SWM costs.

Privatization

The nature of operations relating to the urban community, namely disposal and transfer stations readily lend themselves to subcontracting to a private contractor, because they are distinct activities. The organizational structure in charge of this activity within the urban community then becomes a body of control and advice. Necessary conditions for successful use of contractors include the following.

- The organization and the objectives should be clearly defined by the specifications of tender documents issued to select the private contractors, and they are confirmed and detailed in their offers.
- The private contractor should be highly motivated to realize SWM objectives in order to perpetuate his company.
- The operational responsibility of the urban community is delegated to the private contractor.
- The urban community controls the execution of offers and can at any time substitute for the subcontracting party in case of failure.
- SWM cost are specified in the service contract.

At the level of the commune as well as at the level of the urban community evolution of SWM requires the control of highly-advanced techniques, hence the presence of skilled staff. In the following section, we will present proposals for the optimization of human resources.

4.3.3 Main Rules and Conditions for Effective SWM

Whatever the established structure is, a number of rules and conditions should be observed and codified within internal rules for the accomplishment of SWM. These should include :

- The work schedule of the staff.
- The distribution of the days off and the holidays.
- The place of work of each category of staff.
- Meeting places for the drivers, the unskilled workers and the sweepers.
- Work uniforms and protective clothing.
- The list of obligatory security rules.
- Enforceable penalties in case of professional misconduct.
- The mode of allocating grants and allowances.
- The rules for staff evaluation and conditions for professional development.

4.4 Optimization of Human Resources

We will successively present :

1. Required professional qualifications,
2. Required manpower,
3. Staff training,
4. Evaluation and motivation.

4.4.1 Required Professional Qualifications

SWM is an activity which requires considerable manpower. It needs skilled managers and staff. Table 4.4-1 shows the main functions of SWM and the required levels of qualification. The good running of SWM depends on the personality and the experience of its managers and heads of departments, and the quality which in part is determined by the ability to supervise operations.

Table 4.4-1 Functions and Qualifications for SWM

Hierarchical Level	Function	Qualification
Management	Cleansing manager	University graduate/at least 10 years experience in this function
Heads of departments	Operational, financial, logistic, treatment	Engineers or university graduates
Supervisors	Heads of sections	Graduates of high school and/or 10 years experience in this profession
Employees	Drivers	Graduates of primary school and truck driving license
Employees	Unskilled workers, sweepers	Graduates of primary school

4.4.2 Required Manpower

The survey of the 22 urban communes in Morocco has provided data to analyze the manpower assigned to SWM. In Table 4.4-2 are presented survey results. Figures indicated are the arithmetic sum of the personnel indicated in the survey divided by the population of the towns concerned. The ratio in the last column is that generally accepted within the profession for comparable conditions.

Table 4.4-2 Manpower of SWM

Function	Average observed in the 22 analyzed communes	Manpower not to be exceeded
Drivers	1.4 for 10,000 inhabitants	1 for 10,000 inhabitants
Collection workers	5.4 for 10,000 inhabitants	2 to 3 for 10,000 inhabitants
Total Manpower for collection and transport	6.8 for 10,000 inhabitants	3 to 4 for 10,000 inhabitants

These numbers show a heavy use of manpower. It would have been interesting to carry out the same analysis for sweeping, treatment and the administrative staff. In the absence of reliable data, it was impossible to do it.

4.4.3 Staff Training

Vocational training is a necessity for two reasons. It permits the staff to adapt to emerging techniques of environment, and it offers opportunities of promotion for the best workers. We will describe the needs for training, and the methods which we will recommend.

Table 4.4-3 gives a list of the needs concerning training, according to the different levels involved in SWM. This list is not exhaustive.

4.4-3 Table of needs concerning training

Level of Training	Themes of Training Periods
SWM executives	Management by objectives Analytic management SWM planning
Expert engineers	Planning of collection and transport Engineering and operation of controlled landfill Intermediate treatment such as incineration and composting Recycling and channels of waste recovery
Persons in charge of operations	Planning of collection routes Planning of sweeping Preventive maintenance of equipment Stock management
Drivers and equipment operators	Driving of trucks and heavy equipment Prevention against accidents and security measures

4.4.4 Evaluation and Motivation

The motivation of SWM staff is a factor determining the efficiency of SWM. Collection and sweeping performance may be improved by 50 % if the workers understand that their personal interest is linked to the realization of the objectives of these services.

The evaluation of communal staff is made in Morocco according to an annual marking attributed by the head of service according to a scale of 0 to 3. This scale corresponds to the following progress rates : mark 3/3 = rapid, mark 2/3 = average, mark 1/3 = slow. In fact because of the low level of remuneration of the communal function, the head of service gives the maximum mark to everybody. There is therefore no distinction between good and bad workers. As administrative penalties are rarely enforced, the workers are not motivated.

An effort to reemphasize the importance of SWM professions was successfully demonstrated by the city of Paris in the 1980's. The following propositions are inspired from the lessons of this experience.

Issues

We propose that the heads of departments conduct an annual evaluation of their employees, including an interview leading to a report signed by the two interlocutors.

It is also advisable to modify the salary structure. A section leader earns practically the same salary as his subordinates. A driver has the same pay as an unskilled worker, whereas his responsibility is greater. The re-emphasis on the importance of these categories of wage earners, section leaders and drivers and will improve the image of the profession.

The increase in basic pay of the section leaders and drivers should be accompanied by the establishment of a system of allowances, fixed according to the objectives assigned to SWM. For drivers, their allowances should be linked to the good maintenance of trucks and absence of accidents. For unskilled workers, allowances should be fixed according to the reports of section leaders on the quality of service and the absence of complaints by users.

Main Issues for SWM Optimization and Strengthening of its Organization

In this section a number of issues are suggested for strengthening SWM organization. To sum up this section, the main issues discussed for SWM optimization are as follows

- Strengthening the planning function in order to permit a sound definition of objectives and priorities
- Separating the costs of SWM within the accounts of the commune so as to achieve transparent management of this sector.
- Creating within the commune a special cleansing department with autonomous structure if the fleet exceeds 14 vehicles.
- Decentralization of the decisions concerning SWM according to the objectives and

budget defined by the communal council.

- Motivation of staff in order to involve them in the objectives of SWM, and the quality of service rendered to the public.
- One of the means used to motivate the staff is training. It should involve all levels of the hierarchy and permit adaptation to innovating techniques.
- Optimization of organization and improvement of staff efficiency leads to rationalizing manpower, and consequently a reduction in costs.
- Privatization is a practical means of attaining these objectives.

