12.2 Study on the Present ISWM (Industrial Solid Waste Management)

12.2.1 Study Methods

a. Scope of the Study

The study intends to prepare general recommendations for the improvement of ISWM in the Study Area.

b. Study Methods

Due to time limitations a quick study was carried out for a month. One should bear in mind, therefore, that there are certain limitations to the utilization of the study results in view of the reliability and accuracy of data obtained. In order to make a quick study on the present ISWM, the following surveys were conducted:

- data collection from responsible agencies on the present ISWM, i.e. MARENA and ALMA
- questionnaire survey to the producers of ISW
- field survey such as observation of the incoming ISW at the present landfills and field reconnaissance on illegal dumping sites

12.2.2 Study Results

a. Responsible Agencies

In Nicaragua, the responsible agencies on ISWM are MARENA, MINSA and the municipalities.

b. Present Situation of Industries

ba. Survey on Industrial Distribution

baa. Locations of Industries in the Study Area

Industries are concentrated in D2 to D6, and 96% of the factories in Managua are in these districts.

bab. Classification of Industries

Industries in Managua are mainly light industries (food & beverage, textile, wood & furniture production).

bac. Distribution of Factories by Number of Employees

There are 72 factories with more than 50 employees, and this number only represents 3% of the total number of factories in Managua.

bb. Present Municipal Collection Services

The present municipal collection service charges these industries according to the following categories:

1. Enterprises with up to date account records
2. Large scale enterprises
3. Institutions renting containers from the municipality

bba. Enterprises with Up to Date Account Records

The municipal waste collection fee department keeps a file on enterprises with account records. The 1,300 enterprises paying collection fees are regarded as enterprises with account records.

bbb. Large Scale Enterprises

There are 16 industries classified as large scale enterprises that do not pay collection fees to the municipality in accordance with the executive decree (Decreto Ejecutivo).

bbc. Institutions Renting Containers from the Municipality

There are 24 institutions renting containers from the municipality.

bbd. Estimated Non-Paying Industries

The estimated number of industries not paying the collection fee is approximately 800.

Non-paying institutions are assumed to dispose industrial solid wastes in the past by the following methods:

- At the Acahualinca landfill site (this is possible because supervision is not strict at the site)
- Within their premises
- Illegal dumping along roads, in channels, etc.

c. Questionnaire Survey to Industries

Existing data on ISWM is limited and this study may be the first on industrial solid waste to be conducted in Nicaragua. Although the survey was conducted on institutions in the Study Area, the discharge amount and final disposal methods of ISW producers were not completely surveyed because the study was only given a short period of time.

To cope with the limitation, 30 representative factories were interviewed to grasp the general prevailing conditions and to supplement the existing data provided by MARENA and ALMA. Field surveys were also carried out on the illegal dumping sites in the Study Area.

da. Results of Questionnaire Survey to Factories

daa. Selection of Representative Factories

Large scale factories, potential producers of hazardous wastes, were selected for an interview.

dab. Results of Questionnaire Survey

The results of the survey indicate the factories' various waste handling methods at the municipal final disposal site. Some of these methods are recycling, incineration

and self-disposal.

e. Field Survey

ea. Illegal Dumping Sites Survey

eaa. Survey Results

- **Along the main roads in rural areas**

  The main roads in rural and urban areas are generally quite spacious with reserves a lot wider than paved carriageways. Municipal solid wastes are illegally dumped mainly in these areas.

- **Along the branch roads in rural areas**

  Municipal solid wastes are the kind of wastes mainly illegally dumped along the branch roads of rural areas, which are normally unpaved.

- **In the channels**

  The kind of wastes mainly observed to be illegally dumped along the channels are municipal solid wastes.

- **Near Managua International Airport**

  Traffic in roads on the east and south side of the international airport is light, and these areas are mainly used as illegal dumping sites for construction waste and glass and leather factory wastes. Factories in the vicinity illegally dump their wastes because of the proximity of the area and the high cost of haulage of waste to the Acahualinca disposal site.

12.2.3 Findings

a. Laws and Regulations

Nicaragua has no laws on groundwater and environmental protection, and neither does it have water quality standards nor guidelines for the disposal of hazardous and industrial wastes.

Although the Environmental Standards and Guidelines of international organizations like WHO and UNDP are being enforced in the country in lieu of national laws, they are not compelling enough to cope with the conditions prevailing in Nicaragua.

The laws and regulations in effect in Nicaragua are very lenient. Penalties or punishments are not imposed.

b. Administration and Organization

Industrial Waste Management is associated with many government organizations. However, no particular investigations are carried out for the disposal or treatment of industrial wastes.

c. Generation

ALMA states that the annual amount of industrial waste disposed at the Acahualinca disposal site totals 13,000 m^3. There are no data that would substantiate the figure however.

d. Classification of Factories

Factories located in Managua are classified as either of the light industry category or factories of small scale enterprises.

e. Collection and Haulage

ALMA provides collection and haulage services for the industrial wastes of factories but with the exclusion of hazardous and toxic wastes. The collection fee charged by ALMA to factories are based on their sales taxes. There are factories, however, who do not pay the collection fee.

f. Final Disposal

Industrial wastes are finally disposed of at the Acahualinca disposal site through the collection services of the municipality.

On the other hand, the disposal methods of non-paying institutions are quite difficult to determine. Some are presumed to use the Acahualinca disposal site, while others are presumed to dump their wastes illegally along the roads on the east and south sides of the Managua International Airport (Augusto César Sandino).

g. General Recommendations

ga. Necessity of Further Surveys

Although there are approximately 2,100 factories in Managua, the questionnaire survey could only be conducted on a limited number of factories, due to time shortages and lack of a reliable list of factories.

Since there are many sorts of factories and wastes generated, the survey should be conducted again after the list of existing factories have been prepared.

gb. Laws and Regulations

A legislation which ensures economic incentives shall be produced to support efforts to minimize the production of industrial wastes and to promote the use of pollution control equipment.

Environmental impact assessment legislation shall be prepared in order to define the precise role of the different government agencies dealing with this matter.

Coordination shall be sought between MINSA, MARENA and ALMA, when producing laws, regulations and guidelines regarding industrial waste, bearing in mind the hierarchy of the laws, ordinances and guidelines, so to avoid conflicts on environmental legislation.

The control and enforcement system to eliminate illegal dumping of ISW shall also be established urgently in cooperation with various agencies concerned.

gc. Administration and Organization

gca. Administrative Structure

An administrative structure which will ensure a proper ISWM shall be established by clearly defining the roles of each organization concerned.

Coordination shall also be sought between the different levels of government and

the different governmental agencies, in the law enforcement activities related to industrial waste management.

The municipalities shall cooperate with the national government authorities mainly on matters related to nuisances and hazards to the people produced by mismanagement of the industrial wastes.

gcb. Plans and Technology

Guidelines and plans should be made with regards to industrial waste management to serve as a standard the enterprises have to comply with.

It will be essential to review personnel disposition within the administration and organization and increase the staff responsible for industrial waste management, and then conduct necessary training courses.

Furthermore the administration is required to have technical knowledge (in discharge, treatment, recycling, disposal methods, etc.), collect information and develop new techniques. The administration has to transfer technical information to enterprises and provide them with technical aid through subsidies and other schemes.

gd. Reduction at Generation Source and Recycling

Although the generation of ISW is not large, it is necessary to control the generation and discharge of waste, and further reduce the amount through recycling.

Enterprises shall develop processes which would enable the treatment of industrial waste at generation source. It is necessary that enterprises examine the raw materials they use and take necessary steps that would mitigate environmental pollution caused by their waste.

In addition, all enterprises are required to plan the utilization of these recyclable materials and to increase the means for their use.

ge. Generation of Waste

gea. Inventory system

Each factory shall submit to the MARENA and ALMA information on the characteristics and amount of industrial waste they generate. The information can

be used for the management of industrial waste. Inventory system is effective for supervising ISWM. Therefore, precise registration and continuous updating of inventories shall be implemented.

geb. Segregation of hazardous wastes

Dischargers should try to separate hazardous wastes from non-hazardous ones in order to reduce the amount of harmful industrial solid wastes to be disposed of and facilitate waste reuse and recycling.

gf. Treatment and Disposal

Basic treatment and final disposal methods needed for industrial wastes are chemical treatment such as neutralization, oxidation and reduction, thermal treatment such as incineration, and secured landfill. The characteristics of industrial solid waste are so variable that it is necessary to find out the best treatment and final disposal alternatives from a technical and economic point of view.

In many cases the most convenient treatment and final disposal method is secured landfill, because its cost is relatively low. The central government may be requested to construct such facilities for the sake of environmental protection if it is very difficult for the private sector to acquire land and funds for such construction.

An environmental impact assessment is necessary prior to the construction of an industrial waste disposal site.

gg. Supervision and Advice

Appropriate supervision and sound advice from the central government are most important to steadily implement industrial solid waste management.

It is, therefore, important to primarily analyze and improve administrative capacity, then conduct inspection and give advice on the operation of the storage, transportation, and final disposal of industrial solid wastes.

In addition, ISW shall be clearly defined by the central government (MARENA).