

(En Capiata es casi 50%)

y, son muchas las personas que trabajan en el manejo de basura.

(En Asunción, casi 450 personas. ...explicar que trabajan por la noche.)

(En San Lorenzo casi 55 personas)

(En Capiata casi 10 personas)

B. Las basuras que no son recolectadas, son quemadas en el patio de sus casas, son enterradas en pozos, o son arrojadas en las calles, parques y arroyos. Pero, son muchas las basuras que son arrojadas. Por eso dentro de la ciudad se tiene olor a basura.

A. ¿Por qué, piensas que se arrojan en las calles, parques y arroyos?

B. Si no existe basura dentro de su casa está bien.

Porque no saben que la basura puede ser causa de enfermedades.

Porque no les importan las personas que viven, cerca de donde de arrojó la basura. (No piensan en la molestia a los demás)

Porque no vienen a recolectar.

A. Las personas que arrojan en las calles, parques y arroyos, no estudiaron sobre la basura, y como no saben que la basura puede ser causa de enfermedades, piensan que está bien arrojar en esos lugares.

A. Arrojar basura es igual que arrojar microbios.

iv. ¿Cómo cooperar en la disposición de la basura.?

A. Para recolectar, transportar y disponer en forma correcta, se necesita de muchas personas y maquinarias. Para eso se necesita de mucho dinero.

A. Por eso para ser recolectada y dispuesta, existe la necesidad de pagar un precio. Y también, sacar la basura respetando algunas reglas.

A. ¿Qué se entiende por reglas para sacar basura?

B. Cuidar que la basura no se desparrame, para que no salgan aguas sucias de los restos de comida, colocar en una bolsa de plástico.

Colaborar para que los recolectores no puedan cargar fácilmente.

Cuidar que los recolectores no se lastimen.

A. ¿En qué momento piensan que puedan lastimarse?

B. Cuando la bolsa de basura contiene vidrios o algún objeto puntiagudo.

Cuando la caja de hierro donde se deja la basura está dentada.

Cuando la basura tiene mucho peso.

A. Los vidrios y objetos puntiagudos, se deben envolver con papel antes de colocar en la bolsa, y cuando pesa demasiado, colocar en dos bolsas.

- A. ¿En qué puedan prestar atención, cuando se encuentran fuera de casa?.
- B. Las bolsas de las compras y los papeles de las galletitas, no se deben arrojar en las calles, sino que se necesariamente se deben arrojar en los basureros públicos y si éstos no existen, se deben llevar a la casa.
- B. Los restos de comida y latas vacías de las bebidas, cuando se sale de excursión se deben arrojar en los basureros o se deben llevar a la casa.
- A. Pensando bien, uno se da cuenta de muchas cosas. Vamos a construir una ciudad limpia y saludable, manteniendo limpia la casa y la ciudad.
- A. Hoy aprendieron sobre la basura y se dieron cuenta de lo peligro que es la basura, por eso cuando vuelven a sus casas, pueden contarles a sus familiares sobre la charla de hoy.

Vamos a ver juntos cómo estamos eliminando las basuras

YO QUEMO Y SE ENOJAN LOS VECINOS

YO TIRO EN LA ZANJA

YA ESTAMOS LLENANDO AQUEL BALDIO

TRANCA TODO NUESTRO ARROYO

TENEMOS MUCHOS ANIMALES

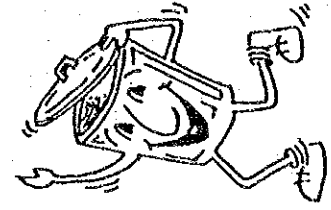
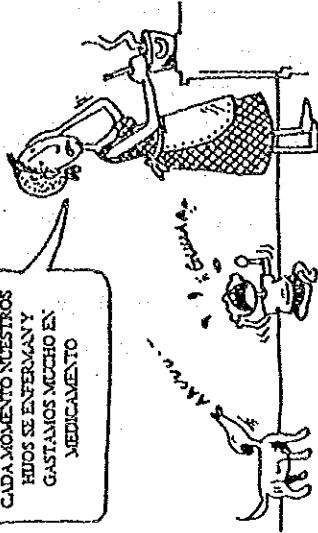
MUCHOS TIRAN DELANTE DE MI CASA

CHE ANOTY CHE KORAPYE HA HENYHE MBAMA

Analizamos juntos las causas y consecuencias del mal procesamiento de las basuras

La basura trae:
 Enfermedades : -Diarrea
 -Pysevo'i
 -Cólera
 -Moscas
 -Anguja (ratones)
 -Cucarachas
 -Mal olor
 -Tujú (no se puede caminar)

CADA MOMENTO NUESTROS HIJOS SE ENFERMAN Y GASTAMOS MUCHO EN MEDICAMENTO



Las basuras en el basurero

Quando se ve un montón de basuras ... todos vienen a tirar

K.2.3 Result of the Experiment on School Education

a. Schedule of School Education

An one hour lecture was given at the schools shown in Table K.2.3a.

Table K.2.3a Schedule of School Education

Category	Municipality	Name of School	Date
Highly Urbanized Mun.	Asuncion	Colegio San Andres Esuela Rosa Pelletier	14th March
Urbanized Mun.	San Lorenzo	Asociation Cristana De Jovenes	11st March
Less Urbanized Mun.	Capiata	Escuela Parroquial Nuestra Senora De La Candelaria	11st March

b. Lecturers

The following members worked as lecturers.

Takao Yoshida: Leader of JICA Study Team
Rosalba Gabian: SENASA
Felipe Planas: Asuncion Municipality
Damiana: Asuncion Municipality

c. Record of School Education

Name of school: Colegio San Andres
Type of school: Private school
Date and time: 8:30 to 9:30 on 14th March, 1994
Lecturer: Mr. Felip Planas
Participants: 6 teachers
25 pupils in the 4th year

Name of school: Escuela Rosa Pelletier
Type of school: Public school
Date and time: 15:30 to 16:30 on 14th March, 1994
Lecturer: Mr. Felip Planas
Participants: 3 teachers

45 pupils in the 4th and 5th year

Name of school: Asociacion de Cristina de Jovens
Type of school: Public school
Date and time: 8:30 to 9:30 and 13:30 to 14:30 on 11th March, 1994
Lecturer: Mrs. Rosalba Gabilan
Participants: 3 teachers
39 pupils in the 4th year

Name of school: Escuela Parroquial neustra Senora de la Candelaria
Type of school: Private school
Date and time: 10:30 to 11:30 and 15:30 to 16:30 on 11th March, 1994
Lecturer: Mrs. Rosalba Gabilan
Participants: 3 teachers
am: 54 pupils in the 4th year
pm: 50 pupils in the 4th year

K.2.4 Findings

The execution of the experiment of primary school lecture on solid waste motivated pupils on solid waste problems. The majorities of pupils listened to the lectures and made discussions and questions full of interests. Many teachers expected to carry out the education on solid waste themselves by using the educational video and materials prepared by the Study Team, provided that the audio-visual system was available.

This experiment made not only the pupils but also teachers to understand how dirty their towns were at present and how important the appropriate discharge manner of solid wastes was. Their motivation will be expanded to consider how they should go about making their towns clean and beautiful through the continuous sanitary education programs.

Many people related to the solid waste management understand that the problems can not be solved only by improvement of waste collection and disposal systems and that the sanitary education will be very effective in solving these problems. Therefore, this experiment of school education was much appreciated by them.

The method of school education on solid waste which was used for the experiment was found to be very effective and applicable to most cities in Paraguay with small revision depending on the conditions of the towns.

ANNEX L

GENERAL RECOMMENDATION FOR THE IMPROVEMENT OF ISWM AND MEDICAL SWM

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L.1 Study on Present ISWM (Industrial Solid Waste Management)

L.1.1 Method of the Study

a. Scope of the Study

The scope of the study is to prepare general recommendations for the improvement of the ISWM (Industrial Solid Waste Management) in the study area based on a rapid diagnosis study.

b. Method of the Study

Due to the time limitation of the study a rapid diagnosis study was carried out for one month. Therefore, one should bear in mind that there are certain limitations on the utilization of the results of the study; i.e. reliability and accuracy of the data obtained. In order to make a rapid diagnosis on the present ISWM, the following surveys were conducted:

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

c. Study Flow

The study was executed according to the following flow chart.

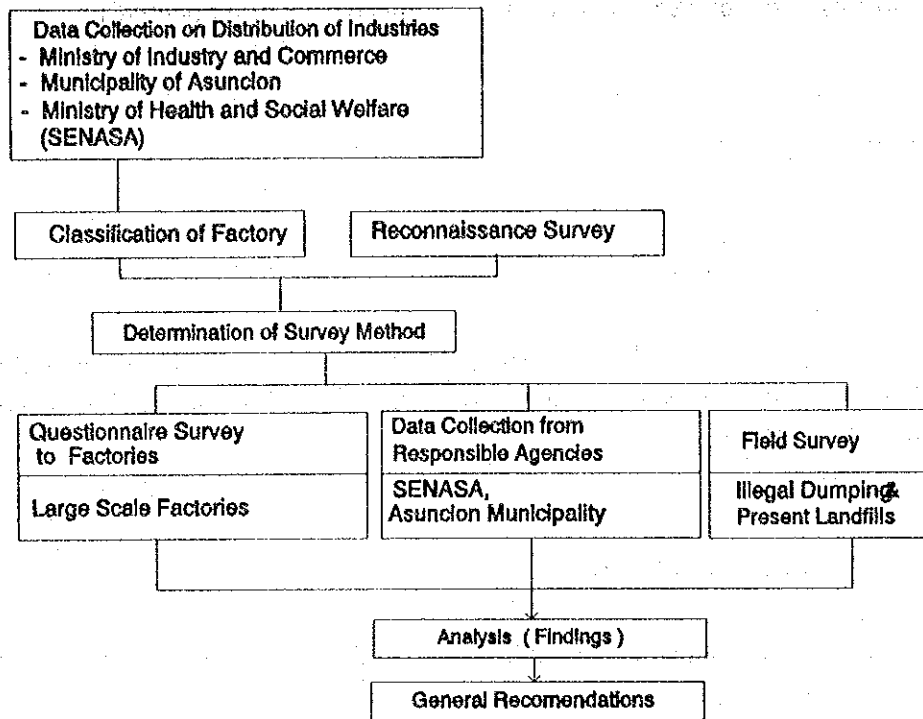


Figure L.1.1a Study Flow Chart of Present Industrial Waste Management

L.1.2 Execution of the Survey

a. Data Collection from Agencies Responsible on Present ISWM.

aa. Agencies responsible

In Paraguay, the agencies responsible on ISWM are SENASA and the municipalities. Therefore, data on the following aspects were collected from SENASA and Asuncion:

- laws and regulations
- administration and organization
- generation and discharge
- collection, processing, recycling and final disposal.

ab. Results of the Survey

aba. Laws and Regulations

i. National Central Government Level

The Sanitary Code (Law No. 836/80) is, today, the main piece of legislation dealing with the discharge of pollutants (including solid wastes) to the environment.

In this Code, article No. 66 states that "It is forbidden for any activities to damage the natural environment, lessen its quality, and make it harmful to the health". The following article (No. 67) says that the Ministry (of Public Health) will determine the emission or discharge limits of contaminants or pollutants in the atmosphere, in the water or in the ground, issuing guidelines for transport, industrial and commercial activities".

Concerning more precise industrial wastes, article 82 of the same code forbids the emission, without treatment, of any industrial waste to the atmosphere, channels, surface or underground water streams, that cause or may cause pollution to the ground, to the atmosphere or to the bodies of water.

Still under this Code, the output of regulations and guidelines following these articles was assigned to the Direction of Environmental Protection of the SENASA.

So far, SENASA has prepared and the Ministry of Public Health has issued the "Control Guidelines on the Characteristics of Water Resources related to Environmental Sanitation"

This guideline classifies the water bodies according to its use and sets the quality parameters as limits to effluent discharges. Besides that, it gives the enforcement guidelines, fines etc..to be used in the control actions.

Concerning solid wastes, a draft Regulatory Code has been prepared and it is in the final revision stage. The Code is soon to be issued by the Minister of Public Health.

In the draft of this Regulatory Code, there is a chapter on Hazardous Wastes. In this chapter, among rules for storage and handling, there is an article stating that the generator of these wastes is solely responsible for its storage, handling and final disposal.

It should be mentioned also that recently, an "Environmental Impact Assessment Law" (Law 294) has been issued by the National Congress. This law has been

presented to the Congress by the Under Secretary of the Environment and Natural Resources, which belongs to the Ministry of Agriculture. According to it, Municipal and Industrial Solid Wastes collection among others, treatment and disposal shall have an Environmental Impact Assessment submitted to the Ministry of Agriculture through its Direction of Environmental Control.

The application of this legislation has not begun so far, because it depends on coordination that is being established between the Under Secretary of the Environment and SENASA.

ii. Municipal Level

At the local level (municipalities), there is no specific legislation concerning industrial waste. Some of the municipalities in the Study area, however, have been dealing with these wastes based on the Sanitary Code, and the Municipal Organic Law (Law 1294/87). In this Law, Art.18 states that it is a municipal function "to preserve the environment and the ecological equilibrium along with the promotion and cooperation to protect natural resources. These pieces of legislation, although being rather general, (when dealing with wastes), are used to advert, to fine or even close an industry which is harmful to the health of the people.

Furthermore, the municipalities of Asuncion and Fernando de la Mora are preparing municipal legislation (ordinances) so to curb the wastes discharged to bodies of water, air and soil by the industries (as well as by other sources).

One must also remember that the municipality of Asuncion, although not having a specific legislation about industrial wastes so far, has been halting, with the assistance of SENASA, the illegal dumping of industrial wastes in vacant lots and river embankments.

The Municipality is also issuing a public awareness campaign (including the production of a video tape) so to warn the population on the dangers of handling industrial wastes, specially the ones coming from tanneries

Table L.1.2a presents a summary of the laws and regulations, currently in use and in the draft stage, concerning industrial waste.

Table L.1.2a Industrial Waste Legislation

Level	Existent	Draft
National Government	<ul style="list-style-type: none"> - Sanitary Code, Law 836/80, Art. 66 and 82. - Environmental Impact Assessment, Law 294/93 - Ministry of Agriculture 	<ul style="list-style-type: none"> - Guidelines on Solid Waste Management, chapter 5 (hazardous waste)
Municipal Government	<ul style="list-style-type: none"> - Municipal Organic Law, Law 1294/87 Art. 18 gives to the municipalities the duty "to preserve the environment...." 	<ul style="list-style-type: none"> - Under consideration by the municipalities of Fernando de la Mora and Asuncion

abb. Administration Systems

The organizations and their functions concerning industrial solid wastes when seeking approval for a factory construction is shown in Figure L.1.2a. SENASA examines it in terms of environmental impact and the municipality judges it in terms of structural safety. SENASA and the municipality work together for environmental protection, as shown in Table L.1.2b.

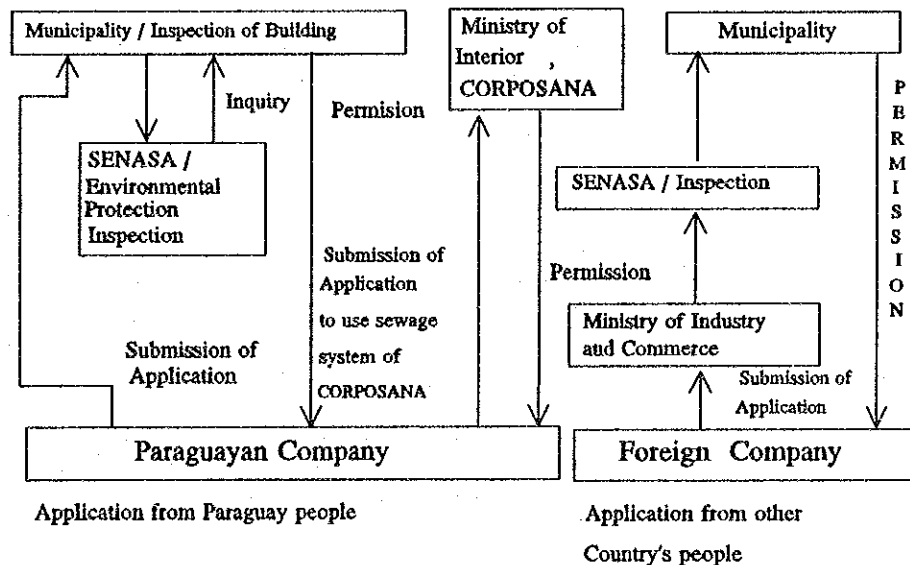


Figure L.1.2a Function of Government Organization for Application of new Factories.

Table L.1.2b Inspection of Factories by the Municipality and SENASA

Office	Municipality	SENASA (Exclusively outside Asuncion Metropolitan Area)	
Mainly for	Small Factory	Large Factory	
I N S P E C T I O N	When neighbors report to either SENASA or Municipality, an inspector is dispatched to the factory for visual inspection. (1)	Inside Inspection	Outside Inspection
		* Occupational Security * Industrial Hygiene	Routine Inspection Official Inspection
			* Noise * Smell * Liquid Waste (Intangible observation)
Frequency			Depends on the Situation
Punishment	1st Stage: Warning 4th Stage: Penalty	2nd Stage: Caution 5th Stage: Close Factory	3rd Stage: Indictment
	* If difficult problems happen, Municipalities consult with SENASA		

Notes:

- If a factory operates illegally twice, it is reported to the legal department unless the factory improves the situation, the court punishes the factory.
- Both the municipality and SENASA can impose punishments on factory owners.

abc. Disposal of ISW in HUM (Asuncion and F.Mora)

i. Present Fee Collection

The regulation of the Municipality of Asuncion specifies that the disposal fee of ISW is 500,000 Gs /company /month. The record of the regulation executed is presented in Table L.1.2c.

Table L.1.2c Payment Situation of Disposal Fee of ISW at Cateura Landfill, in August, 1993

Charge		500,000	1-100,000 Gs	No Payment	Total
Number of Factories	Large	4	30 (Payment by commodities)	No data	No data
	Small	By normal collection service			No data

The ISWs of large factories are transported and disposed of by the producers while those of small factories are dealt with by the Municipalities. The classification of the large and small scale factories is shown in Table L.1.2d.

Table L.1.2d Classification of ISW in HUM

	Small Factories	Large Factories
Waste Collector	Municipality	Producers
Food, Beverage, Tobacco.	Yogurt, Milk, Vegetable, Fruit Juice, Bakery, Confectionery, Food.	Slaughterhouse, Meat Factory, Cooking Oil, Flour mill, Sugar, Food for animal, Alcoholic drink, Wine, Malt, Juice, Tobacco.
Textile, Clothes	Textile, Sewing, Hand knit, Rope, Clothes	
Leather, Shoes	Fur, Leather shoes	Leather goods, Tannery.
Wood, Furniture	Furniture	Sawing, Plastic products, Cork, Paper, Cardboard
Paper, Printing, Publishing	Pulp, Paper mill, Printing, Publishing	
Chemical product	Chemicals, Agricultural chemical, Fertilizer, Medicine	Paint, Soap, Perfume, Cosmetics, Oil, Refinery
Rubber, Plastic		Rubber tube, Rubber, Plastic
Non-Metallic products		Ceramic, Brick, Tile, Cement, Lime
Iron, Steel		Iron, Steel
Non-Ferrous, Metal, Metal product	Non-Ferrous metal, Tool, Metal product	Non-Ferrous metal, Metal product
Machinery		Agricultural equipment, Machinery
Electric Appliance	Communication equipment, Electric equipment	Electric appliance for factories, Electric appliance for home
Transport Equipment		Ship building, car, Motorbike, Bicycle
Others	Research instrument, camera, spectacles, Jewel, Musical instrument, Sport goods, Hand made goods	
Construction		

ii. Non-paying Factories of ISW

It is presumed that the non-paying factories are disposing industrial solid wastes by the following three measures:

- At the Cateura landfill site (this is possible because supervision is not strict at the Cateura landfill site.)
- On their premises
- Illegally along roads, in rivers, etc.

It is difficult to identify how the factories are disposing of waste at present.

abd. Disposal of ISW in UM and LUM

The present situation of ISWM in the 13 municipalities other than Asuncion and F.Mora are summarized in Table L.1.2e. This table shows that most factories in these municipalities are not disposing of waste in the municipal final disposal sites. This is deemed to be because factories have enough area within their premises to dispose

of the ISW.

Table L.1.2e ISW Disposal in UM and LUM

District	Capiata, Ita, Lambare, M.R. Alonso, Nemby, San Lorenzo, Villa Elisa, Villa Hayes,	Aregua, B. Aceval, Luque, Limpio, J.A. Saldivar
Final Disposal Site of Municipality	Yes	None
Expected Disposal Site	Final Disposal Site of Municipality	Their own land or illegal dumping
Collection of Industrial Waste	Municipality Collection or Direct transport	Direct transport
Remarks	No presence of factories which may produce hazardous or toxic industrial wastes.	

Source : Information by SENASA

b. Questionnaire Survey to Factories.

Data on the present ISWM is not sufficient, especially regarding technical systems such as generation, discharge, collection, processing, recycling, and final disposal. Therefore, a questionnaire survey to producers of ISW, i.e. factories, was conducted.

ba. Survey on distribution of Industries

There are two unpublished data concerning the present distribution condition of industries. One is the data for the whole of Paraguay prepared by Ministry of Industry and Commerce, and the other is the data covering Asuncion City prepared by the Municipality of Asuncion.

The former data prepared by the Ministry of Industry was adopted for this survey, because these data covered the whole Study Area.

bb. Locations of Industries in the Study Area

Industries are concentrated in the Central Department, including the Metropolitan area of Asuncion, as shown in Figure L.1.2c, because a large consumption area is located there.

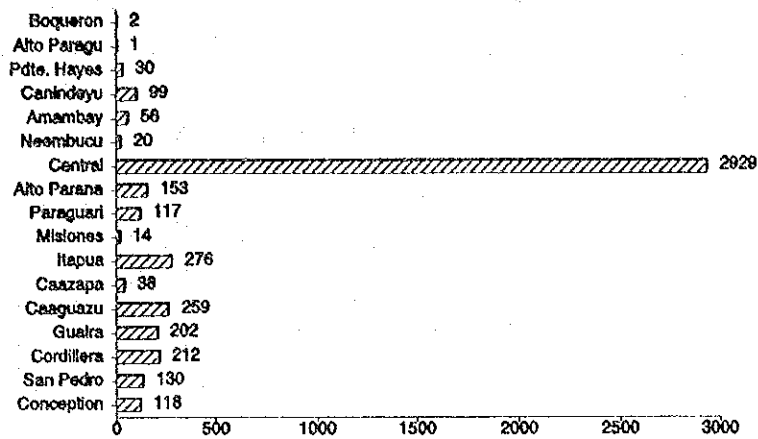


Figure L.1.2c Distribution of Factories by Departments

77 % of industries in the Study Area, are located in the City of Asuncion as shown in Figure L.1.2d.

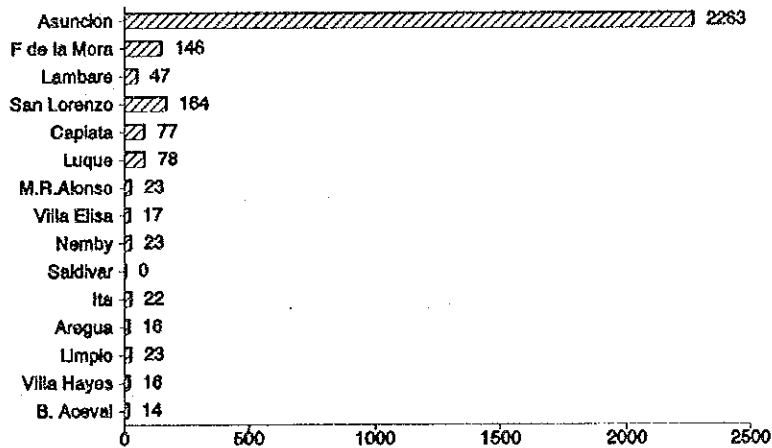


Figure L.1.2d Distribution of Factories by Municipalities

This shows that the City of Asuncion is the center for administration, commerce and industries. Recently, industries are settling in the suburbs of Asuncion City, avoiding the highly urbanized area.

bc. Classification of Industries

Table L.1.2f represents the lists of factories located in the Metropolitan area of Asuncion. This data shows that there are light industries outstanding in this area.

Table L.1.2f Type of Industry in the Asuncion Metropolitan Area

Municipality	Type of Industry															Total Number
	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Aregua	9	2	1	1	0	1	0	2	0	0	0	0	0	0	0	16
Asuncion	437	238	127	275	191	119	52	139	19	157	87	132	38	76	176	2,263
Benjamin Aceval	12	0	0	0	0	0	0	1	0	0	0	1	0	0	0	14
Capiata	38	3	2	9	1	5	2	5	3	5	1	0	2	1	0	77
F.Mora	51	11	6	19	2	7	5	9	0	19	1	13	1	2	0	146
Ita	13	2	4	1	0	1	1	0	0	0	0	0	0	0	0	22
Lambare	9	3	1	7	2	1	4	1	0	19	0	0	0	0	0	47
Limpjo	17	0	1	3	0	2	0	0	0	0	0	0	0	0	0	23
Luque	27	9	2	11	0	4	6	6	2	8	0	1	0	2	0	78
M. R. Alonso	4	3	2	3	0	1	3	2	1	0	0	2	2	0	0	23
Nemby	9	0	0	1	0	2	3	2	1	3	0	2	0	0	0	23
San Lorenzo	68	6	5	28	3	12	13	6	0	16	0	4	3	0	0	164
Villa Elisa	5	0	1	1	0	5	1	1	0	1	0	1	0	0	1	17
Villa Hayes	8	0	1	0	0	3	0	2	1	0	0	0	1	0	0	16
Grand Total	707	277	153	359	199	163	90	176	27	228	89	156	47	81	177	2,929

- Note:
- | | |
|---------------------------------------|---|
| 6. Food, beverage & tobacco | 14. Iron & steel |
| 7. Textile & wearing apparel | 15. Non-ferrous metal & Fabricated metal products |
| 8. Leather & foot wear | 16. Machinery |
| 9. Wood & furniture | 17. Electrical |
| 10. Paper, printing & publishing | 18. Transport equipment |
| 11. Chemical & other chemical product | 19. Others |
| 12. Rubber & plastic | 20. Construction |
| 13. Non-metallic products | |

bd. Distribution Condition of Factories by Number of Employees

According to Table L.1.2g showing the list of factories by number of employees, majority of factories have less than 20 employees and only 82 factories have more than 100 employees.

Table L.1.2g Classification of Factories by Number of Employees

Municipality	Number of Employee				Total
	1 to 19	20 to 49	50 to 99	> 100	
Aregua	14	0	0	2	16
Asuncion	1,978	179	50	47	2,263
B. Aceval	12	0	1	1	14
Capiata	54	13	3	7	77
F.Mora	112	25	6	3	146
Ita	21	0	0	1	22
Lambare	42	2	3	0	47
Limpio	18	1	1	3	23
Luque	57	13	6	2	78
M. R. Alonso	17	5	0	1	23
Nemby	16	4	0	3	23
San Lorenzo	129	23	5	7	164
Villa Elisa	9	6	0	2	17
Villa Hayes	9	3	1	3	16
Grand Total	2,497	274	76	82	2,929

be. Questionnaire survey to the factories

There are very limited existing data on ISWM and this study may be the first study on industrial solid waste in Paraguay. Although the survey on all factories, approximately 3,000, located in the Study Area is desired, it is considered to be too difficult to investigate the discharge amount and the final disposal sites of all factories within the limited study period.

Finally, an interview survey on 10 representative factories was conducted in order to understand general conditions, and to supplement the existing data collected from SENASA and the Municipality of Asuncion. In addition, the following field surveys were carried out:

- Observation of incoming ISW at the present landfills.
- Survey on illegal dumping sites in the Study Area.

bf. Results of Questionnaire Survey to Factories

bfa. Selection of Representative Factories

The large-scale factories which might produce hazardous wastes were selected for interviewing.

bfb. Results of Questionnaire Survey

As Table L.1.2h shows the results of the questionnaire survey; various methods such as recycling, incineration, self-disposal and disposal at the municipal final disposal sites are being used by factories.

Table L.1.2h Result of Questionnaire Survey to Industries

Co-m-pany	Location	Number of Workers	Product	Waste Generated			Waste Disposal Cost (1,000 Gs/month)	Haz-ardous or Toxic Waste
				Waste Category	Quantity (ton/month)	Disposal Method		
A	Asuncion	70	Beer	Glass Bran Beer	0.5 10	Recycle Selling	NA	No
B	Asuncion	350	Meat	Plastic Paper	0.35 0.15	Incinerated Incinerated	8,100	No
C	Asuncion	37	Reused Tire	Paper Rubber Plastic	8 m ³ 44 m ³ 4 m ³	Cateura Cateura Cateura	770	No
D	Asuncion	15	Meat	Animal Residue	12 m ³	Cateura	870	No
E	Asuncion	18	Paint	Sludge	1.6	Own Land	160	No
F	Asuncion	380	Leather	Ash Plastic Animal Residue Chrome waste	4 0.63 72 120	Cateura Recycle — Cateura	6,820	Cr Yes
G	Aregua	49	Detergents, etc.	Ash Alkaline Plastic	12 1 0.25	Own Land Own Land Incinerated	300	No
H	Nemby	176	Vegetable Oil	Ash Soap residue	300 0.9	Road —	3,000	No
I	Asuncion	267	Leather	Ash Alkali chrome waste	14.4 — 7.5m ³	Cateura — Cateura	500	Cr Yes

c. Field survey

ca. Observation of incoming ISW at the present landfills.

In order to obtain data on the industrial waste disposal situation at the present landfills, 3 days of inspection of incoming ISW to 12 present landfills in the Study area were conducted in August 1993. According to the results of, no ISW was observed at the 11 landfill sites for Lambare, San Lorenzo, Capiata, Luque, M.R. Alonso, Villa Elisa, Nemby, Ita, Limpio and Villa Hayes. It was, however, observed

at Cateura Landfill for Asuncion and F.Mora.

On the other hand, a water quality survey of leachate from present landfills was conducted from August 17 to September 2 in 1993, by the Study Team. The results of the survey on Cateura and Ñemby proved the disposal of some ISWs which included hazardous materials; Hg (mercury) and Cr (chromium) were observed in the leachate of Cateura and Ñemby respectively.

cb. Observation of incoming ISW at Cateura Landfill

A load cell type truck scale was installed at the Cateura landfill to obtain data of disposal amount in accordance with the waste categories specified in the Section E.6 of the Annex E. In the classification of the incoming wastes to Cateura landfill, the ISWs were categorized into the following 4 codes:

Code No.	Classification
200	Registered ISW in Asuncion
210	Non-registered ISW in Asuncion
220	Registered ISW in Other Municipalities
230	Non-registered ISW in Other Municipalities

According to the above-mentioned category, ISWs disposed of at Cateura landfill were observed from October 1, 1993 to February 28, 1994 and the results are tabulated in Table L.1.2i.

Table L.1.2i ISWs disposed of at Cateura Landfill from 1/10/1993 to 28/2/1994

Code	No. Plate	Type of Vehicle	Responsibility	Disposal	No. Disp.
200	8284	CAMION TUMBA	ADMINISTRACION DE PU	1,740	1
200	210533	CAMIONETA	ALFA KAPPA	4,590	7
200	9020	UTILITARIOS	APAL	1,960	1
200	99241	UTILITARIOS	ARTES GRAFICAS ZAMPH	3,420	5
200	79578	CAMIONETA	ASTILLEROS CAVEL	3,620	3
200	56658	CAMIONETA	BID MUEBLES CARPIN	340	1
200	96926	CAMIONETA	BID MUEBLES CARPIN	480	1
200	9018	UTILITARIOS	CAPASA EX APAL	540	1
200	102745	CAMIONETA	CAPASA EX APAL	700	3
200	81450	CAMIONETA	CARPINTERIA LA MILAG	160	1
200	230536	UTILITARIOS	CARTONES YAGUARETE S	4,620	2
200	85167	UTILITARIOS	CASA ESCAURIZA	360	1
200	94496	UTILITARIOS	CASA ESCAURIZA	3,700	2
200	28754	CAMION TUMBA	CERVECERIA ASUNCION	5,980	3
200	28882	CAMION TUMBA	CERVECERIA ASUNCION	6,840	3
200	91949	CAMION TUMBA	CERVEPAR	7,940	7
200	106313	UTILITARIOS	CLAUDIO OVANDO	1,020	1
200	29209	CAMION TUMBA	CONSTRUCTORA MIGUEL	5,520	1
200	49000	UTILITARIOS	COOPERATIVA COL. NEU	300	1
200	109976	UTILITARIOS	COOPERATIVA COLONIAS	280	1
200	86917	CAMION TUMBA	CUPAR	177,960	65
200	101486	CAMION TUMBA	CUPAR	169,820	65
200	103061	CAMION TUMBA	CUPAR	330,140	157
200	106031	UTILITARIOS	CUPAR	12,880	2
200	2420	CAMIONETA	CURTIEMBRE SAN LOREN	3,440	2
200	91123	CAMION TUMBA	CURTIEMBRE SAN LOREN	332,690	86
200	120405	CAMION TUMBA	CURTIEMBRE SAN LOREN	772,060	196
200	99991	UTILITARIOS	DIESA S.A.	4,380	5
200	99313	CAMIONETA	EMPORIO	100	1
200	50185	UTILITARIOS	EMPRESA PARAGEL	14,540	8
200	88974	UTILITARIOS	ENRIQUE REMMELE S.A.	3,160	2
200	253331	CAMIONETA	EXTINTORES CHACO	440	1
200	12505	CAMION TUMBA	FAB. PARAGUAYA DE VI	266,300	67
200	106373	UTILITARIOS	FABRICA ALUMINIO	4,060	3
200	110420	CAMIONETA	FABRICA PARAGUAYA DE	1,060	3
200	103741	UTILITARIOS	FAMILUX	280	1

200	104586	UTILITARIOS	FRIGORIFICO GRANDE	5,080	8
200	107740	CAMIONETA	HBLADERIA PARIS	500	3
200	239448	CAMIONETA	IMDUMEL I.C.S.A.	1,880	3
200	110647	CAMIONETA	IMPORTVIDRIO	200	1
200	110263	CAMIONETA	INDELPAR	200	1
200	106175	CAMION TUMBA	IPS	1,500	3
200	81095	UTILITARIOS	KIKO PLASTICOS	980	1
200	71509	CAMIONETA	LA NEGRITA I.C.S.A.P	2,780	4
200	109832	CAMIONETA	LABORATORIOS INDEX S	280	1
200	50189	VOLQUETE	LARZON SA	242,990	87
200	83326	CAMION TUMBA	LARZON SA	8,760	3
200	102382	UTILITARIOS	LARZON SA	1,100	1
200	126360	VOLQUETE	MARAMBA C.I.S.A.	2,880	1
200	240343	UTILITARIOS	MOSAICOS TILLNER	4,700	2
200	92269	CAMIONETA	NICOLAS BO	320	1
200	109237	CAMIONETA	PARABRISAS LA MODERN	3,740	6
200	194571	CAMIONETA	PARABRISAS LA MODERN	100	1
200	47831	CAMIONETA	PARTICULAR	240	1
200	99704	UTILITARIOS	PARTICULAR	560	2
200	219927	CAMION TUMBA	PENITENCIERIA NACION	25,740	8
200	85931	UTILITARIOS	PLASTIMAR	3,220	4
200	2278	UTILITARIOS	REGISTRADA	80	1
200	7601	CAMION TUMBA	REGISTRADA	1,160	2
200	8332	UTILITARIOS	REGISTRADA	520	1
200	9021	UTILITARIOS	REGISTRADA	2,280	2
200	9472	CAMION TUMBA	REGISTRADA	3,280	2
200	21812	CAMIONETA	REGISTRADA	260	1
200	26508	UTILITARIOS	REGISTRADA	60	1
200	32555	CAMIONETA	REGISTRADA	740	1
200	81625	UTILITARIOS	REGISTRADA	900	1
200	87831	CAMION TUMBA	REGISTRADA	3,660	2
200	90983	CAMION TUMBA	REGISTRADA	680	1
200	91346	CAMIONETA	REGISTRADA	200	1
200	94727	CAMION TUMBA	REGISTRADA	4,120	3
200	95097	CAMIONETA	REGISTRADA	240	1
200	97038	CAMIONETA	REGISTRADA	200	1
200	98055	UTILITARIOS	REGISTRADA	440	2
200	99449	CAMIONETA	REGISTRADA	700	1

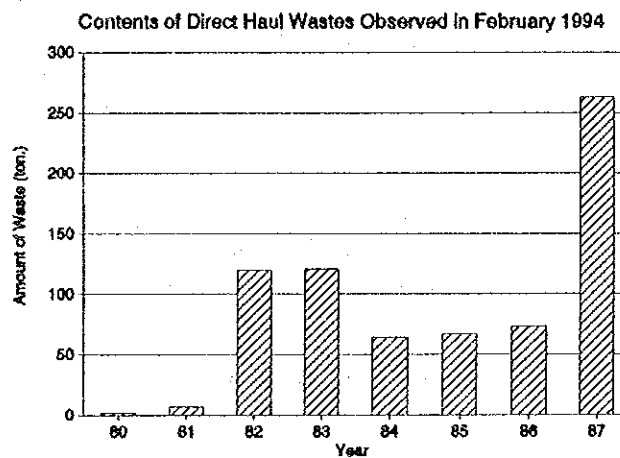
200	105293	UTILITARIOS	REGISTRADA	1,400	2
200	107051	CAMIONETA	REGISTRADA	300	1
200	107143	UTILITARIOS	REGISTRADA	360	1
200	108098	CAMIONETA	REGISTRADA	60	1
200	108590	UTILITARIOS	REGISTRADA	240	1
200	110291	UTILITARIOS	REGISTRADA	1,560	2
200	110350	CAMIONETA	REGISTRADA	160	1
200	110616	CAMION TUMBA	REGISTRADA	9,520	2
200	113952	CAMIONETA	REGISTRADA	1,040	1
200	129247	CAMION TUMBA	REGISTRADA	6,040	2
200	152916	COMPACTADOR	REGISTRADA	5,260	1
200	183282	CAMIONETA	REGISTRADA	260	1
200	194134	VOLQUETE	REGISTRADA	4,860	1
200	217276	CAMIONETA	REGISTRADA	280	1
200	236047	CAMION TUMBA	REGISTRADA	720	1
200	252806	UTILITARIOS	REGISTRADA	1,100	1
200	809150	UTILITARIOS	REGISTRADA	360	1
200	1859	UTILITARIOS	SANSUY PLASTICO	4,980	3
200	98983	UTILITARIOS	SANSUY PLASTICO	3,000	2
200	80915	CAMIONETA	SHEEL PARAGUAY	180	1
200	87050	UTILITARIOS	SHEEL PARAGUAY	420	1
200	105487	UTILITARIOS	SHEEL PARAGUAY	1,560	3
200	106904	CAMION DE CARGA	SHEEL PARAGUAY	440	1
200	88634	CAMION DE CARGA	TECNO ELECTRIC	360	1
200	120503	CAMION TUMBA	VERNON I.C.S.A.	64,840	20
200	152938	CAMION TUMBA	VERNON I.C.S.A.	55,040	30
200	61685	UTILITARIOS	VICENTE PALLARES	2,380	1
200	237808	CAMIONETA	YERBALBY	280	1

As shown in the table, the number of vehicles belonging to registered ISW dischargers in Asuncion Municipality (Code No 200) came to the Cateura Landfill was 102 while the number of others (210, 220 and 230) fell to zero (0) after five months operation. It was observed that during the same period the number of vehicles for direct haul (Municipal Solid Waste) by private sector (which is code No 80) was 404. Since a strict classification between MSW and ISW is not established in the Study area and the operators of the truck scale did not perform a strict inspection of the wastes categorized as 80, 200, 210, 220, and 230, a strict inspection

and classification of wastes categorized 80 was conducted for one month in February 1994. The results are shown in Table L.1.2j.

Table L.1.2j Contents of Direct Haul Wastes in February 1994

Categories of Generation		Code No.	Total
Bulky Waste	Household	80	2
	Office, Shop, Others	81	7
Garden Waste	Household	82	120
	Office, Shop, Others	83	121
Construction Waste	Household	84	64
	Office, Shop, Others	85	67
Other Waste	Household	86	73
	Office, Shop, Others	87	263
TOTAL			717



cc. Survey on illegal dumping sites in the Study area.

cca. Site reconnaissance on illegal dumping

- Illegal dumping along roads in the Study area

Illegally dumped wastes along the main roads in the Study area were investigated and the wastes found on illegal dumping sites consisted of mainly municipal solid wastes and a few industrial wastes.

- **Illegal dumping in streams and rivers**

There are many illegal dumping places along streams and rivers and the wastes in these places consist of mainly municipal solid wastes.

ccb. Results of the survey

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

There are extra spaces along the main roads generally in the rural areas because the road reserve is much wider than the paved carriage way. There are many illegal dumpings in these extra spaces and these wastes, mainly consist of municipal solid wastes, not industrial solid wastes.

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

Illegal dumpings are seldom seen along the branch roads in rural areas. This seems to be due to bad conditions of these roads, for example stone paved or non-paved roads.

- **In the streams**

The Municipality of Asuncion has been using 8 streams, flowing to Paraguay River as final disposal sites since 1971, as shown in Table L.1.2k and Figure L.1.2e.

Table L.1.2K Previous Locations of Final Disposal Sites in Asuncion

Year	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
1. Trinidad	=====															
2. Puente Peru		=====	=====	=====												
3. Arroyo Zalamanca					=====	=====	=====									
4. Arroyo Mburicao								=====	=====	=====						
5. Cateura (Rio Paraguay)											=====	=====	=====	■	■	=====
6. Arroyo Moroti													=====	=====	=====	
7. Nemby (Mbocayaty)																=====
8. Nemby (Zona Coca Cola)																=====

Note : (1) ■ : Interruption by floods
 (2) 3M : 3 Months use

ASUNCION & FERNANDO DE LA MORA

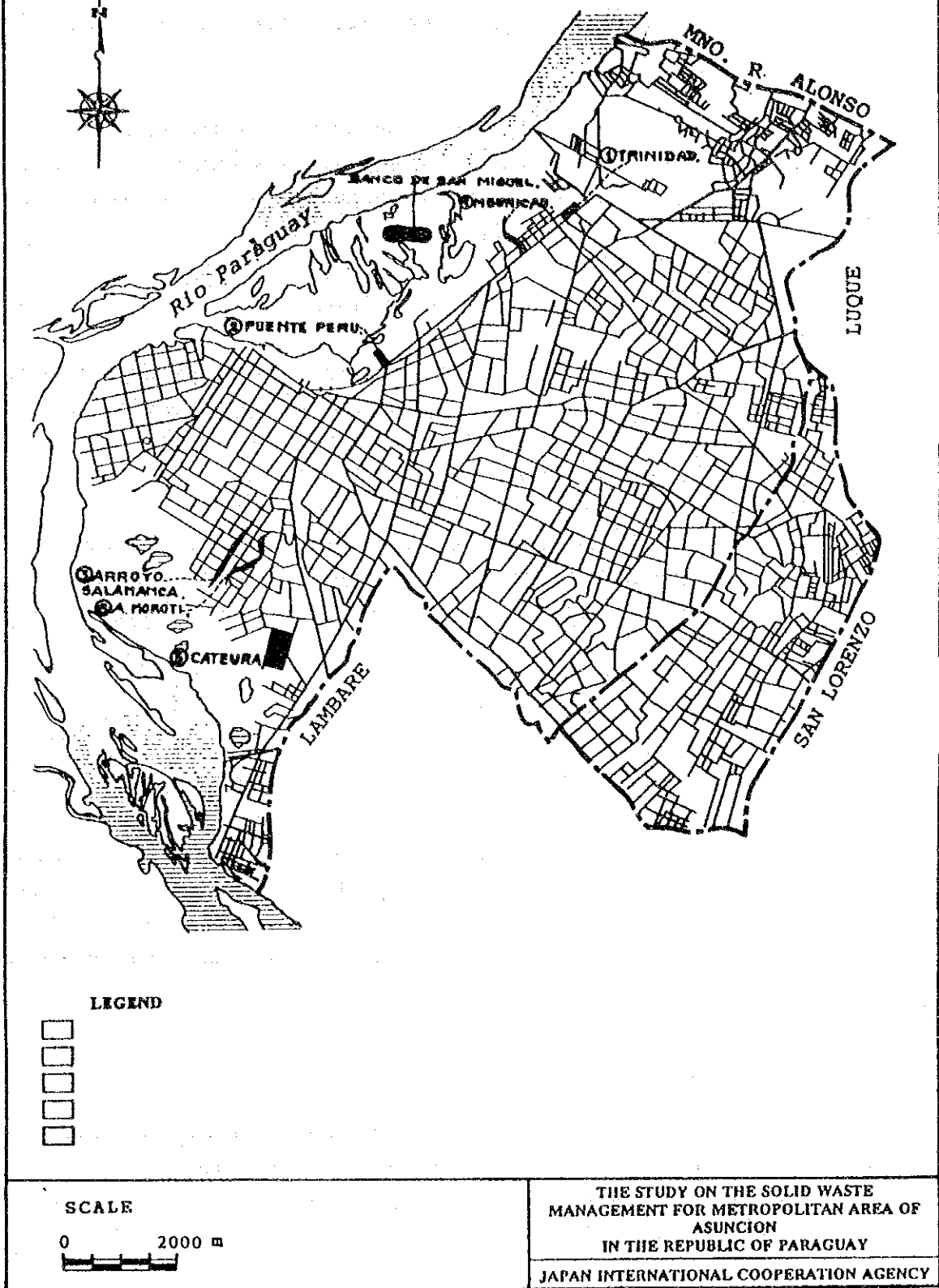


Figure L.1.2c Final Disposal Sites in Asuncion

The Arroyo Mburicao, shown in Table L.1.2k, is at present used for illegal dumping of ISW, because access to this site is good and is well hidden. Illegal dumpings are also seen in Banco de San Miguel, near the Arroyo Mburicao.

It is supposed that the waste collection contractor disposes of industrial solid waste illegally without informing it to their clients, because the factories (producers) answered to this question as "disposing of wastes in the Cateura Landfill."

- **On the east bank of Paraguay River**

Illegal dumping of industrial solid wastes are hardly seen in this side. It may be due to, the long distance from the main generation area.

- **In the other areas**

It is difficult to point out specific illegal dumping sites for industrial solid wastes except Arroyo Mburicao and Banco de San Miguel, because small illegal dumpings are scattered in the whole Metropolitan Area of Asuncion.

ccc. Sewage sludge

The coverage ratios of sewage system are at present 60 % in Asuncion and 40 % in Fernando de la Mora. However, Paraguayan people have a habit of not flushing used toilet paper due to the structural problem of flush toilets, disposing used toilet paper as a municipal waste at the municipal landfills. In addition, there are no sewage treatment plants in the Study area which generates sewage sludge and collected sewage is discharged into Paraguay River from the 8 outlets without any treatment.

ccd. Construction waste

It is observed that the quantity of construction wastes generated is quite small. Form work is not always necessary for building construction and also broken bricks generated through demolishing are sold as construction material, because the price of aggregate is expensive in Asuncion.

cce. Industrial liquid waste.

The Arroyo Mburicao Stream has been deteriorating due to industrial liquid waste;

at some places the water color of Arroyo Mburicao was observed to be red due to blood discharged from the slaughter houses.

The river improvement project is from the outset of Arroyo Mburicao. CORPOS-ANA in the Ministry of Interior is authorized to issue permission to factories to discharge their liquid waste to the sewage system.

The wastes dumped in Arroyo Mburicao and Banco de San Miguel are observed to contain the following compositions.

- Arroyo Mburicao
 - . Wastes discharged from leather factories
 - . Wastes discharged by glass factories
 - . Construction Wastes
 - . Empty drums

- Banco de San Miguel
 - . Wastes discharged by leather factories
 - . Feathers and chicken offal

L.1.3 Findings

a. Laws and Regulations

Environmental control, on industrial waste, in particular, in Paraguay are scattered within several laws and regulations and shall be followed by guidelines and ordinances, to make it's enforcement effective .

Also, so far there has not been coordination defined among the different laws and regulations, at national government level and at the local level (municipalities).

Since a hierarchy of laws, regulations, ordinances and guidelines regarding the environmental aspects is not established and each municipality is being made to regulate their own regulations concerning industrial pollution, a coordination among the different national and municipal agencies will become more difficult in the future.

b. Administration and Organization

Environmental control in Paraguay is in its initial stage, showing a system not already fully organized. The laws, ordinances and guidelines concerning solid waste management, as well as environmental control on the whole are not already consolidated in a coherent body of legislation. This situation places difficulty on the coordination of actions among the different government agencies, at various levels, to curb waste discharges to the environment.

For the new industries an approval system has already been designed, which is shown in Figure L.1.2a. This system however may be disrupted by the new Environmental Assessment Law, which gives the Ministry of Agriculture and Livestock, through the Direction of the Environmental Control, the powers to make decisions on the Impact Assessment necessary to approve each industry.

It seems, however, that SENASA (Ministry of Public Health) will keep working on pollution and contaminants and the Direction of Environmental Control (Ministry of Agriculture) will be in charge of the natural resources, i.e. the fauna and flora.

Control for the wastes discharged by the existing industries, are made today only following complaints from neighbors to the municipality or to SENASA. These complaints are usually related to air pollution (smell or smoke), flies and other nuisances to the population.

Regular and routine controls are made by SENASA only on the selected industries, known to be the heavier polluters. These are, the olive oil producers, tanneries, alcohol distilleries and slaughterhouses.

The role of the provincial governors, recently elected for the first time, has not been defined so far, but they will probably also play a role concerning pollution control.

c. Generation

ca. Characteristics of factories

62 % of factories in Paraguay are located in the Metropolitan Area of Asuncion. 80 % of factories in the Metropolitan Area of Asuncion are light industries and heavy industry accounts for only 20 %. Quite a large percentage of factories are using agricultural products as raw materials. Factories tend to be located in the suburbs of Asuncion; only 80 factories in the Metropolitan Area of Asuncion have more than 80 employees. In other words, the majority of factories have less than 20

employees.

cb. Generation

The generation of ISWs is considered to be minimal compared with MSWs due to underdevelopment of not only heavy industries but also light ones. In addition, at present, the wastes generated in small industries are managed (collected and disposed) by municipalities. According to the incoming ISW survey at the present landfills, the amount of ISW disposed of at municipal landfills are very limited except those deposited at Cateura landfill.

d. Collection and Haulage

Generally in the study area, wastes from small scale factories are collected and transported to the municipal landfills by the Municipalities as MSW while wastes from large scale factories are collected and transported by private contractors or the factories by themselves.

e. Processing and Recycling

No processing facilities for ISW exist in the Study area while recyclable ISW is reused according to the questionnaire survey conducted by the Study Team. Construction wastes are well recycled as aggregates or materials for reclaiming low lands.

f. Final disposal

fa. HUM (Asuncion and Fernando de la Mora)

faa. Companies approved for Disposal by Asuncion Municipality.

Only 4 companies have been approved for disposing of their wastes into the Cateura landfill site by the Municipality of Asuncion by paying 500,000 Gs/month, at the time of July 1993.

In addition, approximately 30 companies have been allowed to pay for disposal of wastes with their products, not money, to the Municipality of Asuncion.

fab. Companies without approval

-- Small scale factories

Wastes discharged by small scale factories are generally collected by the municipal collection service because their quantities are little.

-- Large scale factories

The following measures are expected to be taken by them:

- . Final Disposal in their premises.
- . Illegal dumping in public areas.
- . Illegal dumping in landfills.

To identify disposal measures and their final disposal sites for all factories is too difficult because of the large number of factories.

fb. UM and LUM.

Factories in this area are expected to dispose of wastes in their own premises and illegally dump them and the former measure is deemed to be more common than the latter because most factories have large compounds. However, it is too difficult to identify their waste amount and their final disposal sites because of the large number of factories.

g. Data obtained by the Truck Scale

ga. Salient feature

According to the data obtained by the truck scale at the Cateura landfill for five months from October 1, 1993 to February 28, 1994, the following salient features of ISW disposal are observed.

Table L.1.3a ISW Disposal at Cateura Landfill (1/10/1993–28/2/1994)

Items	Units	Quantity	Remarks
Maximum Daily Disposal	ton/day	58.3	4/10/93
Average Daily Disposal	ton/day	17.8	-----
Total Disposal in 5 Months	ton	2,666	-----
Share of ISW in Total Disposal	%	3.7	Total disposal 71,213 ton
Monthly Disposal (Max.)	ton/month	785	Feb.,1994
Monthly Disposal (Min.)	ton/month	358	Dec.,1993
Biggest Amount by a Company for 5 months	ton	1,108	Curtiembre San Lorenzo S.A. (Tannery)
Number of Companies Registered	company	85	-----
Number of Vehicles Registered	units	102	-----
Total Disposal from Tannery	ton	2,172	-----
Share of Disposal from Tannery in ISW	%	81.4	-----

From Table L.1.3a it is concluded as follows:

- Disposal amount of ISW is not very large. It accounts for only 3.7% of the total disposal.
- Main ISW was the wastes from tanneries and it is equivalent to 81.4% of the total ISW disposed of.

gb. Survey on direct haul wastes

According to the data obtained by the scale, the daily disposal amount seems to be very small. As the classification of ISW and MSW is not clear in the Study area, some of the ISW might be registered in the category of direct haul waste (code No. 80). A one month survey on the contents of Code No. 80 was conducted, dividing Code No. 80 into 7 codes as shown in Table L.1.2j.

- Other wastes, which is considered as municipal wastes, shares about half (46.9%). This is because normal municipal collection has limits on the amount which can be collected.
- Garden wastes came second (33.6%).
- The amount of construction waste is very small (18.3% and 4.68 ton/day) compared to other countries.
- Bulky waste disposal is almost negligible (1.3% and 0.32 ton/day).

This proves that bulky items such as TVs, cars, tables, etc. are well recycled in the Study area.

h. Others

ha. Illegal Dumping of ISW

haa. On the west bank of Paraguay River

Arroyo Mburicao and Banco de San Miguel are two major illegal dumping sites and various industrial solid wastes have been dumped there.

The other illegal dumping sites are small and difficult to identify their numbers and locations.

hab. On the east bank of Paraguay River

Although there are some illegal dumping sites in this area, the areas, amounts, etc. have not been identified.

hb. Sewage Sludge

Sewage sludge is not generated because there are no sewage treatment plants.

hc. Industrial Liquid Waste

Discharge of industrial liquid waste is accelerating the deterioration of river water.

L.1.4 General Recommendations

a. Necessity of Further survey

Although there are approximately 3,000 factories in the Metropolitan Area of Asuncion, the questionnaire survey could only be conducted on limited factories, due to time shortages and lack of a reliable list of factories. Therefore, one should bear in mind that there is a certain limitation in the application of the Study.

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.

b. Laws and Regulations

A legislation which ensure economic incentive shall be produced to support efforts in order to minimize the production of industrial wastes and to promote the use of pollution control equipments.

The Environmental Impact Assessment legislation shall be in order to define the precise role of the different government agencies dealing with this matter.

Coordination shall be sought between the National Government and the Municipal governments, 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.

c. Administration and Organization

ca. Administrative structure

The administrative structure which ensures 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.

cb. 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.

d. 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 to 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.

e. Generation of Waste

ea. Inventory system

Each factory shall submit to the SENASA 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.

eb. 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.

f. 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.

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

g. Supervision and advise

Appropriate supervision and sound advises 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 advises on the operation of the storage, transportation and final disposal of industrial solid wastes.

In addition, the ISW shall be clearly defined by the Central government (SENASA).

L.2 Study on Present Medical SWM

L.2.1 Method of the Study

a. Definition of Terms

In this study, "Medical Solid Wastes" is defined as wastes produced in conjunction with the activities in the medical institutions.

The medical solid wastes are classified into the following two wastes:

- Infectious wastes
- Non-infectious wastes, which consists of non-infectious medical wastes (wastes produced in association with medical treatments, those other than infectious wastes) and non-medical wastes (wastes discharged by business activities other than medical activities).

Since non-infectious wastes are collected and disposed of at municipal landfills, the study of those wastes is done as part of MSWM (Municipal Solid Waste Management). The term medical waste in this chapter refers to infectious wastes. The infectious wastes include the types of wastes as shown in table L.2.1a

Table L.2.1a Types of Infectious Wastes

Types of wastes	Example
Blood, etc.	Blood, blood serum, blood plasma, body fluid (sperm, tissue fluid, etc.), blood preparation.
Pathologic wastes discharged from operations, etc.	Organs, tissues
Those having sharp edges stained with blood	Injection needle, scalpel, test tube, petri dish, glass scrape, etc.
Test equipment, culture medium used for testing and inspections in relation to pathogenic bacteria.	Test tubes, culture medium, petri dish, etc. used for testing and inspections
Equipment used for dialysis treatment	Tube, filter, etc.
Others stained with blood	Disposable goods such as gloves for testing and inspections, sanitary cotton, gauze, bandage.

b. Scope of the study

The scope of the study is to prepare general recommendations for the improvement of Medical SWM (Infectious Wastes) in the Study area based on a rapid diagnosis study on it.

c. Method of the Study

Due to time limitations, a rapid diagnosis study was carried out for one month. Therefore, one should bear in mind that there are certain limitations on the utilization of the results of the study: i.e. reliability and accuracy of the data obtained. In order to make a rapid diagnosis on present medical SWM, the following surveys were conducted:

- data collection from agencies responsible on present medical SWM, i.e., SENASA and Asuncion Municipality.
- questionnaire survey to the producer of medical solid waste.
- field survey

The above mentioned surveys were conducted for one month from July to August, 1993.

d. Study Flow

The study on the medical solid waste management was conducted according to the following flow chart.

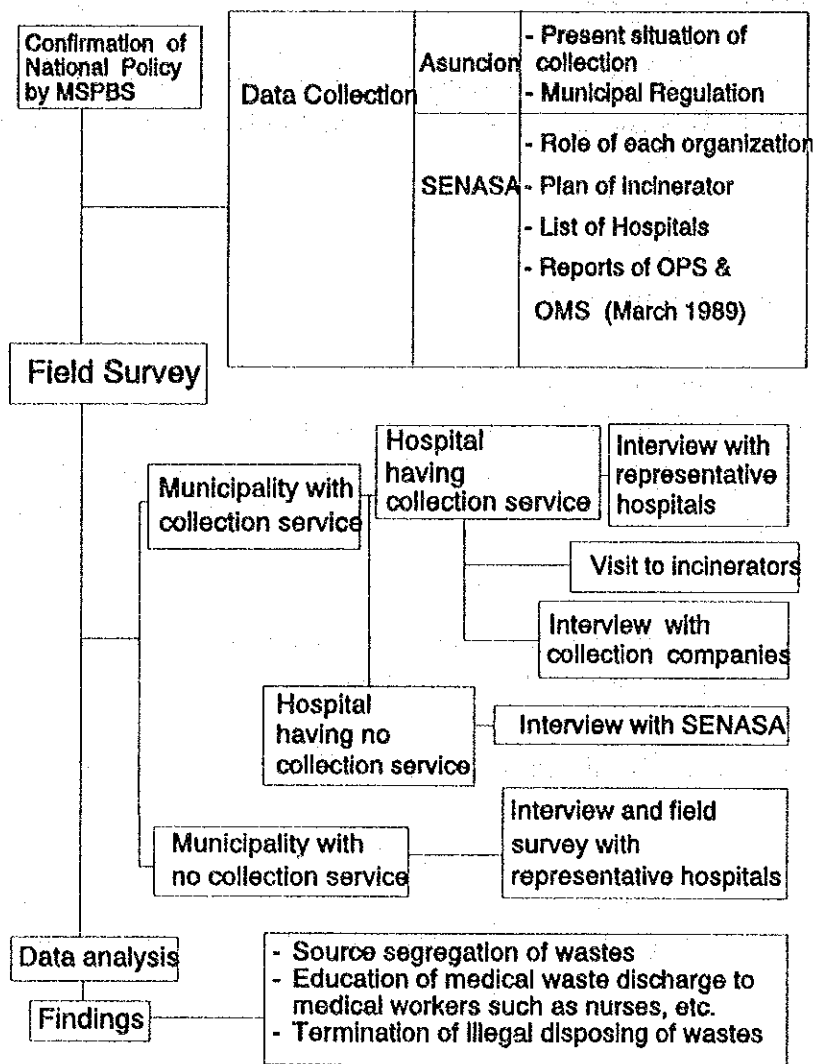


Figure L.2.1a Flow on Medical Waste Treatment Study

L.2.2 Results of the Survey

a. Roles of Governmental Organization

The roles of governmental organizations regarding water and wastes management in Paraguay as summarized in Table L.2.2a.

Table L.2.2a Roles of Governmental Organizations on Water and Wastes Management

Governmental Organization		Ministry of Interior (CORPOSANA)	Ministry of Health and Welfare (SENASA)	Municipality	Ministry of Industry & Commerce
Water Supply & Sewage	Population 4,000 or more	Construction & Maintenance	Inspection		
	Population less than 4,000		Construction, Maintenance & Inspection		
Industry	Liquid Waste	Issue of Permission on Discharge Industrial Waste to sewage system	Preparation of Regulations & enforcement	Inspection	
	Solid Waste		Inspection	Inspection	
Medical	Liquid Waste	No Control			
	Solid Waste		Inspection	Inspection	

b. National Policy

ba. Plan of Parasite Extermination

Although the Paraguayan government knew the importance of medical solid waste management, the parasite problem needed more urgent attention, because more than 80 % of the population suffer from parasitic infestations. The government therefore gave it high priority and proceeded the water supply and sewage treatment projects in advance.

bb. Plan of the medical SWM

SENASA has a policy shown in Table L.2.2b concerning medical solid waste management. The policy is to improve it in the Metropolitan Area and then expand to the whole country.

Table L.2.2b SENASA's Basic Policy on Medical Solid Waste Management

Stage	Medical Facilities	Large scale	Small Scale
First	Asuncion and Fernando de la Mora	In Dec. '91 private contractor's collection started, using an incineration facility at Itagua National Hospital	Not included
		In August, 1993 a tender was carried out in Asuncion and a private contractor was awarded the contract. According to the contract two incinerators for infectious waste should be constructed in Ñemby	
Second	Asuncion Metropolitan Area	Private contractor's collection and/or incineration by each hospital	
Third	Outside Asuncion Metropolitan Area	Private contractor's collection and/or incineration by each hospital	

Source : Information by SENASA

c. Technical System

ca. Conditions of Medical SWM before 1990

Before 1990, all hospitals in Asuncion except two, Hospital de Clínicas – University Hospital and Hospital Central FF.AA. – Military Hospital, did not control medical (infectious) waste and the wastes appeared to be disposed of at the municipal solid waste landfill sites.

cb. OPS / OMS Technical Study Report

OPS / OMS Technical Study Report published in March 1989 gave recommendations summarized in Table L.2.2c.

Table L.2.2c Recommendations on Medical SWM in Asuncion March, 1989

Alternative Solution	1	Special residues should be eliminated at generation source.
	2	Construction of a central incinerator under the direction and administration of Asuncion Municipality
	3	Before and during the construction of incinerator, sanitary landfill is conducted by the direction and administration of the Cleaning Department of Asuncion Municipality
Suggestions		Construction of an incinerator by Asuncion Municipality

Source : Estudio Tecnico Sobre Manejo de Residuos Solidos Hospitalarios de la Ciudad de Ntra. Señora de la Asunción, Paraguay, Marzo 1989

cc. Incineration Plant in LACIMET Hospital

The LACIMET Hospital constructed by the grant aid of Japan in 1991 is equipped with an incinerator. The medical wastes discharged by many large hospitals in Asuncion are incinerated in this plant.

cd. Incineration plant in Italian Sanatorium

The incineration plant was installed in the Italian Sanatorium in 1990 in accordance with OPS / OMS Study Report. This plant deals with medical waste other than injection needles which are carried to LACIMET Hospital.

ce. Private Collection Company

The private collection company started collection service for Asuncion and Fernando de la Mora in December 1991. A 2 Ton pickup truck starts collection at 7 a.m. and arrive at the National Hospital in Itagua, which was built by the French grant aid, at 2 p.m. for incineration.

Figure L.2.2a shows collection route of infectious solid wastes. Table L.2.2d shows its collection fee.

Table L.2.2d Collection Service Charge of Infectious Solid Waste

Discharge Amount	Up to 75 Kg/Month	More than 75 Kg/Month
Collection Service Charge by Private Co.	50,000 Gs/Month fixed charge	5,000 Gs/each 1 Kg

ASUNCION & FERNANDO DE LA MORA

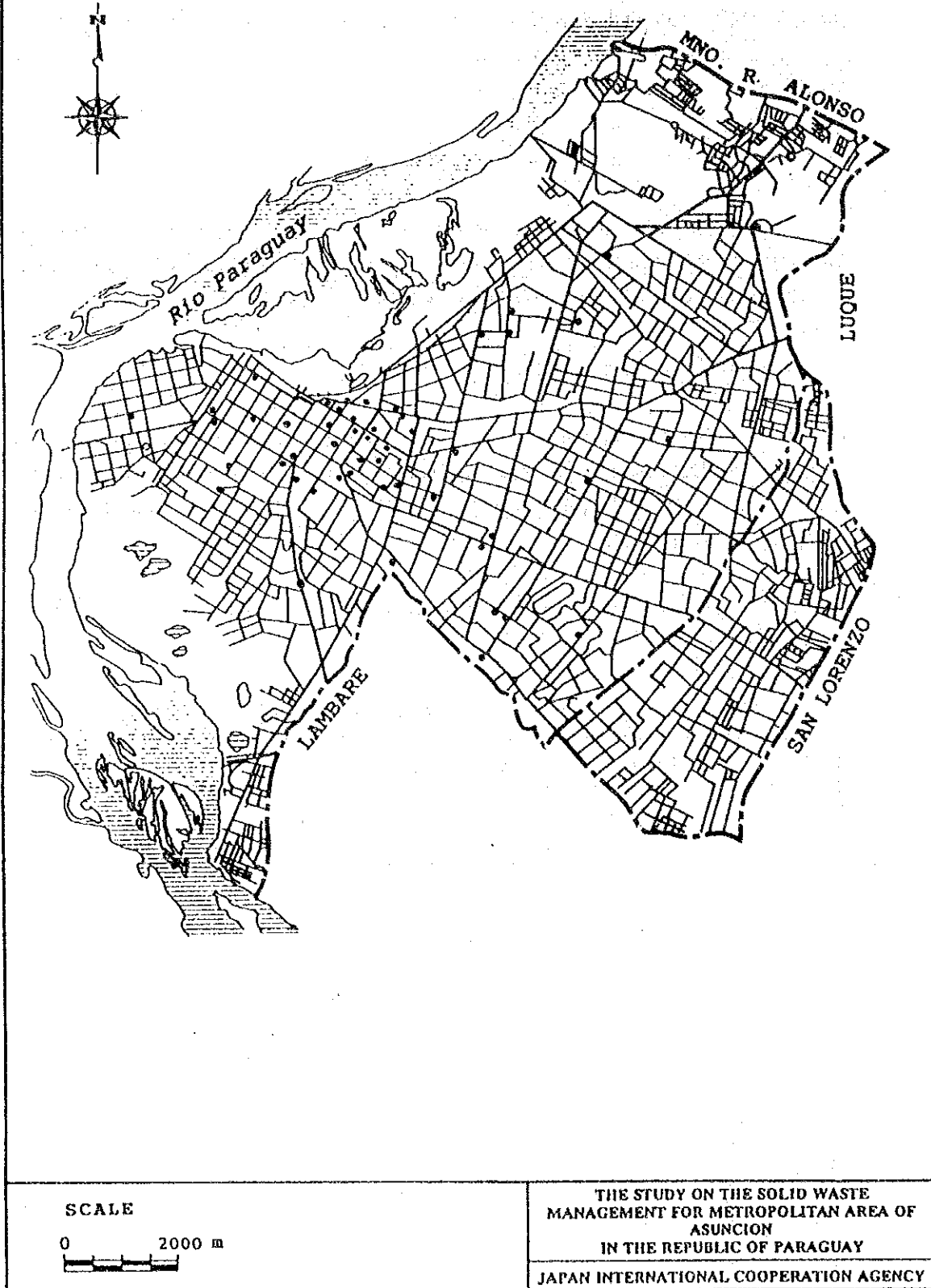


Figure L.2.2a Private Contractor's Collection Route for Main 51 Medical Institutions

d. Laws and Regulations

da. National Government Level

The most important (higher hierarchy) legislation dealing with Medical Waste is the Sanitary Code (Law 836/80). This code states, on article No. 90 that " The Ministry (of Public Health) will determine sanitary **guidelines** for the proper disposal and treatment of the wastes".

A first resolution of the Ministry of Public Health (Resolution No. 1281) concerning only Medical Waste was issued in 1991. This resolution, establishes the "Service of Collection and Treatment of Hospital Residues" in the Asuncion area, under compliance to the Department of Solid and Liquid Residues of SENASA.

This resolution, in practical terms, enabled the development of a collection and disposal system, paid by the medical institutions, under control and guidance of the Asuncion Municipality and SENASA.

Another resolution on Medical Wastes is presently being prepared by the Ministry of Health so to extend the area covered by the services of collection and treatment of hospital residues, in the same way as it was made for Asuncion, to the whole country.

The **guidelines** anticipated in Art. 90 of the Sanitary Code, have been drafted and went through several revisions. Decision to issue it rests in the hands of the Ministry of Health.

Although these Guidelines deal with wastes in general, there is an exclusive chapter on " Pathogenic Hospital Solid Wastes", (chapter 9). This chapter, along with 13 articles, determines how the pathological wastes shall be collected, stored and disposed of.

db. Municipal level

Concerning the municipality of Asuncion, in 1978 an Ordinance (No 2464) and it's guidelines (No.2465) were issued by the Municipal Council of Asuncion. This ordinance defines how Pathological Solid Wastes should be collected, transported and disposed of, giving special emphasis on the disposal of these harmful wastes.

Based on this Ordinance, and on the Ministerial Resolution, the Municipality of Asuncion, in accordance with SENASA, developed a collection and disposal service last year, through a private enterprise.

Another ordinance on Medical Waste was issued at that time, so to determine fines for those medical institutions that would not comply with the previous ordinance.

Due to some deficiencies in the pathological waste management and implementation program, another ordinance on medical wastes has been submitted to the Municipal Council.

This ordinance proposal consolidates and upgrades the existing one and its main features are:

- The definition of pathological wastes, being the materials which may transmit any viruses, microbes, living organisms or its toxins to the environment.
- The classification of Pathological Wastes into pathogenic or non-pathogenic, according to the place where they are produced.
- The disposal of Pathological Wastes of the pathogenic type by incineration while the non-pathogenic may be disposed of in Sanitary Landfills.

The guidelines related to this ordinance determine that all Hospital, Wards, Biological laboratories and other institutions producing pathological wastes shall have incinerators to dispose its pathogenic wastes. If they don't, they should send it to the Municipal Incinerator (still to be constructed).

These guidelines also define design parameters to the pathological incinerators and the storage procedures for the institutions that does not have incinerators and thus send its pathological residues to the municipal incinerator.

Another set of guidelines of the same ordinance, determine that all hospital solid waste shall be separated into different types and placed in colored bags and boxes according to the following types:

- White bags: Materials and disposable items contaminated with blood or body fluids, organic materials (tissues, body parts, research animals...), gloves, etc.
- Yellow bags: Pathological waste (non-contaminated materials)
- Cardboard boxes: Sharp items, like needles, broken contaminated glass, lancets, etc..

White and yellow bags shall be stored in special containers, enclosed in specific rooms, and subjected to periodic disinfection, while radioactive materials should be handled according to the regulations issued by the Atomic Energy National

Commission.

These ordinance proposals are presently under study at the Municipal Council's Hygiene and Health Committee in order to be cleared for approval.

Table L.2.2e is presented ahead with a summary of the existing and the proposed laws and regulations dealing with medical waste.

Table L.2.2e Medical Waste Legislation

MEDICAL WASTE LEGISLATION		
Level/Status	Existing	Proposed
National Government	<ul style="list-style-type: none"> - Sanitary Code, Law No. 836/80, Art. No 90. - Resolution No. 1281/91, Ministry of Health creates pathological waste services. 	<ul style="list-style-type: none"> - Guidelines on Solid Waste Management; Chapter 9. (Presently in the Ministry of Public Health)
Municipal Government (Asuncion)	<ul style="list-style-type: none"> - Ordinance 2464, 1978 and Guidelines 2465, 1978, on Collection, Transport and Disposal of Pathological Solid Waste. - Ordinance No.8 1992, establishes fines for non-compliance of ordinance 2464. 	<ul style="list-style-type: none"> - Ordinance proposal to upgrade the existing ordinance. (Presently in the Municipal Council)

e. Field Survey

ea. Hospitals receiving collection services of infectious solid wastes

eea. Interview survey of representative hospitals

Table L.2.2f summarizes the result of the interview survey to the nine representative hospitals.

As shown in Table L.2.2g it was proved that hospitals were not satisfied with the infectious waste collection service by the private company due to insufficient collection frequency and irregular collection.

This survey also found that the infectious waste management system was not established sufficiently even in the hospitals which have infectious waste collection service.

Table L.2.2f Summary of Questionnaire Survey on Medical Solid Waste Management

Location	Asuncion Service	Asuncion Service	Asuncion Service	Asuncion Service	Asuncion Service	Asuncion Service	Asuncion Service	Asuncion Service	F.Mora Service	San Lorenzo No Service	San Lorenzo Hospital Regional San Lorenzo	San Lorenzo Government
Infectious Waste	I.P.S.	Sanatorio Italiano	Lacimet	Sanatorio Cruz Blanca	Hospital Clinicas	Primeros Auxilios	J.M. Bontner	Centro de Salud No 5 San Pablo				
Name of Medical Institutions	Government	Private	Government	Private	Government	Government	Government	Government	Government	Government	Government	Government
Owner	Government	Private	Government	Private	Government	Government	Government	Government	Government	Government	Government	Government
Number of Outpatient (person/day)	3,200	20	52,318	6	94	220	28	970	142	100	80	
Number of Beds (beds)	600	60	46	18	260	70	230	60	14	12	8	
Medical Doctors	675	6	50	7	220	77	25	99	8	19	2	
Assistants	571	62	120	14	228	96	146	87	12	39	4	
Administration	778	16	170		35	62	20	78	5		2	
Major Operation	225	45	330	9	75	382	90	47	300	15	4	
Minor Operation	750	150		30	450	130		39	15	0	4	
Parturition	450	35		12	120			163	8	90	0	
Total	1,425	230	330	51	645	512	90	249	323	105	8	
Disposal Method	DM2	DM1	DM1	NA	DM1	NA	NA	DM2	NA	DM1	DM1	DM1

Note : (1) Medical waste generation is estimated based on the following assumption:
 Unit volume of medical waste for minor operation is 0.5kg/operation.
 Unit volume of medical waste for major operation is 1.0kg/operation.
 Unit volume of medical waste for parturition is 1.0kg/operation.

(2) DM1 Medical waste is incinerated by a hospital.
 DM2 Medical waste is incinerated by the private disposal company.

Table L.2.2g Demand of the Hospitals on Medical Solid Waste Management

Existing Situation		Demands from the Hospitals
1	Collection Service 3 Times/week by one pick-up (2 Ton car) (Monday, Wednesday, Friday)	a. Regular collection service b. More frequent service c. Every day collection
2	Separation of infectious from non-infectious solid waste (Unless it is separated, the private collection company leaves such waste at the Hospital)	a. Detailed clarification of infectious wastes b. Insufficient knowledge of infectious waste collectors in the Hospitals. (Low Education Level)
3	Collection service charge is 50,000 Gs/month up to 75 Kg/month. For exceeding amount 5,000Gs/each Kg.	a. Free of charge
4	Penalty of mixing non-infectious solid waste with medical solid waste US\$1,000.-/Time	a. Too much penalty cost
5	Others	a. Disposal at municipal final disposal site, regarding ash generated from incinerator.

eab. Existing Incinerators

The results of the survey on existing incinerators for infectious wastes are presented in Table L.2.2h. Medical solid wastes discharged from most of the main hospitals are incinerated at the incinerator of the National Hospital in Itagua. When we visited the National Hospital in Itagua in July 1993, medical waste was burnt in a hole outside of the hospital because the incinerator was out of order. Reparation works were completed in one month.

Table L.2.2h Incinerators for Infectious Solid Waste in the Study Area

Location		Itagua	Asuncion	Asuncion
Hospital Name		Hospital Nacional	LACIMET	Sanatorio Italiano
Average Incineration	Kg/day	430	50	10
	Hours	7	0.5	1
Diesel Oil cost		250,000 Gs/day	20 L/day	NA
Average ash weight		NA	20 Kg/day	NA
Remarks		June 20, 1993 Out of order July 19, 1993 Repaired	4 workers engaged	* Injection needles are carried to LACIMET * Incinerator's capacity 45 Kg/hr

Note : Hospital de Clinicas and Military Hospital are not interviewed.

eac. Storage of Waste

After medical waste is separated to infectious and non-infectious waste, they are generally stored in the hospital safekeeping container. According to the observation on these storages, it was found that the storage in small scale hospitals are better controlled than large scale hospitals.

ead. Interview with private infectious waste collection company

The private company suspected that the client hospitals might be taking the following actions in order to reduce the amount of infectious waste discharged to cut their fees.

- Controlling the amount discharged to less than 75 Kg, the minimum unit of collection fee. (There were some hospitals where the amount of infectious waste decreased with the start of collection service).
- Discharging some infectious waste as non-infectious waste, which is collected by municipalities.

eb. Hospitals having no collection service for infectious waste

The small scale medical institutions which are categorized as "Laboratory", "Clinic", and "Consultant Pharmacy" are generally discharging infectious wastes as domestic waste.

The plan proposed in August 1993 which makes the private contractor carry out collection, haulage and incineration operation totally will cover infectious waste discharged by all small scale medical institutions.

ec. Present situation in municipalities having no collection services for infectious waste (13 municipalities other than Asuncion and F.Mora)

There are no large hospitals in the Metropolitan Area of Asuncion except Asuncion and Fernando de la Mora, and critical patients are carried to the hospitals in Asuncion. Therefore, the infectious waste amount discharged in the 13 municipalities other than Asuncion and F.Mora area is very little.

According to the interview with two hospitals in San Lorenzo, both of them burn infectious waste with non-infectious waste on their premises, but no complaints were made so far. It is expected that the other hospitals are taking the same action or disposing infectious with non-infectious wastes.

ed. Entrustment of infectious waste collection

In order to entrust collection, haulage and incineration work of all infectious waste discharged, the Municipality of Asuncion held a tender in August 1993. After implementation of this project, the medical SWM system will be as follows.

Table L.2.2i Entrustment Plan of Infectious Solid Waste Collection Service to Private Companies

	Discharge	Collection	Incineration
Private Collection Company	None	Complete separate collection	2 incinerators will be built at the same site in Nemby, taking mechanical trouble into account
Medical Institution	Infectious waste should be collected from all the medical institutions	80,000 Gs/month up to 75Kg/month 7,0-00Gs/Kg each beyond 75 Kg/Month	The incinerator of National Hospital will not be used for Asuncion & Fernando de la Mora municipalities
Municipality	Inspection of complete separate discharge	None	None
SENASA	Inspection of complete separate discharge	Inspection of collection service	Inspection of disposal service

L.2.3 Findings

a. General

aa. Difficulty in obtaining medical institutions list

It was very difficult to obtain the medical institutions list in the Study Area, because it did not exist and also there were many medical institutions discharging infectious wastes.

ab. National policy of infectious waste management

The basic policy, improvement of the infectious waste management expanding from Asuncion to the whole country step by step, is considered to be reasonable.

The project in accordance with this policy has started in Asuncion and Fernando de

la Mora, and this project should be expanded to cover the whole Metropolitan Area.

b. Technical Aspects

ba. Separate Collection

Separate collection for infectious waste is observed to be carried out improperly due to the financial reasons of medical institutions and also lack of basic knowledge on infectious wastes even among persons working in the institutions.

c. Institutional Aspects

ca. Education of infectious solid waste to all medical staff.

Education on how to deal with infectious solid waste should be given to all medical staff, including doctors, nurses, cleaners, etc., because all of them potentially handle infectious waste.

cb. Illegal dumping of infectious waste at sites other than municipal landfill sites

This case is not seen at present and this condition should be maintained.

L.2.4 General Recommendations

a. Laws and Regulations

aa. Guideline

The guideline on MSWM prepared in accordance with the Sanitary Code which contains a section on medical solid waste shall be put into effect as soon as possible so to empower the government authorities to carry on their plans related to Medical Waste Management.

ab. Public education of segregation

The enforcement of the above mentioned guidelines shall be preceded by a public education program at hospitals and sanatoria, promoting source separation and storage

of infectious and non-infectious wastes.

ac. Hierarchy of legislation

Coordination between the National Government and the Municipal governments shall be sought, when producing laws, regulations and guidelines on medical waste, bearing in mind the hierarchy of the laws, ordinances and guidelines, so to avoid legislative conflicts.

ad. Coordination

Coordination between the different levels of government and the different governmental agencies shall also be sought, in the law enforcement activities related to the medical waste management.

as. Role of municipalities

The role of the Municipalities shall be to cooperate with the National Government authorities mainly on matters related to nuisances and hazards to the people in general produced by mismanagement of the medical waste.

af. Enforcement

The source segregation of infectious waste shall be strictly controlled. According to the regulation, penalties for hospitals which will not segregate wastes shall be fined.

b. Others

ba. Smooth implementation of entrustment plan

Based on the tender results (held in August 1993), Asuncion Municipality shall facilitate the entrustment plan of infectious solid waste collection and disposal service to the private company.

bb. Strengthening SENASA

In order to realize sound medical waste disposal by the private company, the SENASA shall strengthen its capability of inspection and control to both medical institutions and the private contractor. The inspection and control work shall cover the following aspects:

- i. to medical institutions;
 - segregation of infectious waste.
 - elimination of infectious waste discharge as MSW which is collected by municipalities.
 - payment of disposal fee to the private company.
- ii. to the private company for infectious waste disposal;
 - strict execution of the regular collection service.
 - proper treatment and disposal.

bc. Review of collection fee

The extra collection fee, i.e. 7,000Gs/kg if exceeding 75kg/month, shall be revised in order to avoid the inclusion of infectious waste into the MSW. Because the extra fee of 7,000Gs/kg is about 7 times more expensive than the normal fee of 1,068Gs/kg ($80,000 \text{ Gs/month} \div 75 \text{ kg/month} = 1,068 \text{ Gs/kg}$) this may cause integration of infectious waste into the MSW by hospitals. Generally, the extra fee should be cheaper than the normal fee to give an incentive to hospitals for discharging infectious waste.

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