

# Annex F

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## *Medical Waste Survey*

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## F Medical Waste Survey

### F.1 Objectives

The medical waste survey (MWS) was carried out with following objectives.

- To understand the status quo of the medical waste management in AMSS
- To obtain information for formulating an optimal system for the future medical waste management
- To estimate present and future medical waste stream based on the outcome of this MWS

### F.2 Samples

Table F-1 shows numbers of medical institutions and beds in AMSS. 41 medical institutions are selected from them for this inquiry survey on medical waste management (Table F-2). With regard to medical waste amount, not only the medical institutions but also medical waste collectors are inquired in this survey.

Table F-1: Hospitals and Number of Beds in AMSS

Classifications		Nos. of hospital	Nos. of beds per type of hospital			Total
			I more than 200 beds	II 50 to 200 beds	III less than 50 beds	
Private	Charity	1	-	60	-	60
	NGOs	1	-	78	-	78
	Private	19	-	347	277	624
	Total	21	-	485	277	762
Public	ISSS	15	908	377	120	1,405
	Ministerio de Defensa	1	302	-	-	302
	Ministerio de Justicia	1	-	50	-	50
	MSPAS	32	2,480	111	345	2,936
	Total	49	3,690	538	465	4,693
Total		70	3,690	1,023	742	5,455

Table F-2: Outline of Sample Hospitals

N°	Name	Managed by	Beds	Address	Tel.
1	Hospital Rosales	MSPAS	554	Final Calle Arce y 25 Av. Norte	222-5866
2	Hospital Maternidad	MSPAS	308	1 Calle Poniente y 25 Av. Norte	221-0129
3	Hospital Zacamil	MSPAS	230	Centro U. J. S. Cañas, C. Zacamil, Mejicanos	272-2000
4	Hospital Bloom	MSPAS	291	25 Av. Norte y Final. 29 calle Poniente	225-8171
5	Hospital Psiquiátrico	MSPAS	400	Calle La Fuente, Cantón Limón Soyapango	291-0056
6	Hospital Neumologico	MSPAS	292	Carretera Planes de Renderos km. 9 1/2	280-8202
7	Hospital San Rafael	MSPAS	220	Final. 4ta. C. Ote. #9-2 Nueva S.S.	228-1740
8	Hospital San Bartolo	MSPAS	60	Fnal.C. Fco. Menéndez , Z. Franca San Bartolo	295-1675
9	Hospital Militar	M. Def.	274	Res. San Luis, Av. Bernal	274-6066
10	U.de S. San Miguelito	MSPAS	0	20 Av. Nte. y 25 Calle Ote.	274-3283
11	U. de Salud Concepción	MSPAS	0	Barrio Concepción, 5° Calle oriente, S.S	235-8850
12	U.de San Antonio Abad	MSPAS	0	Fnal. C. El Algodón Col. Miralvalle	274-3239
13	Laboratorio de Salud	MSPAS	0	Alameda Roosevelt Contiguo Hospital Rosales	271-1339
14	Medicina Legal	M.Jus.	0	Centro Judicial Isidro Menéndez	235-1923
15	Hospital M. Quirúrgico	ISSS	308	Av. Juan Pablo II y 1a. Calle Poniente	260-9277
16	Hospital Oncológico	ISSS	53	1 Calle Pte. Y 25 Av. Norte	260-9242
17	H. de Especialidades	ISSS	325	1era. C. Pte. Ctgo. Inst. del Cáncer	260-7369
18	Hospital 1 de Mayo	ISSS	218	Calle Arce y 23 Av. Sur	271-1166
19	Hospital Psiquiátrico	ISSS	103	1era. C. Pte. y C. Arce No 1290	271-0809
20	Hospital Neumologico	ISSS	91	Carretera Planes de Renderos km.8 1/2	280-8140
21	C. de Salud Zacamil	ISSS	0	C. Urbano J. S. Cañas, C. Zacamil, Mejicanos	272-5019
22	Hospital Pro Familia	NGOs	78	25 Av. Norte No. 583	226-3999
23	H. Divina Providencia	Charity	80	Col. Miramonte, Cl. Toluca Pje. B	260-0509
24	Hospital de Diagnostico	Private	62	Col. Medica, Diagonal Dr. Luis Vasquez	226-5111
25	Hospital Ginecologico	Private	55	Col. Medica, Diagonal Dr. Luis Vasquez	226-1122
26	Hospital Metropolitano	Private	30	23 Av. Nte. No. 1340, Col. Medica	225-0060
27	Hospital Baldwin	Private	50	37 Av. Nte. No 207	260-9900
28	Hospital de la Mujer	Private	50	Entre 81 y 83 Av. Sur, Col. Escalón	263-5111
29	Hospital Central	Private	28	Col. Guadalupe y Bulevar Tutunichapa	225-5822
30	H. Centro Pediátrico	Private	30	Diagonal Luis E. Vasquez No. 222, Col. Medica	225-3688
31	H. C. de Emergencias	Private	16	Diagonal Dr. Luis Edmundo Vasquez	226-0003
32	Hospital Clínica Mater	Private	10	3ra Calle Pte. No 1225	221-9790
33	H. Cl.Ginec. Drs. Farela	Private	10	27 Av. Nte. No 1317 Col. Medica	225-9967
34	Hospital Climosal	Private	15	6 C. Pte. Entre 6a. y 8a. Av. Sur, Santa Tecla	228-2334
35	Cruz Roja	Private	0	17 C. Pte. y Av. Henry Dunant	271-9220
36	Hospital Salvadoreño	Private	21	6a. Décima c. Pte. No. 2419, Col. Flor Blanca	245-4564
37	H. de Ojos y Otorrino	Private	14	Col. Médica Av. Max Bloch y Av. Emilio Alvarez	225-0122
38	Hospital Instituto de Ojos	Private	10	Bulevar Tutunichapa 2da Diagonal No 326	225-3687
39	Cli. F. de Odont. UES	UES	0	Fnal. 25 Av. Nte. Cdad. Universitaria	225-7198
40	H. Internacional de Ojos	Private	2	Col. Medica, diag. Victor M. Posada No.1321	235-2440
41	Hospital Bautista	Private	55	23 av. Nte. No. 128	222-5522
Total number of beds			4,343		

### F.3 Formulation of Questionnaire

Focal points of the survey items were generation, separation, storage, discharge, collection, treatment and disposal of infectious/hazardous waste from medical institutions. The survey items are summarized as follows.

**a. Basic Questions**

- Location
- Type of services
- Number of employees
- Number of beds
- Others

**b. Actual Conditions of Generation Source Separation, Storage, Discharge, Collection, Treatment, and Disposal of Infectious and Hazardous Medical Wastes**

- Generation amount and composition
- Source separation and methods involved
- Storage method and containers used
- Discharge method and containers used
- Treatment methods (e.g., incineration, disinfection)
- Collector and collection method
- Location where the waste is disposed of and disposal method
- Others

**c. Opinions**

*For infectious and hazardous wastes:*

- Knowledge of medical waste management regulations and their enforcement
- Education of employees on the methods of handling of infectious and hazardous medical wastes
- Fees for the collection and treatment of infectious and hazardous medical wastes

*For municipal wastes*

- Awareness of environmental and sanitation problems
- Acknowledgement of the importance of environmental consideration
- Views on introduction of separate collection
- Payment of collection fees (cleansing tariff) and collection fee amount
- Views on collection fee
- Cooperation in recycling activities
- Contracting out to private companies or direct haulage by the institutions
- Current collection methods
- Others

## F.4 Results of the Survey

### F.4.1 General Information of Interviewee

The health institutions sampled represent almost 100% of those providing hospitalization services (33) plus three health units from MSPAS and one health unit from ISSS and other health institutions such as the Laboratorio Central de Salud, Medicina Legal, Red Cross (*Cruz Roja*) and odontology clinics of the Universidad de El Salvador (UES). The latter were sampled in order to have a broad view on the main bio-infectious waste generators.

Sample totaled 41 institutions, of which 53.7% are public, 43.9% are private and 2.4% are others, such as an international entity as the Red Cross.

Within this universe of medical institutions, 29.3% of them are general hospitals and 41.4% are specialty hospitals, 19.5% are categorized as other such as labs and clinics, and 9.8% are health units.

Question 4 was oriented to showing an overview of the institutions and a bed census of the 33 hospitals sampled was obtained, adding up to 4,343 beds. The public sector encompasses 86% of the total of these beds.

Table F-3 summarized answer of general information.

Table F-3: Summary of General Information

Category	No.	Name	Floor Area(m <sup>2</sup> )	Number of Employee			Beds		Consultations per year
				Medical	Administ.	Total	Nos.	Occup.	
I (More than 200 beds)	01	Hospital Rosales	22,000	733	767	1,500	554	90%	242,575
	02	Hospital Maternidad	9,104	607	113	720	308	90%	118,192
	03	Hospital Zacamil		510	140	650	230	43%	90,000
	04	Hospital Bloom		452	411	863	291	80%	1,114
	05	Hospital Psiquiatrico	8,000	980	110	1,090	400	100%	13,822
	06	Hospital Neumologico	11,500	35	347	382	292	74%	56,461
	07	Hospital San Rafael	32,954	284	236	520	220	88%	149,276
	09	Hospital Militar		442	375	817	274	40%	135,146
	15	Hospital Medico Quirurgico	2,156	700	751	1,451	308	100%	94,900
	17	Hospital de Especialidades	6,000	900	400	1,300	325	85%	400,000
	18	Hospital 1 de Mayo		478	394	872	218	97%	35,000
II (50 to 200 beds)	08	Hospital San Bartolo	3,804	112	89	201	60	98%	249,844
	16	Hospital Oncologico		83	137	220	53	79%	50,000
	19	Hospital Psiquiatrico	1,260	84	96	180	103	80%	144,000
	20	Hospital Neumologico	1,326	43	65	108	91	65%	1,000
	22	Hospital Pro Familia	7,350	113	45	158	78	38%	12,031
	23	Hospital Divina Providencia		4	5	9	80	63%	
	24	Hospital de Diagnostico	2,970	109	168	277	62	55%	8,289
	25	Hospital Ginecologico		67	47	114	55	55%	2,280
	27	Hospital Baldwin		56	61	117	50	20%	1,825
	28	Hospital de la Mujer	5,243	110	74	184	50	60%	
	41	Hospital Bautista	15,600	45	8	53	55	60%	4,000

Category	No.	Name	Floor Area(m <sup>2</sup> )	Number of Employee			Beds		Consultations per year
				Medical	Administ.	Total	Nos.	Occup.	
III (Less than 50 beds)	26	Hospital Metropolitano	1,197	10		10	30	50%	
	29	Hospital Central	2,691	40	59	99	28	39%	540
	30	Hospital Centro Pediatrico	5,100	72	62	134	30	33%	8,400
	31	Hospital Centro de Emergencias	500	22	6	28	16	50%	650
	32	Hospital Clinica Mater	210	5	4	9	10	40%	1,800
	33	Hospital Clinica Ginecologica Dres. Farela		13	8	21	10	50%	400
	34	Hospital Climosal	4,050	20	9	29	15	40%	1,150
	36	Hospital Salvadoreño		20	33	53	21	52%	
	37	Hospital de Ojos y Otorrino		10	16	26	14	50%	
	38	Hospital Instituto de Ojos	2,250	5	7	12	10	30%	
	40	Hospital Internacional de Ojos		22	3	25	2	100%	1,800
IV (Without beds)	10	Unidad de Salud San Miguelito		39	41	80			91,357
	11	Unidad de Salud Concepcion		48	36	84			62,864
	12	Unidad de Salud San Antonio Abad	447	32	19	51			59,690
	13	Laboratorio de Salud	8,700	42	21	63			
	14	Medicina Legal		48	18	66			20,000
	21	Consultorio de Salud Zacamil	400	139	270	409			3,733
	35	Cruz Roja		38	154	192			23,000
39	Clinica Facultad de Odontologia UES	1,500	65	113	178			2,000	
Total			156,312	7,637	5,718	13,355	4,343		2,087,139

#### F.4.2 Evaluation of the Present System

It was concluded that 73.2% of interviewees answered that in general terms there are no internal waste management troubles; however, in AMSS, 29.3 % of interviewees consider that there is a problem and 39% think such situation is unacceptable for the environment.

Question 7 which is the last of this section was oriented to prioritizing those aspects that influence on hospital solid waste management, such as the following: laws and regulations, guidelines for the management, state supervision and control, funds to conduct such management, internal instructions and training to use the equipment. Generally speaking, all these aspects were ranked 43.9 to 58.5% as great responsibility issues.

Table F-4: Answer of Question 7

Aspect	Responsibility		Great	Considerable	Low	No	I don't know	Total				
	Great	Considerable										
1.Lack of legislation and regulations	22	53.7%	5	12.2%	7	17.1%	3	7.3%	4	9.8%	41	100.0%
2.Lack of guidelines for the present management	21	51.2%	4	9.8%	9	22.0%	3	7.3%	4	9.8%	41	100.0%
3.Lack of supervision and control by the authorities	18	43.9%	5	12.2%	13	31.7%	3	7.3%	2	4.9%	41	100.0%
4.Lack of funds to carry out an appropriate management	19	46.3%	3	7.3%	9	22.0%	2	4.9%	8	19.5%	41	100.0%
5.Lack of obedience to internal instructions	24	58.5%	6	14.6%	6	14.6%	1	2.4%	4	9.8%	41	100.0%
6.Lack of training of the equipment	21	51.2%	9	22.0%	4	9.8%	3	7.3%	4	9.8%	41	100.0%

The most important aspect (58.5%) is disobedience of internal instructions; i.e., the difficulty to change attitudes and practices by the staff that generates wastes (physicians and nurses), followed by the absence of law and regulation with 53.7%.

An important data is that of the lack of supervision and control by the authorities, since 43.9%, of interviewees consider such as very important in the responsibility of the current situation, whereas 31.7% regards it as a low responsibility factor.

### F.4.3 Solid Waste Management

#### a. Medical Waste Management

This section is structured to acknowledge hazardous solid waste management that represent a risk in each internal and external management stage.

##### a.1 Training and Instructions

It was found that 80.5% of the institutions have instructions for the management of hospital wastes and 97% acknowledge the existence of hazardous waste. 53.7% of such institutions conduct quarterly training programs, 21.9 % perform annual programs and 19.5 % carry out introductory talks in the beginning of the works, and only 4.9 % never conducts training programs.

##### a.2 Storage

In the storage stage, 100% of interviewees stated that wastes are stored separately and 95% in more than two categories.

##### a.3 Waste Generation Amount and Composition

###### a.3.1 Waste Generation Amount

The generation amount does not have data results directly weighted at the site, however, the estimations by the persons in charge are respected. Results of the estimation show in Table F-5.

Table F-5: Results of the Estimation

Category of hospital	Type	Org.	Name of hospital	Number of bed	Generation amount (kg/day)	Generation ratio (kg/bed/day)
I	Public	MSPAS	Hospital Rosales	554	231.43	0.42
I	Public	MSPAS	Hospital Maternidad	308	266.57	0.87
I	Public	MSPAS	Hospital Zacamil	230	106.57	0.46
I	Public	MSPAS	Hospital Psiquiatrico	400	72.86	0.18
I	Public	MSPAS	Hospital Neumologico	292	49.86	0.17
I	Public	MSPAS	Hospital San Rafael	220	104.71	0.48
I	Public	Ministerio de Defensa	Hospital Militar	274	58.29	0.21
I	Public	ISSS	Hospital Medico Quirurgico	308	328.57	1.07
I	Public	ISSS	Hospital de Especialidades	325	363.71	1.12
<b>Average</b>						<b>0.553</b>



Category of hospital	Type	Org.	Name of hospital	Number of bed	Generation amount (kg/day)	Generation ratio (kg/bed/day)
II	Public	MSPAS	Hospital San Bartolo	60	46.43	0.77
II	Public	ISSS	Hospital Oncologico	53	97.43	1.84
II	Public	ISSS	Hospital Psiquiatrico	103	30.00	0.29
II	Public	ISSS	Hospital Neumologico	91	147.71	1.62
II	Private	Charity	Hospital Divina Providencia	80	4.28	0.05
II	Private	Private	Hospital Metropolitano	30	9.75	0.33
II	Private	Private	Hospital Baldwin	50	5.71	0.11
II	Private	Private	Hospital Bautista	55	21.45	0.39
<b>Average</b>						<b>0.675</b>
III	Private	Private	Hospital de la Mujer	50	32.29	0.65
III	Private	Private	Hospital Central	28	14.29	0.51
III	Private	Private	Hospital Centro Pediatrico	30	7.14	0.24
III	Private	Private	Hospital Centro de Emergencias	16	2.00	0.13
III	Private	Private	Hospital Clinica Mater	10	0.71	0.07
III	Private	Private	Hospital Clinica Ginecologica Dres. Farela	10	0.29	0.03
III	Private	Private	Hospital Climosal	15	0.40	0.03
III	Private	Private	Hospital Instituto de Ojos	10	6.50	0.65
III	Private	Private	Hospital Internacional de Ojos	2	1.30	0.65
<b>Average</b>						<b>0.329</b>

### a.3.2 Waste Composition

Table F-6 shows the medical waste composition.

Table F-6: Waste Composition

Type of Waste	Category	I	II	III	total
1.Blood		10.8%	8.6%	10.4%	9.9%
2.Infectious agent, cultures, fungi		6.9%	2.9%	3.1%	4.3%
3.Non anatomic waste that comes from the medical attention of patients and laboratories		30.5%	36.6%	32.4%	33.3%
4.Pathological waste		8.4%	11.8%	8.6%	9.7%
5.Sharp material (needles, surgical knives, etc.)		28.2%	18.8%	35.6%	27.2%
6.Hazardous waste (chemicals, medicine)		4.2%	2.9%	4.2%	3.7%
7.Radioactive waste		0.8%	2.4%	0.7%	1.3%
8.Mixed waste		10.2%	16.0%	5.0%	10.6%
Total		100.0%	100.0%	100.0%	100.0%

Note: Number of sample: 26

### a.4 Waste Treatment

Regarding waste treatment, 92.5% of non-anatomical waste are treated, 22.5% of them at the site by means of chemical disinfecting and 70% outside the site with

thermal disinfecting. 70.6% of pathological wastes are treated; 41.2% within the site with formalin and 29.4% outside the site.

Table F-7: Location of Waste Treatment

Type of Waste	Location		On site		Out side		No Treatment		Total number
1.Blood	21	58.3%	13	36.1%	2	5.6%			36
2.Infectious agent, cultures, fungi	16	53.3%	12	40.0%	2	6.7%			30
3.Non anatomic waste that comes from the medical attention of patients and laboratories	9	22.5%	28	70.0%	3	7.5%			40
4.Pathological waste	14	41.2%	10	29.4%	10	29.4%			34
5.Sharp material (needles, surgical knives, etc.)	30	73.2%	9	22.0%	2	4.9%			41
6.Hazardous waste (chemicals, medicine)	4	11.8%	6	17.6%	24	70.6%			34
7.Radioactive waste	5	29.4%	2	11.8%	10	58.8%			17
8.Mixed waste	3	25.0%	4	33.3%	5	41.7%			12

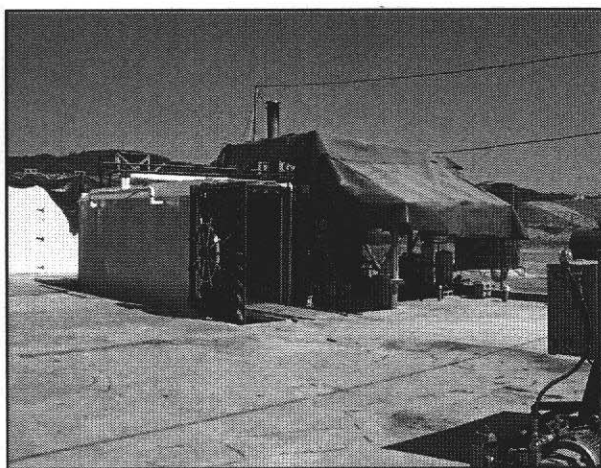
95.2% of sharp materials are treated; 73.2% within the site with chemical disinfecting by means of a 1% concentrated sodium or calcium hypochlorite solution in plastic containers in which the sharp material is placed. 22% of the interviewees declare that this material is sent to CINTEC autoclave (in Nejapa sanitary landfill site).

Table F-8: Waste Treatment Method

Type of waste	Treatment method		Incineration with gas cleaning		Open burning		Disinfection				I don't know	Others	Total number	
							Chemical	Autoclave						
1.Blood							22	64.7%	11	32.4%	1	2.9%		34
2.Infectious agent, cultures, fungi							9	32.1%	17	60.7%	2	7.1%		28
3.Non anatomic waste that comes from the medical attention of patients and laboratories	1	2.7%	1	2.7%	9	24.3%	25	67.6%				1	2.7%	37
4.Pathological waste	2	8.3%			15	62.5%	3	12.5%				4	16.7%	24
5.Sharp material (needles, surgical knives, etc.)			1	2.6%	28	71.8%	8	20.5%				2	5.1%	39
6.Hazardous waste (chemicals, medicine)			2	20.0%	3	30.0%	2	20.0%				3	30.0%	10
7.Radioactive waste					3	42.9%	1	14.3%	1	14.3%	2	28.6%		7
8.Mixed waste					2	33.3%	3	50.0%	1	16.7%				6

Within the category of those centers that give chemical treatment to sharp materials, at least 70% sent them to CINTEC thermal disinfecting.

It should be noted that according to data reported by MSPAS and Transportes Guadalupe haulage company, only 25 medical attention centers have a collection and treatment system. This information coincides with the answers provided in question 18 that asks about the treatment of non-anatomical waste; answers show that 67.6% (25 medical centers) use thermal disinfecting.



Autoclave in Nejapa Landfill Site

Nevertheless, it is acknowledged that other wastes such as blood, infectious agents, cultures, fungi and sharp materials are also to the same system and only pathological waste receives a different treatment. 62.5% of the interviewees state that pathological waste receives a chemical treatment and 16.7% buries such in the cemetery (classified as others) and 12.5% sends it to CINTEC autoclave, and just one hospital incinerates them.

#### a.5 Recycling

Regarding the recycling of hospital waste, 92.7% stated that they do not recycle and only 2 medical centers (4.9%) do so; the material recycled belonged to broken glass in Medicina Legal and X-ray plates from the Hospital Metropolitano, which recovers silver from them.

#### a.6 Waste Discharge

It was found that 73.2% stores and discharges separately, 26.8% states that wastes are stored separately but mixed discharged.

Table F-9: Waste Discharge Manner

	Category of Hospital						Total	
	I		II		III			
1. We separate store but mix discharge.			4	36.4%	7	63.6%	11	26.8%
2. We separate store and separate discharge	11	36.7%	10	33.3%	9	30.0%	30	73.2%
Total	11	26.8%	14	34.1%	16	39.0%	41	100.0%

Actually, the interpretation is that packing of hospital wastes is separately for those interviewees that state the storage is separately (which accounts for a 100%).

Data on the amount of wastes discharged was also consulted: 42.5% of interviewees discharge less than 100 kg/week, 20% discharges between 101-300kg/week, 7.5% between 301-500kg/week, 10% between 501-1000kg/ and 20%, i.e., 8 centers, discharge more than 1001kg/week.

The proportion of wastes discharged is similar to that obtained in the generation, since only two medical centers recycle and only one center incinerates pathological waste, reason why the composition remains the same.

## a.7 Collection

### a.7.1 Collector

Regarding the waste collection service, only two systems meets MSPAS and MARN requirements: the one administered by the Department of Environmental Sanitation of MSPAS and other one is Transporte Guadalupe enterprise, since both meet the collection and haulage conditions. However, Table F-10 shows the proportion of establishments to which each entity in charge of the collection renders the service.

Table F-10: Collector of Medical Waste

	Category of Hospital								Total	
	I		II		III		IV			
Private company contracted by us	3	17.6%	9	53.0%	4	23.5%	1	5.9%	17	41.5%
Municipality			2	22.2%	5	55.6%	2	22.2%	9	22.0%
MSPAS	5	55.6%	1	11.1%	0	0.0%	3	33.3%	9	22.0%
Others	3	50.0%	0	0.0%	1	16.7%	2	33.3%	6	14.5%
Total	11	26.8%	12	29.3%	10	24.4%	8	19.5%	41	100.0%

### a.7.2 Collection Method and Frequency

21.9% is door-to-door collection; 4.9% is curb side collection; 14.6% is bell collection, 9.8% in stations or containers outside the medical center and 48.8% in central storage centers inside the hospitals. The latter portion belongs to MSPAS and ISSS hospitals, along with private hospitals that are rendered the collection and haulage service duly authorized.

Collection frequency in hospital centers is good, since 31.7 % of interviewees have the service more than 5 days per week and 12.2% from 4 to 5 days, and 53.7% those every three days. Only one center pointed out that the service is provided irregularly.

This fact is satisfactory and is better when the scheduled time of arrival of the collection truck was questioned: 75.6% of the interviewees receive it at an specific time, 22 % state that the time varies and one center answered they do not have a collection service.

## a.8 Final Disposal

Regarding final disposal, 73.2% of interviewees stated that they send wastes to Nejapa sanitary landfill, 22 % is unaware of the destination and 2.4% disposes of it within their property (1 medical center).

## a.9 In-house Collection System

Results show that more than 40% of interviewees have a standard container system along with other tags, accounting for 60%; however the remaining 40 % uses only untagged bags.