

C.5.2

Findings

a. Findings in accordance with the survey sheet

As presented in the previous section C.5.2, the outcome with findings are shown according to the survey sheet. In addition to the outcome, important findings which are necessary to identify current ISWM on-site as well as outside, and ISW generation are presented the following Annexes :

- i. ISWM on-site : H.2.1 of Annex H
- ii. ISWM outside (factories) : H.2.2 of Annex H
- iii. Present ISW flow : I.1.4 of Annex I
- iv. Present ISW generation : I.1.3 of Annex I

b. Findings in general

ba. Large-scale hazardous wastes generation sources

It was found that there are no outstanding large-scale hazardous waste generation sources, which may emit enormous amount of hazardous wastes, even by a sole factory (such as copper smelting refinery, blast furnace, petroleum refinery or pulp digesting and bleaching), in the Metropolitan Region (MR). Only one thermoelectric power station (100MW capacity, fuel: heavy oil 80% and coal 20%) located in the MR, operates only when hydroelectric power cannot cover the demand in the water shortage season (i.e. rate of operation (days in a year) is just about 10%) and furthermore fuel conversion to gas is planned. Therefore, large-scale hazardous wastes generators do not seem to exist in the MR.

bb. On-site ISWM

Significant number of factories newly built or renovated recently operate in the north industrial zones along the North Pan-American Highway. Those factories are located in larger sites. Most interviewees from these factories, who are responsible for production or management, showed their consciousness of environmental protection. Provision of facilities viewing environmental protection and work site cleanliness were well observed.

On the contrary, where several industrial zones are found in the south central section of the urbanized area, many older factories which have been in operation

for a few decades (mainly small and medium industries), are located in modest sites. They tended to face difficulties in renovating facilities and most waste water was discharged directly to the sewers. It is envisaged that substantial improvement in environmental protection could not be easily expected from these small and medium factories. However, it is appreciated that resource recovery by separate storage (for recyclers' internal collection) and work site cleanliness were pursued within the limited area of the production site.

As for Cleaner Production (CP), only several modernized factories, mainly from multinational enterprises, were observed to be endeavoring CP. Whereas in general, resource recovery and waste minimization (*in terms of visible wastes*) seemed to be well organized and practiced. However, present resource recovery and waste minimization were mainly accomplished by recuperation of resources from wastes, utilizing abundant and cheap labor forces (employees and recyclers). In future, when economic growth and rise in income level affects the availability of the low cost labor force, countermeasures regarding resource recovery and waste minimization will be a set of critical issues for industries. On the other hand, the timing and methods of treatment for "invisible" pollutants in effluent gas and waste water, as suspended and dissolved solid will be another set of critical issues.

bc. Waste water treatment

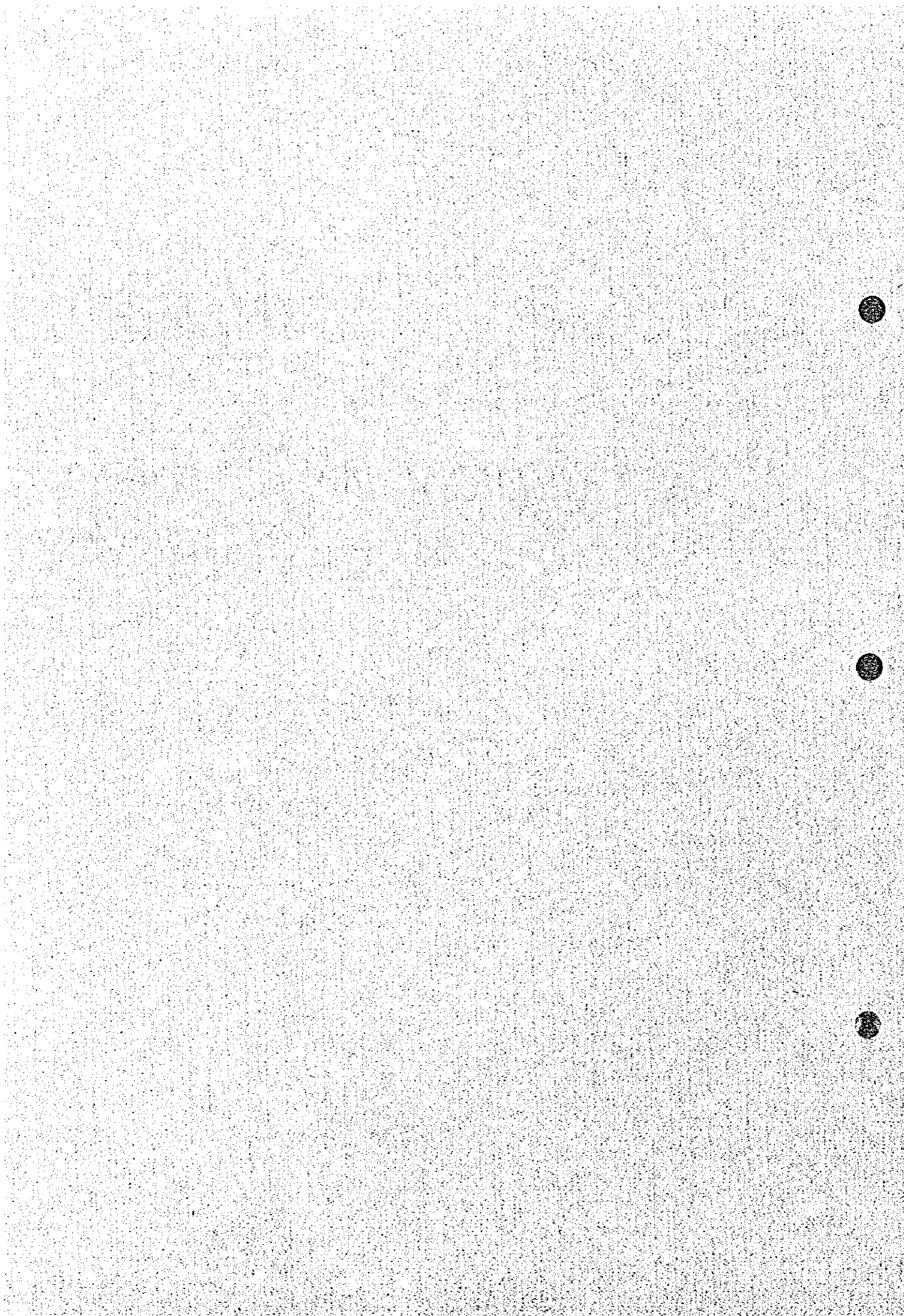
Almost all the waste water from industries, without any treatment, together with domestic waste water infiltrates rivers of Mapocho, Zanjón de la Aguada or Maipo. The river water is utilized as irrigation water downstream. Among these rivers, Zanjón de la Aguada, the smallest and receiving considerable amount of untreated industrial waste water, seems heavily contaminated with industrial waste water. It is distressing that contamination (with some hazardous substances) of agricultural lands which receive irrigation water from Zanjón de la Aguada is intensifying. Water quality should be urgently checked and whether and how soon regulations for industrial waste water discharge should be established shall be examined. Zanjón de la Aguada merges with Mapocho which converges with Maipo. The river water is used not only for irrigation but also for potable water down stream. Some data of raw water at the potable water treatment plant of Agua-quinta serving San Antonio (located most downstream of Maipo) does not indicate serious deterioration of water quality. It could be deemed due to the large volume of water leading to natural dilution of pollutants.

bd. ISW generated in the mining industries

As for the mining industries (CIU code 21001 to 29090), there are several in the MR and they produce considerable amount of ISW. However, all of generated ISW in the mining industries are disposed of at their own landfills at present and in future (i.e. closed system). Therefore, ISW generated in mining industries are excluded from the estimation of ISW generation.

ANNEX D

MEDICAL INSTITUTIONS' SURVEY



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ANNEX D MEDICAL INSTITUTIONS' SURVEY

D.1 Previous Study

COREMA prepared in 1994 a comprehensive study 'Estudio de Manejo de Residuos Sólidos de Establecimientos Hospitalarios en la Región Metropolitana' (Study on the Management of Solid Waste from Healthcare Establishments in the Metropolitan Region) the objectives and results are presented below.

D.1.1 Objectives

The general objective of the study was to characterize the quantity and quality of solid waste generated in hospitals of the Santiago Metropolitan Region. The wastes being generated in the different hospital sections were analyzed and those being potentially harmful requiring special treatment before final disposal were identified. Based on this, the technical options and the most appropriate management procedures were analyzed.

The following specific objectives were formulated for the project:

- Qualitative and quantitative characterization of solid waste produced by hospitals in the Metropolitan Region and elaboration of a diagnosis regarding the present management situation.
- Definition of technical options and procedures for the management (internal and external) of medical solid waste produced in the Metropolitan Region on the basis of magnitude, characteristics and complexity of treatment required for the different types of waste.
- Evaluation of the capacity and the present status of existing equipment for medical solid waste treatment in hospitals, as well as the possibility for recovering damaged equipment.
- Taking into account the results of the previous objective regarding the capacity and status of existing equipment, to evaluate from technical, sanitary and economic points of view the appropriateness of establishing:
 - . A centralized treatment system
 - . Treatment solutions for groups of hospitals
 - . Individual treatment solutions.
- Identification of suitable location for the final disposal of such wastes.
- Proposal for a policy regarding the roles of the waste generators and the

public and private sectors for the recommended solution.

- Proposal for a regulation scheme in accordance with the solution recommended, including the following aspects: sanitary/environmental aspects, safety in the operation and continuity of the service, fees system, and surveillance and monitoring mechanisms.
- Identification of the human and financial resources required for implementing the proposed regulations.

D.1.2 Results

The study includes detailed information on the present medical solid waste management, including detailed registration of the present technical installations at the main hospitals and clinics. Furthermore, the study presents data for the solid waste generation today based on detailed investigation at 17 sources of medical solid waste (hospitals, clinics and one laboratory) and a projection to year 2000.

Table D.1.2a presents the generation data obtained by the study. The four categories of public hospitals refer to the complexity of the services offered by the hospital with type 1 as the most complex.

Table D.1.2a Generation of Medical Solid Waste (1992) According to the COREMA Study

Health Establishment	Generation of Risk Waste (kg/day/bed)	Generation of Non-Risk Waste (kg/day/bed)	Total Waste Generation (kg/day/bed)
Hospital Type 1	0.1448	1.6854	1.8302
Hospital Type 2	0.0581	1.9974	2.0555
Hospital Types 3 and 4	0.0491	1.7517	1.8008
Private Clinics	0.3229	1.3214	1.6443
Psychiatric Clinic	0.2544	4.5894	4.8438
Primary and Secondary Practitioners ^{*1}	0.0023	0.0518	0.0541

Note: ^{*1} Generation in kg per consultation

^{*2} Hospitals are classified in four categories according to their complexity of the medical treatment. Type 1 is the most complex.

The projection for the year 2000 is based on the population forecast, an expected change between public and private hospitals in accordance with the overall hospital sector policy and also changes in the unit generation data presented in the table above.

Table D.1.2b presents the estimated total daily generation of waste from health care establishments in the Metropolitan Area for 1992 and projected for year 2000.

Table D.1.2b Total Generation of Medical Solid Waste Today (1992) Projected for Year 2000 According to the COREMA Study

Health Establishment	Actual Generation, Year 1992		Projection, Year 2000	
	Total (kg/day)	Risk Waste (kg/day)	Total (kg/day)	Risk Waste (kg/day)
Hospital Type 1	8,729.9	691	6,832.0	540
Hospital Type 2	4,822.3	106	6,074.1	172
Hospital Type 3 and 4	3,084.5	31	3,224.3	33
Private Clinics	9,237.4	1,814	13,219.7	2,596
Psychiatric Clinics	2,107.1	111	3,017.7	158
Primary and Secondary Practitioners	1,857.6	77	2,262.1	94
Other Sources	392.0	75	392.0	75
TOTAL	30,230.8	2,905	35,021.9	3,668

Note: Hospitals are categorized in four groups according to their complexity in medical treatment. Type 1 is the most complex.

It can be seen that in the study risk (or contaminated) waste constitutes approximately 10% of the total waste production and this share is expected to increase slightly in the future.

Sorting procedures are offered special attention in the study and there are proposed detailed schemes for the actual sorting at the source of generation, including proposals for bins and labelling. In the same way, different treatment technologies are presented. Finally, the study considers various options concerning the institutional development.

D.2 New Survey - Plan of Operation

The JICA Study Team launched in April 1995 a comprehensive questionnaire survey at 90 medical institutions in the Metropolitan Region. The objectives of the survey were to provide detailed information on the present medical SW management (practices and equipment) and perception of the future management system.

The target group of the survey were all hospitals, the most important clinics, rural health centers ('Posta de Salud') and well known laboratories as follows:

- 42 hospitals,
- 31 clinics,
- 12 rural health centers, and
- 5 laboratories.

The number of clinics included in the survey provides a statistically representative sample. For rural health centers and laboratories, however, the samples are small and the results are for general guidance only.

The study was carried out by *Adimark Ltda. - Marketing Research* and is referred to as the ADIMARK's RESHOS Study.

D.2.1 Objectives

The following 3 main objectives were defined for the questionnaire survey:

- i. Verification of the present technical system and planned changes with respect to:
 - Applied classification of waste in the actual sorting
 - Receptacles used for collection of the waste and the applied labelling
 - Internal transport of the waste, including the collection frequency
 - Arrangement and actual conditions of the collection points
 - Internal treatment (type, capacity, condition etc.)
 - External treatment and disposal, including collection frequencies
- ii. Specification of the quantity and volume of the waste generated.
- iii. Assessment of the understanding of the consequences of the problems related to the present medical solid waste management and assessment of the attitude towards improvements (e.g. centralized/decentralized solutions).

D.2.2 Target Groups

The Chief of Sanitary Services at the hospitals and clinics (or a person appointed by him) were interviewed.

D.2.3 Waste Classification Applied in the Questionnaire Survey

It was considered to apply the same waste classification as in the COREMA study, but in some aspects the classification used in the COREMA-Study needs improvement and adjustment to the practical sorting. Thus, for the purpose of the questionnaire survey the following classification was proposed:

- i. Medical solid waste from hospitals, clinics etc. with a risk of infection or which for other reasons should be handled separately (corresponds to what is defined as contaminated waste in the sorting today).
 - Waste with a risk of infection (sharp, bloody and blood-stained waste and waste from patients with infectious diseases).
 - Infected waste from laboratories.
 - Pathological and unaesthetic waste.
- ii. Animal waste from laboratories etc., including dead animals with infectious diseases, animals used in clinical tests and the waste from these animals.
- iii. Hazardous waste of general character:
 - Chemicals, including medicines and drugs.
 - Radioactive waste.
- iv. Waste similar to common waste (for final disposal or recycling):
 - Waste from offices etc.
 - Waste from kitchens
 - Packaging materials
 - Bulky waste (furniture, linen etc)
 - Garden waste
 - Construction waste.

v. Special waste types:

- Ash from incinerators
- Sludge.

D.2.4 Questionnaire

The applied questionnaire is presented in the Data Book, Volume IV.

D.3 Survey of Medical Institutions

Section D.3 presents results of the survey compiled and analyzed by the JICA Study Team. Section presents the results as compiled by ADIMARK and section evaluates the results of the Survey.

D.3.1 The Target Objects of the Survey

Table D.3.1a presents the inventory of health care units in the Santiago Metropolitan Region. The inventory is based on information from MS obtained during the survey.

Table D.3.1a Health Care Units and Hospital Beds in Santiago Metropolitan Region, 1994

Service area	Hospitals	Hospitals belonging to institutions	Clinics	Maternity clinics	Rural health centers	Rural and urban surgeries	Total
SSMC	4	1	13	3	-	7	
SSMN	7	-	-	-	8	15	
SSMOCC	7	-	5	-	19	33	
SSMORI	10	4	24	3	-	17	
SSMS	7	-	4	-	11	26	
SSMSOR	2	-	1	-	9	19	
Units, total	37	5	47	6	47	117	259
Beds	11,598	1,340	1,381	198	-	-	14,517

Service areas:

- SSMC: Central district ('Servicio de Salud Metropolitano Central')
SSMN: North district ('Servicio de Salud Metropolitano Norte')
SSMOCC: West district ('Servicio de Salud Metropolitano Oeste')
SSMORI: East district ('Servicio de Salud Metropolitano Oriente')
SSMS: South district ('Servicio de Salud Metropolitano Sur')
SSMSOR: South/East district ('Servicio de Salud Metropolitano Sur/Oriente').

According to the ADIMARK's RESHOS study, the average hospital is equipped with 305 beds, while the average clinic surveyed has 35 beds.

According to information from MS (Table D.3.1a), the present 53 clinics have 1,579 beds in total. Thus, the surveyed 31 clinics cover 58.5% of the total number of clinics and the surveyed 1,097 beds cover 69.5% of the total number of beds. Thus, it is concluded that the surveyed clinics are fairly representative in size.

Table D.3.1b below presents the production data for the hospitals and clinics expressed as occupied bed-days and one-day consultations (out-patients). The total of one-day-occupied beds and one-day consultations provides a reasonable impression of the production at the hospitals and clinics.

Table D.3.1b Data for the Annual Production at Hospitals and Clinics

	Hospitals		Clinics	
	Average per hospital	Estimate for all hospitals	Average per clinic (surveyed)	Estimate for all clinics
Number of beds-days ^{*1}	83,500	3,507,000	9,691	507,800
One day consultations	109,838 ^{*2}	4,613,200	17,027 ^{*2}	902,400
Total	-	8,120,200	-	1,410,200

Note: ^{*1} A bed is assumed occupied 75% of the time, 365 days/year (assumption based on information from hospitals visited by the JICA Study Team).
 ^{*2} According to ADIMARK's RESHOS Study, the average monthly number of one-day consultations is 9,153.2 for hospitals and 1,418.9 for clinics.

It is seen from the table that hospitals are the main potential source of medical SW in terms of performance (the estimated total production at clinics is approximately 17% of the production at the hospitals). The available statistics does not allow of similar safe projections for the production at rural health centers and laboratories.

D.3.2 Assessment of the Present Medical Solid Waste Management

46 of the 90 medical institutions (51.1%) state that there are generally no problems in the present medical SW management in their institutions. Other 21 institutions (23.3%) state that the present waste management is a risk for the external environment only. From this it can be concluded that 67 (74.4%) of the medical institutions see no *internal problems* connected to their waste management.

When it comes to the medical SW management in the Metropolitan Region as a whole, the assessment is different. Only 10 medical institutions (11.1%) state that there are no problems in the present waste management and 20 institutions (22.2%) state that it constitutes a risk to the public.

Of the 80 medical institutions (88.9%) that envisage one or several problems in the present waste management in the Metropolitan Region, the following specific problems were identified by the institutions:

- Lack of legislation, control and awareness is identified by 42 medical institutions (52.7%),
- Lack of funding, infrastructure and treatment facilities is identified by 31 medical institutions (38.9%),
- Risk for those who handle the waste is identified by 17 medical institutions (21.3%).

D.3.3 Classification of Medical Solid Waste

Table D.3.3a shows the waste types generated in the medical institutions. The waste types are not defined precisely and some cover the same kind of waste (for example infectious waste and contaminated waste). Thus, the table can be used for an overview of the types of generated waste only.

As expected, the hospitals generate more complex waste, however, it is noteworthy that also the more - in medical term - 'simple' rural health clinics, generate many of the waste types requiring particular attention. Only waste types such as animal waste (dead animals and from tests), ash and sludge are specific for the hospitals.

Table D.3.3a Waste Types Generated in the Medical Institutions (% of Institutions)

Waste type	Total	Hospitals	Clinics	Rural health center	Laboratories
Sample (nos.)	90	42	31	12	5
Pathological waste	68.9	83.3	74.2	25.0	20.0
Cultures/stocks	65.6	78.6	58.1	25.0	100.0
Blood products	81.1	92.9	71.0	58.3	100.0
Infectious waste	41.1	59.5	29.0	16.7	20.0
Sharps	98.9	97.6	100.0	100.0	100.0
Contaminated waste	82.2	88.1	67.7	91.7	100.0
Food leftovers from patients	77.8	100.0	90.3	0	0
Food from kitchen	82.2	100.0	87.1	41.7	0
Waste from administration	97.8	100.0	96.8	91.7	100.0
Packaging materials	86.7	95.2	80.6	75.0	80.0
Garden waste	72.2	92.9	84.8	50.0	60.0
Construction waste	45.7	73.8	32.3	8.3	0
Other common waste	35.6	45.2	22.6	25.0	60.0
Liquid chemicals	36.7	59.5	19.4	0	40.0
Medicine/drugs	46.7	64.3	41.9	16.7	0
Other hazardous waste	13.3	23.8	3.2	8.3	0
Radioactive waste	18.9	35.7	3.2	0	20.0
Animal waste (dead)	8.9	19.0	0	0	0
Animal waste (tests)	4.4	9.5	0	0	0
Ash/slag	20.0	42.9	0	0	0
Sledge	4.4	9.5	0	0	0

Note: Particular noteworthy results are shadowed.

Table D.3.3b provides an overview of the classification of selected waste types, i.e. how waste types are actually classified. It appears that in many instances, waste types of infectious or hazardous nature are disposed of as common waste.

Table D.3.3b Applied Classification of Specific Waste Types.

	Waste type generated							
	Pathological waste	Cultures and stocks	Blood	Infectious waste	Sharps	Contaminated waste	Liquid chemicals	Medicine/drug waste
Samples of total 90 (nos.)	61	59	73	37	89	74	33	42
Pathological waste	69.4	10.2	12.3	10.8	2.2	1.4	0	2.4
Risk waste	12.9	18.6	38.4	37.8	22.5	17.6	57.6	47.6
Contaminated waste	6.5	54.2	35.6	43.2	15.7	68.9	21.2	16.7
Common waste	4.8	3.5	8.2	2.7	4.5	6.8	12.1	28.6
Sharps	0	1.7	0	2.7	55.1	2.7	0	2.4
Other	6.5	6.8	5.5	2.7	0	2.7	9.1	2.4

Note: Particular noteworthy results are shadowed.

D.3.4 The Present Internal Collection System

The survey reveals that hard receptacles are widely applied for pathological waste, contaminated waste and sharps.

Pathological waste is collected daily from 60% of the 61 medical institutions generating pathological waste, while contaminated waste is collected daily from 80% of the 75 generators of contaminated waste. Of the 61 generators of pathological waste, 39 (63.9%) has refrigerated storage facilities.

Fifty two (57.8%) of the surveyed medical institutions have one dedicated central collection point where the waste is stored before shipment to treatment/disposal. Sixteen institutions (17.8%) have more than one central collection point. Twenty two institutions (24.4%) have direct shipment of the waste from the production places to treatment and disposal.

For the central collection points (at 68 medical institutions), the survey revealed the following results:

- At 28 collection points (41.2%) the waste is kept divided in two groups (one for contaminated waste and one for common waste), while at 25 points, the storage is not systematic.
- 45 collection points (66.2%) have free access for internal collection carts (i.e. no stairways or other obstructions where the waste must be lifted manually).
- 31 collection points (45.6%) are not locked (i.e. with public access) and of these, 18 points are not even fenced. Especially, at the rural health centers free access to collection points is common.
- 35 collection points (51.5%) have free access for collection vehicles, but the waste is loaded manually. 13 collection points (19.1%) require the waste to be carried and loaded manually due to poor access conditions. The poor collection conditions are most frequent for rural health clinics and laboratories.
- Sorting of waste for recycling is carried out in 5 collection points only.

56 of the surveyed medical institutions (62.2%) have no dedicated storage area for hazardous chemicals.

Of 17 medical institutions generating radioactive waste, 6 have no storage facility at all.

D.3.5 The Present Treatment

In table D.3.5a below, the inventory of internal treatment equipment is presented.

Table D.3.5a Existing Internal Treatment Equipment for Medical Solid Waste

Number of institutions and % of total	Total	Hospitals	Clinics	Rural health centers	Laboratories
Autoclave *1	46 (51.1)	20 (47.6)	19 (61.3)	3 (25.0)	4 (80.0)
Pupinel **2	11 (12.2)	2 (4.8)	3 (9.7)	6 (50.0)	0 (0)
Incinerator	12 (13.3)	12 (28.6)	0 (0)	0 (0)	0 (0)
Home made incinerator	9 (10.0)	4 (9.5)	2 (6.5)	3 (25.0)	0 (0)

Remarks: *1: There may be more than one unit at the institution.
*2: Pupinel is a dry heating unit (up to 100 °C) applied for pasteurization.

Table D.3.5b presents the applied treatment/disposal of selected waste types. It is noteworthy that the municipal collection system is widely used for problematic waste types. *Discharge to the sewer is also a convenient disposal means for untreated waste as there are no general treatment and disposal facilities for liquid chemicals.*

Recycling

49 medical institutions (54.4%) state that they do not recycle any waste materials at all.

Packaging cardboard is the most frequent recycled waste material, currently recycled in 25 medical institutions (27.8%).

Laboratory glassware is recycled in 9 medical institutions (10.0%).

Table D.3.5b Applied Treatment/Disposal of Specific Waste Types

	Waste type generated							
	Pathological waste	Cultures/stocks	Blood	Infectious waste	Sharps	Contaminated waste	Liquid chemicals	Medicine/drug waste
Samples of total 90 (nos.)	61	59	73	37	89	74	33	42
Burial	33.9	3.4	11.0	5.4	4.5	0	0	9.5
Own incinerator	12.9	10.2	11.0	21.6	13.5	20.3	0	7.1
Private incinerator	14.5	5.1	6.8	2.7	5.6	5.4	0	2.4
Incineration at other hospital/institution	8.1	6.8	6.8	8.1	9.0	6.8	0	7.1
Municipal landfill with own transport	1.6	0	0	2.7	2.2	2.7	0	9.5
Municipal landfill with municipal collection	1.6	8.5	11.0	18.9	30.3	28.4	9.1	14.3
Recycling	1.6	0	0	0	1.1	0	3.0	2.4
Discharge to the sewer	3.2	16.9	21.9	8.1	0	2.7	66.7	19.0
Destruction (chemical)	0	3.4	4.1	2.7	2.2	1.4	6.1	4.8
Autoclave	12.9	33.9	20.5	18.9	33.7	14.9	0	4.8
Other	8.1	6.8	4.1	8.1	9.0	9.5	6.1	4.8
Destination unknown	1.6	3.4	1.4	0	3.4	2.7	9.1	11.9

Particular noteworthy results are shadowed.

D.3.6 The Present Treatment Equipment

The survey disclosed the following information on the treatment equipment:

Incinerators

Five of the 12 incinerators (41.7%) have a feeding chamber less than 1 m³ and other 5 incinerators have a chamber of 1-2 m³. Feeding during the operation is possible at 10 of the incinerators (83.3%).

Only 2 incinerators (16.7%) have a secondary chamber with an auxiliary burner for after-burning of flue gasses.

Five of the incinerators (41.7%) operates with temperatures below 700 °C and for other 4 incinerators (33.3%) the temperature is not known. Seven incinerators (58.3%) have no display of the temperature or other control equipment.

Seven incinerators (58.3%) operate once a day and with an operation time of less than 4 hours.

Three incinerators (25.0%) are reported to have a filter for treatment of flue gasses. The approximate emitted dust contents is not known for 7 incinerators (58.3%) and for 4 incinerators (33.4%) emissions have never been measured.

Autoclave

Of the 46 medical institutions using autoclaves, 37 (80.4%) inform the temperature being 150 °C and above and the majority of autoclaves (in 36 medical institutions (78.3%)) is equipped with temperature control.

The sterilization period is 30-60 minutes in 28 medical institutions (60.9%) and 60-120 minutes in 15 institutions (32.6%).

D.3.7 The Present Costs of Medical Solid Waste Management

The present costs (excluding of internal collection costs) of medical SW management

of selected types of waste is presented in Table D.3.7a below.

Table D.3.7a The Present Cost of Medical Solid Waste Management

Number of institutions and % of total of generators of the type of waste	Pathological waste	Contaminated waste	Common waste
Sample (nos.)	61	75	85
Costs are unknown	29 (47.5%)	40 (53.3%)	42 (49.5%)
Free of charge	3 (4.9%)	3 (4.0%)	4 (4.7%)
< 50 pesos/kg	6 (9.8%)	7 (9.3%)	n.a.
50-100 pesos/kg	7 (11.5%)	9 (12.0%)	n.a.
100-200 pesos/kg	3 (4.9%)	4 (5.3%)	n.a.
200-300 pesos/kg	7 (11.5%)	7 (9.3%)	n.a.
< 3,000 pesos/tonne	n.a.	n.a.	18 (21.2%)
3,000-5,000 pesos/tonne	n.a.	n.a.	4 (4.7%)
5,000-8,000 pesos/tonne	n.a.	n.a.	5 (5.9%)
8,000-12,000 pesos/tonne	n.a.	n.a.	4 (4.7%)
Other costs	6 (9.8%)	5 (6.7%)	8 (9.4%)

It is noteworthy, that almost half of the institutions are not aware of the present costs. Table D.3.7b below presents the institutions' perception of the costs.

Table D.3.7b Characterization of the Present Costs of Medical Solid Waste Management

	Total	Hospitals	Clinics	Rural health centers	Laboratories
Sample (nos.)	90	42	31	12	5
The costs are insignificant	46.7%	40.5%	54.8%	41.7%	60.0%
The costs are important	18.9%	28.6%	16.1%	0%	0%
The costs are unknown	34.4%	31.0%	29.0%	58.3%	40.0%

D.3.8 The Future Medical Solid Waste Management

The survey provided important information concerning the future medical SW management as it is conceived by the medical institutions.

The Future Collection System

84 medical institutions (93.3%) proposes different degrees of standardization of the collection system - only 6 institutions (6.7%) propose to maintain the present collection system.

The Future Internal Treatment

The majority of the medical institutions (56 (62.2%)) declare that the future internal treatment should be decided by each institution. 27 institutions (30.0%) proposes to suspend use of incineration as internal treatment.

The Future External Treatment

Only 6 medical institutions (6.7%) see no reasons for changing of the present external treatment. 43 institutions (47.8%) propose to replace incineration with safe landfilling at a dedicated sanitary landfill and 35 institutions (38.9%) propose to establish 1 or 2 centralized incineration plants.

Private Operation

The majority of the medical institutions have confidence in a privately operated medical SW management system. Only 11 institutions (12.2%) declare that medical SW management is a public duty.

Applicable Treatment/Disposal Technologies

In Table D.3.8a, the understanding of the most applicable treatment and disposal methods for pathological waste, contaminated waste (infectious waste) and common waste, respectively, are identified.

Table D.3.8a The Perception of the Most Applicable Treatment and Disposal Technologies

First priority	Pathological waste	Contaminated waste (Infectious waste)	Common waste
Sample (nos.)	90	90	90
Incineration	58.8%	60%	34.4%
Sanitary landfill	36.7%	36.7%	63.3%

D.3.9 Medical Institutions Surveyed

The following medical institutions were surveyed.

	HOSPITALS				
	INSTITUTION	MUNICIPALITY	ADDRESS	PHONE NO.	
1	DEL SALVADOR	PROVIDENCIA	AV. SALVADOR 364	2047919	
2	INSTITUTO DE NEUROCIROGIA	PROVIDENCIA	JOSE MIGUEL INFANTE 553	2360941	
3	I.N.E.R.Y.C.T	PROVIDENCIA	JOSE MIGUEL INFANTE 717	2358888	
4	LUIS CALVO MACKENNA	PROVIDENCIA	ANTONIO VARAS 364	2357711	
5	CENTRO GERIATRICO	PROVIDENCIA	JOSE MIGUEL INFANTE 370	2359103	
6	HOSPITAL MILITAR	PROVIDENCIA	PLAZA LOS LEONES S/N	2321000	
7	PEDRO AGUIRRE CERDA	PEÑALOEN	JOSE ARRIETA 5969	2775480	
8	SAN BORJA - ARRIARAN	SANTIAGO	SANTA ROSA 1234	5567650	
9	ASISTENCIA PUBLICA	SANTIAGO	PORTUGAL 125	6341639	
10	INSTITUTO TRAUMATOLOGICO	SANTIAGO	SAN MARTIN 771	7713061	
11	UNIVERSIDAD CATOLICA	SANTIAGO	MARCOLETA 367	6332051	
12	SAN JUAN DE DIOS	SANTIAGO	MUERFANOS 3255	6814491	
13	LUCIO CORDOVA	SAN MIGUEL	GRAN AVENIDA 3204 (INTERIOR)	5518013	
14	BARROS LUCO TRUDEAU	SAN MIGUEL	GRAN AVENIDA 3204	5517533	
15	EXEQUEL GONZALEZ CORTES	SAN MIGUEL	RAMON SUBERCASEAUX 1534	5550011	
16	SAN LUIS DE BUIN	BUIN	ARTURO PRAT 250	8211562	
17	SANATORIO EL PERAL	PUENTE ALTO	CAMILO HENRIQUEZ 2451	2881755	
18	EL PINO	SAN BERNARDO	AV. LOS MORROS 13560	5282671	
19	PARROQUIAL DE SAN BERNARDO	SAN BERNARDO	LIBERTADOR. B. O" HIGGINS 04	8595000	
20	SAN JOSE	INDEPENDENCIA	SAN JOSE 1053	7370011	
21	ROBERTO DEL RIO	INDEPENDENCIA	PROFESOR ZANARTU1085	7371011	
22	INST. CAUPOLICAN PARDO CORREA	INDEPENDENCIA	PROFESOR ZANARTU 1008	7376008	
23	SIQUIATRICO	RECOLETA	AV. LA PAZ 844	7371031	
24	JOSE JOAQUIN AGUIRRE	RECOLETA	AV. SANTOS DUMONT 999	7373031	
25	SOTERO DEL RIO	PUENTE ALTO	AV, CONCHA Y TORO 3459	8500134	
26	DE LA FUERZA AEREA	LAS CONDES	AV. LAS CONDES 8631	2111001	
27	DIPRECA	LAS CONDES	AV. APOQUINDO S/N (SEDE COLON)	2113543	
28	DE CARABINEROS	NUÑOA	AV. SIMON BOLIVAR 2200	2256333	

29	FELIX BULNES		QUINTA NORMAL	LEONCIO FERNANDEZ 2655	7739010
30	TILTIL		TILTIL	EL ATAJO 010	6954796
31	MELIPILLA		MELIPILLA	O" HIGGINS 551	8323555
32	PEÑAFLO		PEÑAFLO	CARRERA 214	8120200
33	TALAGANTE		TALAGANTE	BALMACEDA 1458	8152023
34	CURACAVI		CURACAVI	O "HIGGINS 508	8351077
35	SAN JOSE DE MAIPO		SAN JOSE DE MAIPO	EL COMERCIO 632	S/N
36	PENITENCIARIO				
37	DEL PROFESOR		ESTACION CENTRAL	AV. LIBERTADOR B. O" HIGGINS 4860	7797138
38	CLINICA LAS CONDES		LAS CONDES	LO FONTECILLA 441	2111002
39	CLINICA SANTA MARIA		PROVIDENCIA	AV. STA MARIA 0410	7778024
40	CLINICA DAVILA		RECOLETA	RECOLETA 464	7377707
41	CLINICA ALEMANA				
42	HOSPITAL DEL TRABAJADOR				

CLINICS	INSTITUTION	MUNICIPALITY	ADDRESS	PHONE NO.
1	BOSTON	SANTIAGO	AV. LIBERTADOR B. O " HIGGINS 1620	6981921
2	CORDILLERA	LAS CONDES	ALEJANDRO FLEMING 7885	2120001
3	NIEVES	LAS CONDES	AV. STA MARIA 5950	2427800
4	VITACURA	VITACURA	AV. VITACURA 3197	2086831
5	SANTA LUCIA	SANTIAGO	CORONEL SANTIAGO BUERAS 170	6333985
6	SANTIAGO	SANTIAGO	PROFESOR CARLOS PORTER 23	2228692
7	ASTRA	SANTIAGO	SANTA VICTORIA 354	2223167
8	CENTRAL	SANTIAGO	SAN ISIDRO 231	6397551
9	REPUBLICA	SANTIAGO	AV. REPUBLICA 20	6996350
10	INSTT. DE SEGURIDAD DEL TRAB.	SANTIAGO	PLACER 1410	5519747
11	MUTUAL DE SEGURIDAD C. CH.C	SANTIAGO	AV. LIB. B. O"HIGGINS 4848	7762222
12	BELLOLIO	MAIPU	AV. ESQUINA BLANCA 045	5310506
13	PORTALES	SANTIAGO	COMPANIA 2695	6814396
14	SAN MARTIN	SANTIAGO	SAN MARTIN 730	6723102
15	OF TALMOLOGICA LOS ANDES	VITACURA	LAS HUALTATAS 5951	2124003
16	EUROPA	VITACURA	AV. PEDRO DE VALDIVIA 483	2742054
17	LAS LILAS	VITACURA	AV. ELIODORO YANEZ 2087	2252001
18	MIGUEL DE SERVET	VITACURA	ALMIRANTE PASTENE 150 P1	2359786
19	NORMANDIA	VITACURA	AV. JOSE MIGUEL CLARO 996	2352876
20	VICTORIA ROUSSEAU	VITACURA	AV. RICARDO LYON 1628	2043366
21	AVANSALUD	VITACURA	AV. SALVADOR 130	2235323
22	INDISA	VITACURA	AV. SANTA MARIA 1810	2254555
23	HECTOR VALDES	VITACURA	CAMINO FARELLONES	2151402
24	MACUL	VITACURA	RODRIGO DE ARAYAN 3240	2711066
25	MONTERRAT	VITACURA	AV. IRARRAZAVAL 2221	2748525
26	CALIFORNIA	NUÑA	AV. DUBLE ALMEYDA 3777	2091391
27	JUAN XXIII	PEÑALOÉN	BERLIN 925	5514162
28	SAN BERNARDO	SAN BERNARDO	VICTORIA 421	8593979
29	CENTRO ENF. RESP. INFANTILES	PUENTE ALTO	C. HENRIQUEZ 3295	2881502
30	SAN PANCRACIO			
31	CHILOE			

		LABORATORIES			
		INSTITUTION	MUNICIPALITY	ADDRESS	PHONE NO.
1	CLINICO PASTEUR		SAN MIGUEL	LLANO SUBERCASEAUX 3705	5550451
2	CLINICO GILBERT		PROVIDENCIA	MANUEL MONTT 1815	2255243
3	ESPECIALIDADES MEDICAS SALVADOR		PROVIDENCIA	AV. SALVADOR 135	2743504
4	BIONUCLEAR		LAS CONDES	AV. APOQUINDO 4062	2289620
5	TAJAMAR		PROVIDENCIA	PEREZ VALENZUELA 1245	2352478

	RURAL POSTAS	
	INSTITUTION	MUNICIPALITY
1	ALTO JAHUEL	BUIN
2	BAJOS DE AGUSTIN	CALERA DE TANGO
3	HOSPITAL	PAINE
4	CHACABUCO	COLINA
5	JUAN PABLO SEGUNDO	LAMPA
6	EL ASIENTO	ALHUE
7	EL PAICO	EL MONTE
8	ISLITA	ISLA DE MAIPO
9	LAS MERCEDES	MARIA PINTO
10	POMARE	MELIPILLA
11	EL PRINCIPAL	PIRQUE
12	LA OBRA	SAN JOSE DE MAIPO

D.3.10 Data Sheets of Medical Institutions Survey

The following sheets present the compiled results of the survey as presented by ADIMARK.

Table D.3.10a Number of beds in Hospitals and Clinics (Section 5)

Sample: Hospitals (42) and Clinics (31) interviewed

	Total	Hospd.	Clinics
		S: 42	S: 31
3-46	38,6	9,6	77,4
53-100	12,5	9,6	16,0
114-200	19,3	28,7	6,4
217-300	11,0	19,2	0,0
311-500	8,3	14,4	0,0
520 +	11,1	19,2	0,0
Mean	190,5	305,0	35,4

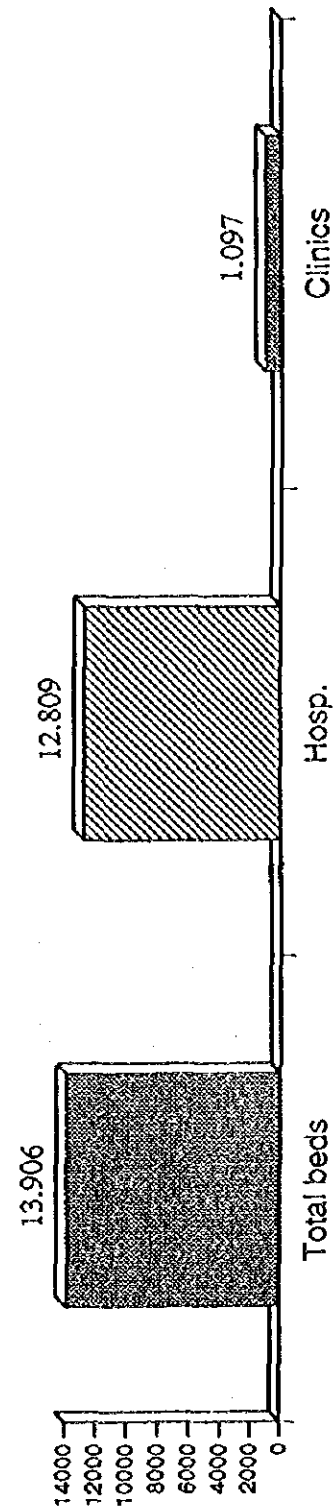


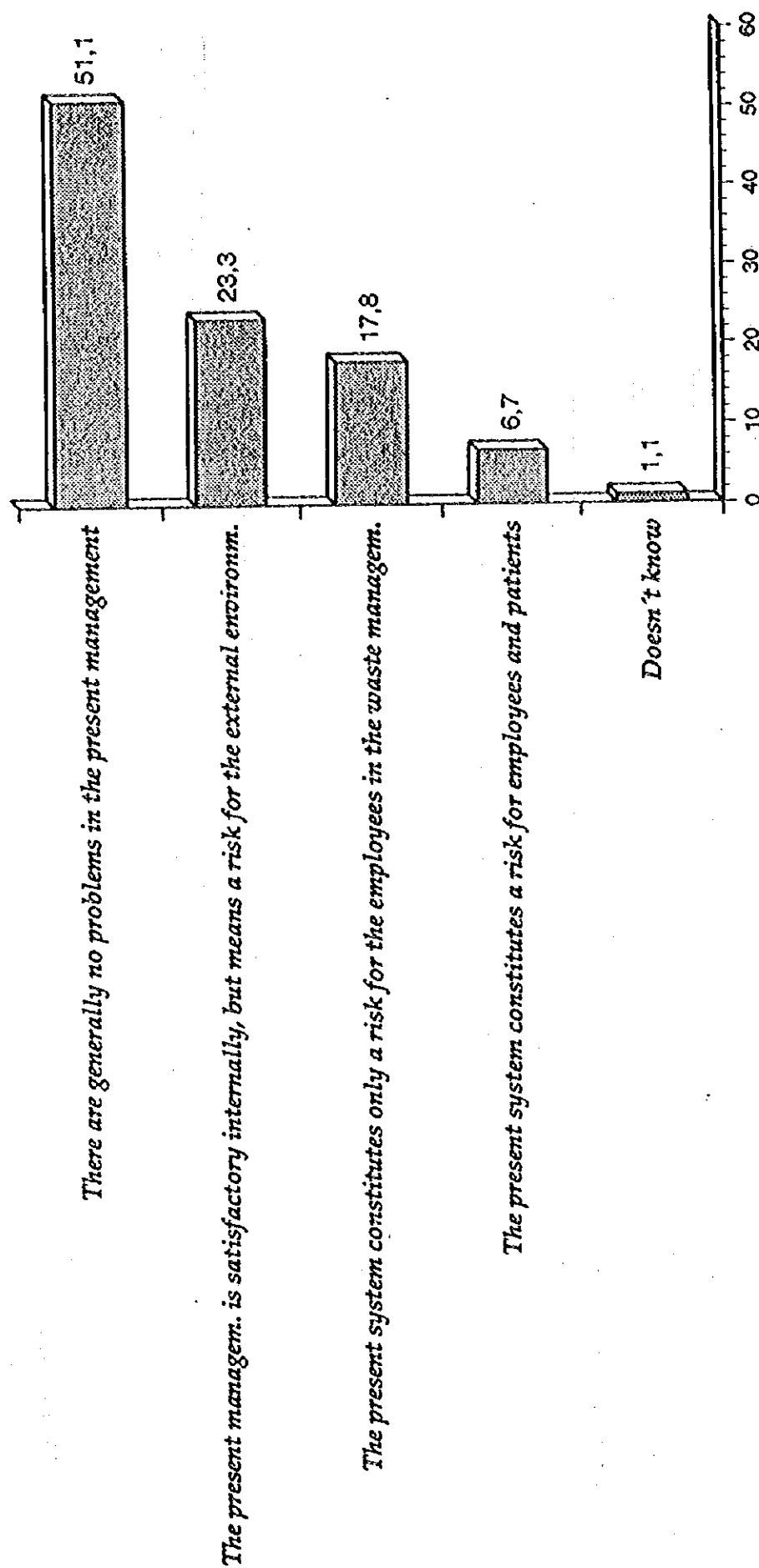
Figure D.3.10aa Number of beds in Hospitals and Clinics (Section 5)

Table D.3.10b Number of out-patients during a month (best estimate) (Section 5)

Sample: Those who know = Hospitals (31) and Clinics (21)

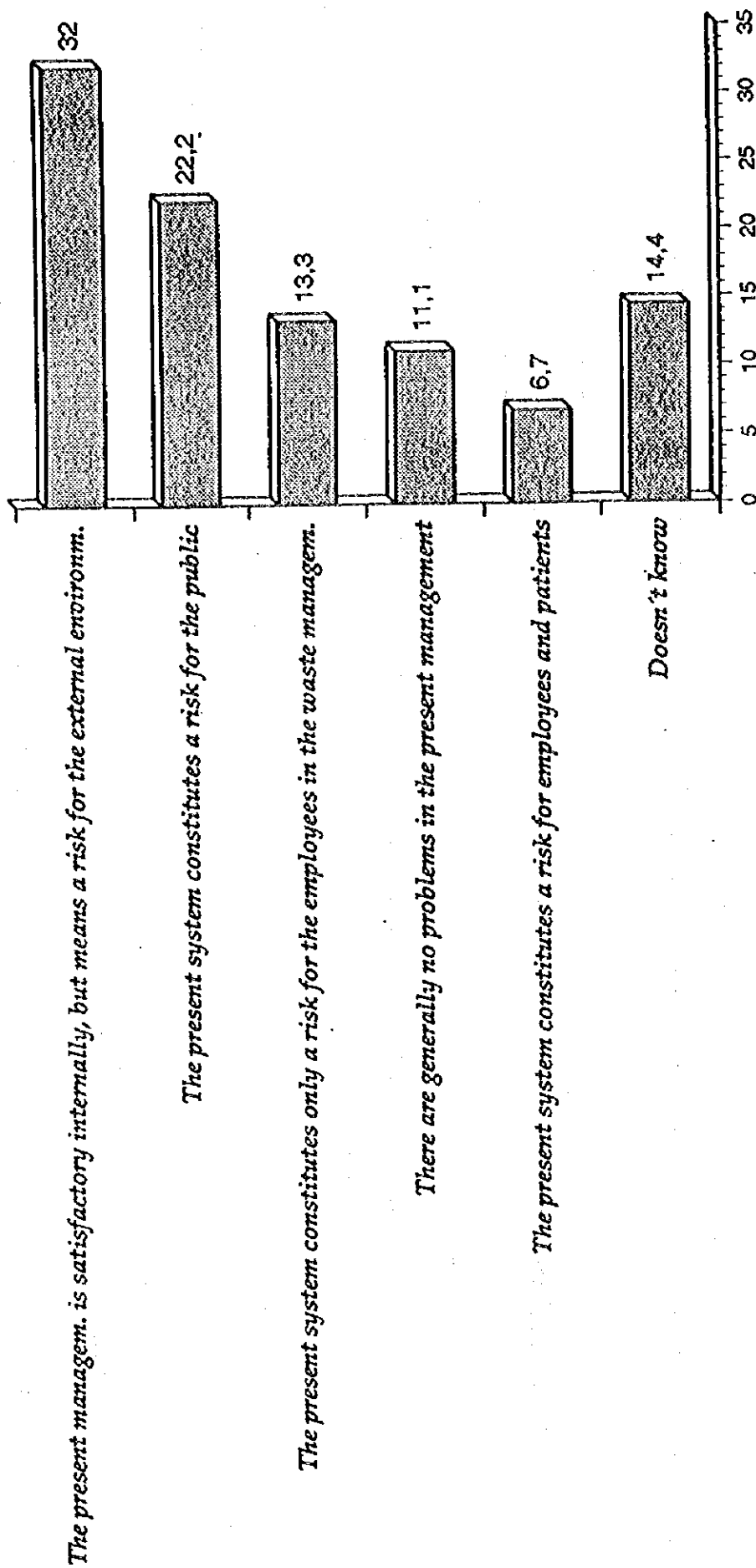
	Total	Hosp.	Clinics
10-500	26,7	9,6	52,7
560-900	11,4	6,4	19,1
2.000	7,7	3,2	14,3
2.425-4.670	20,9	32,2	4,8
5.006-10.000	13,4	19,3	4,8
11.000-20.000	9,5	12,9	4,8
21.333 y más	9,5	16,0	0,0
Mean	6.029,7	9.153,2	1.418,9

	Sample	Total	Hosp.	Clinics
Those who know	52	313.546	283.749	29.797
Total sample / estimate	73	428.420	384.434	43.986



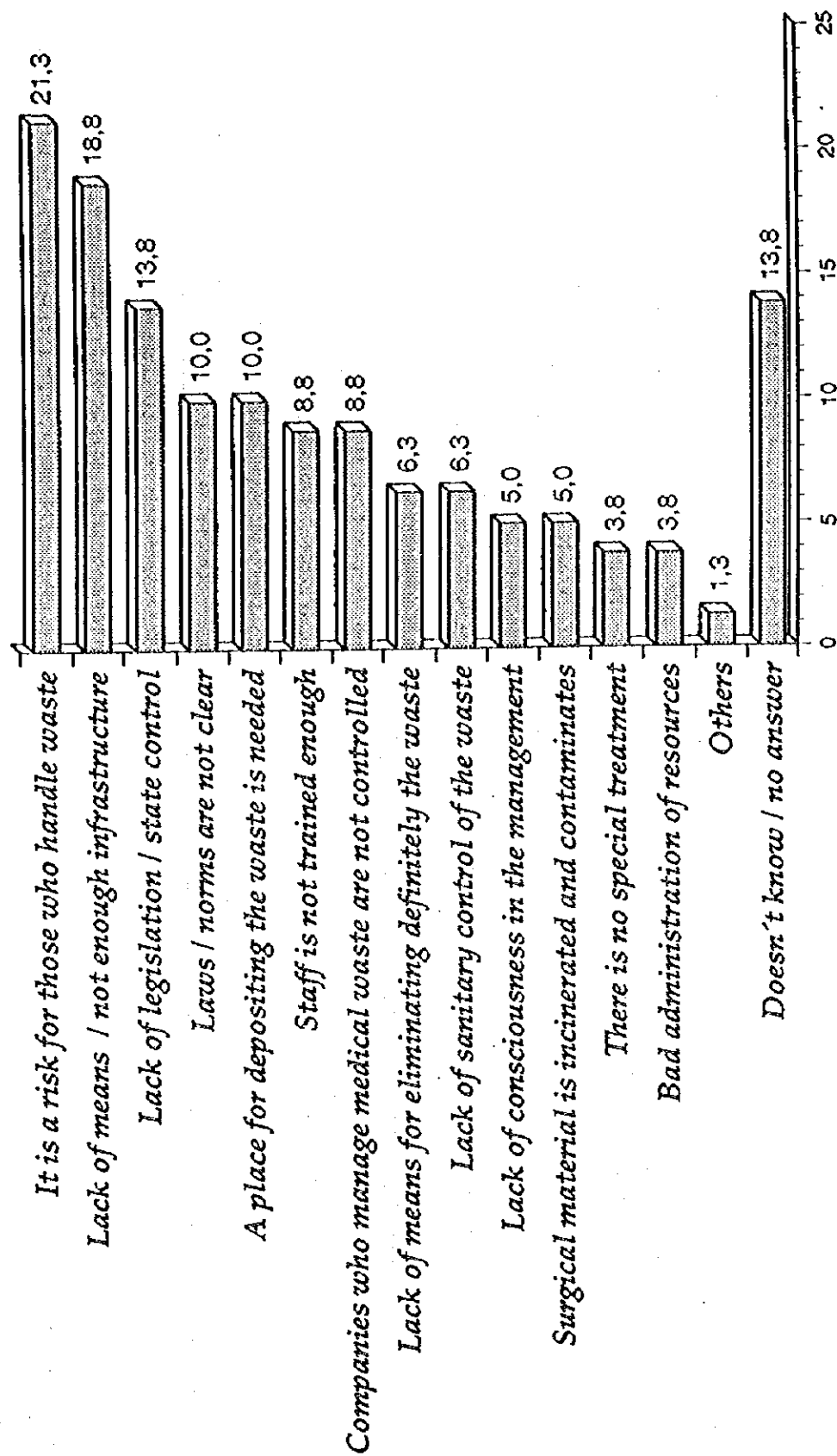
Total Sample: 90

Figure D.3.10ab Which of the following phrases reflects best the present medical waste management situation in your institution? (Q-1)



Total Sample: 90

Figure D.3.10ac Which of the following phrases reflects best the present medical waste management situation in the Metropolitan Region?
(Q-2)



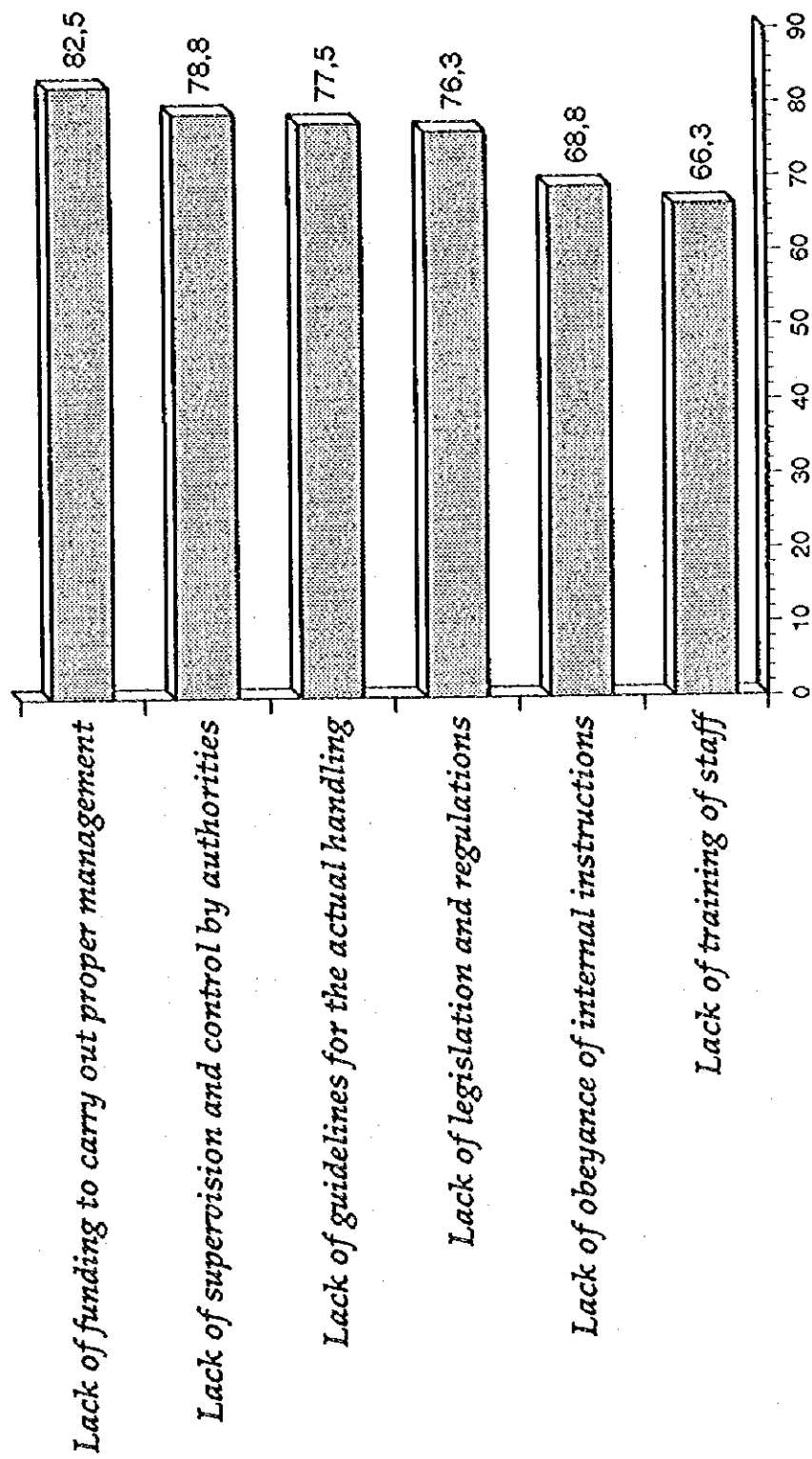
Sample: Those who say that problems exist = 80 (88.9%)

Figure D.3.10ad Why do you think there exist problems in the present medical waste management? (Q-3)

Table D.3.10c Which is the responsibility of each of the following aspects in the present waste management situation? (Q-4)

Total Sample: 90

	Much	Some	Little	None	Doesn't know
Lack of funding to carry out proper management	52,5	30,0	8,8	6,3	2,5
Lack of legislation and regulations	52,5	23,8	10,0	8,8	5,0
Lack of guidelines for the actual handling	47,5	30,0	11,3	8,8	2,5
Lack of supervision and control by authorities	46,3	32,5	10,0	8,8	2,5
Lack of obedience of internal instructions	46,3	22,5	22,5	5,0	3,8
Lack of training of staff	43,8	22,5	23,8	7,5	2,5



Total Sample: 90

Figure D.3.10ae Which is the responsibility of each of the following aspects in the present waste management situation? (Q-4)

Table D.3.10d Identify the waste categories applied in the waste classification in the institution (Q-5)

Total Sample: 90

	TOTAL	HOSPITALS	CLINICS	POSTAS	LABOR.
Sharps	98,9	100,0	96,8	100,0	100,0
Common waste	94,4	100,0	83,9	100,0	100,0
Contaminated waste	83,3	90,5	74,2	75,0	100,0
Pathological waste	67,8	81,0	74,2	25,0	20,0
Risk waste	52,2	50,0	48,4	58,3	80,0

Table D.3.10e Identify the waste categories applied in the waste classification in the institution (Q-5)

Total Sample: 90

	Much	Some	Little	None	Doesn't know
Lack of funding to carry out proper management	52,5	30,0	8,8	6,3	2,5
Lack of legislation and regulations	52,5	23,8	10,0	8,8	5,0
Lack of guidelines for the actual handling	47,5	30,0	11,3	8,8	2,5
Lack of supervision and control by authorities	46,3	32,5	10,0	8,8	2,5
Lack of obedience of internal instructions	46,3	22,5	22,5	5,0	3,8
Lack of training of staff	43,8	22,5	23,8	7,5	2,5

Table D.3.10f Waste types generated at the institution (Q-6)

Total Sample: 90

	TOTRL	HOSP.	CLIN.	POSTAS	LABOR.
Pathol. waste	68,9	83,3	74,2	25,0	20,0
Cultures / stocks	65,6	78,6	58,1	25,0	100,0
Blood products	81,1	92,9	71,0	58,3	100,0
Infectious waste	41,1	59,5	29,0	16,7	20,0
Sharps	98,9	97,6	100,0	100,0	100,0
Contamin. waste	82,2	88,1	67,7	91,7	100,0
Food leftovers from patients	77,8	100,0	90,3	0,0	0,0
Food from kitchen	82,2	100,0	87,1	41,7	0,0
Waste from administr.	97,8	100,0	96,8	91,7	100,0
Packaging materials	86,7	95,2	80,6	75,0	80,0
Garden waste	72,2	92,9	84,8	50,0	60,0
Construction waste	45,7	73,8	32,3	8,3	0,0
Other common waste	35,6	45,2	22,6	25,0	60,0
Chemical liquids	36,7	59,5	19,4	0,0	40,0
Medicine/ drugs	46,7	64,3	41,9	16,7	0,0
Other hazardous waste	13,3	23,8	3,2	8,3	0,0
Radioactive waste	18,9	35,7	3,2	0,0	20,0
Animal waste (dead)	8,9	19,0	0,0	0,0	0,0
Animal waste (tests)	4,4	9,5	0,0	0,0	0,0
Ash / slag	20,0	42,9	0,0	0,0	0,0
Sludge	4,4	9,5	0,0	0,0	0,0

Table D.3.10g Waste categories in which each type of waste is being classified (Q-7)

Sample: Those who generate each waste type

	Pathol.	Cult./ Stocks	Blood	Infect.	Sharps	Contam.	Chem. Liquids	Med./ drugs
	S: 61	S: 59	S: 73	S: 37	S: 89	S: 74	S: 33	S: 42
Pathol. waste	69,4	10,2	12,3	10,8	2,2	1,4	0,0	2,4
Risk waste	12,9	18,6	38,4	37,8	22,5	17,6	57,6	47,6
Contam. waste	6,5	54,2	35,6	43,2	15,7	68,9	21,2	16,7
Common waste	4,8	8,5	8,2	2,7	4,5	6,8	12,1	28,6
Sharps	0,0	1,7	0,0	2,7	55,1	2,7	0,0	2,4
Other	6,5	6,8	5,5	2,7	0,0	2,7	9,1	2,4

Table D.3.10h Type of Treatment/Disposal used for each waste category (Q-8)

Sample: Those who generate each type of waste

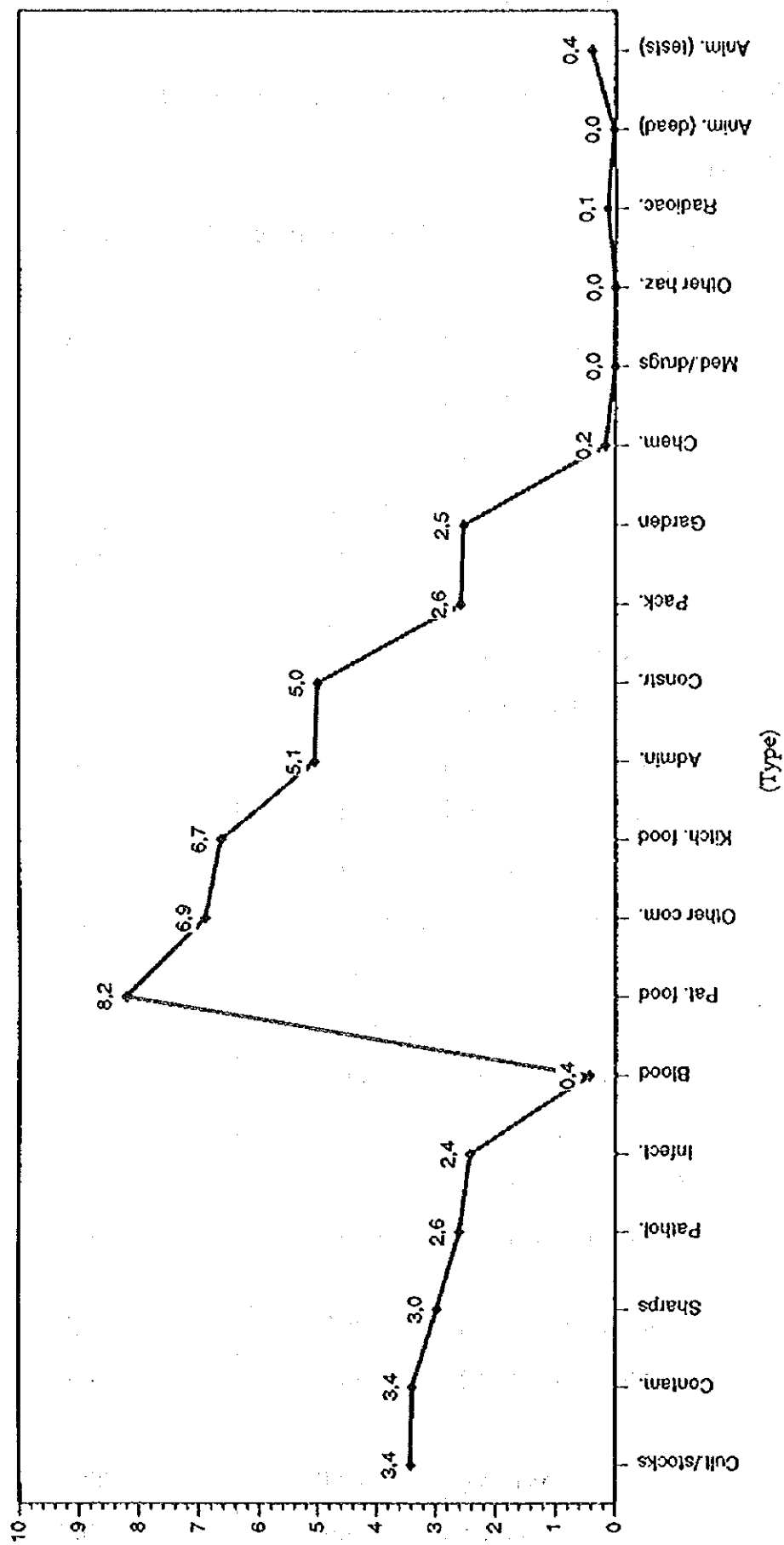
	Pathol.	Cult. / Stocks	Blood	Infect.	Sharps.	Contam.	Chem. liquids	Med. / drugs
	B: 61	B: 59	B: 73	B: 37	B: 89	B: 74	B: 33	B: 42
Digester	33,9	3,4	11,0	5,4	4,5	0,0	0,0	9,5
Own Incinerator	12,9	10,2	11,0	21,6	13,5	20,3	0,0	7,1
Private Incinerator	14,5	5,1	6,8	2,7	5,6	5,4	0,0	2,4
Incin. at other hosp / clinic	8,1	6,8	6,8	8,1	9,0	6,8	0,0	7,1
Municipal landfill with own transport	1,6	0,0	0,0	2,7	2,2	2,7	0,0	9,5
Municipal landfill via municip. collection	1,6	8,5	11,0	18,9	30,3	28,4	9,1	14,3
Recycling	1,6	0,0	0,0	0,0	1,1	0,0	3,0	2,4
Discharged to the sewer	3,2	16,9	21,9	8,1	0,0	2,7	66,7	19,0
Destruction (chemical)	0,0	3,4	4,1	2,7	2,2	1,4	6,1	4,8
Autoclave	12,9	33,9	20,5	18,9	33,7	14,9	0,0	4,8
Other	8,1	6,8	4,1	8,1	9,0	9,5	6,1	4,8
Doesn't know destiny	1,6	3,4	1,4	0,0	3,4	2,7	9,1	11,9

Table D.3.10i Proportion who knows waste quantities (Q-9)

Total Sample: 90

	% generates	% knows quantity
Pathol. waste	68,9	59,7
Cultures / stocks	65,6	50,8
Blood products	81,1	56,2
Infectious waste	41,1	35,1
Sharps	98,9	73,0
Contamin. waste	82,2	56,8
Food leftovers from patients	77,8	57,1
Food from kitchen	82,2	63,5
Waste from administr.	97,8	67,0
Packaging materials	86,7	62,8
Garden waste	72,2	55,4
Construction waste	45,7	38,1
Other common waste	35,6	53,1
Chemical liquids	36,7	48,5
Medicine/ drugs	46,7	34,1
Other hazardous waste	13,3	33,3
Radioactive waste	18,9	23,5
Animal waste (dead)	8,9	12,5
Animal waste (tests)	4,4	50,0
Ash / slag	20,0	38,9
Sludge	4,4	25,0

Kg / bed weekly



Sample: Hospitals and Clinics who know quantity in each waste type

Figure D.3.10af Waste generation per bed (Q-9)

Table D.3.10j Waste generation per bed (Q-9)

Sample: Hospitals and Clinics who know quantity in each waste type

Kg / bed weekly

	Total	Hosp.	Clinics
Cult/stocks	3,42	3,28	4,79
Contam.	3,40	3,25	5,04
Sharps	2,99	2,94	3,63
Pathol.	2,62	2,50	4,32
Infect.	2,44	2,10	5,81
Blood	0,44	0,34	1,33
Pat. food	8,21	8,15	8,95
Other com.	6,90	6,85	7,44
Kitch. food	6,65	6,25	12,29
Admin.	5,06	4,90	7,28
Constr.	5,01	5,02	4,88
Pack.	2,59	2,56	2,95
Garden	2,54	2,26	7,64
Chem.	0,17	0,16	1,26
Med./drugs	0,01	0,01	0,34
Other haz.	0,003	0,003	0,003
Radioac.	0,13	0,13	0,13
Anim. (dead)	0,03	0,03	0,00
Anim. (tests)	0,40	0,40	0,00

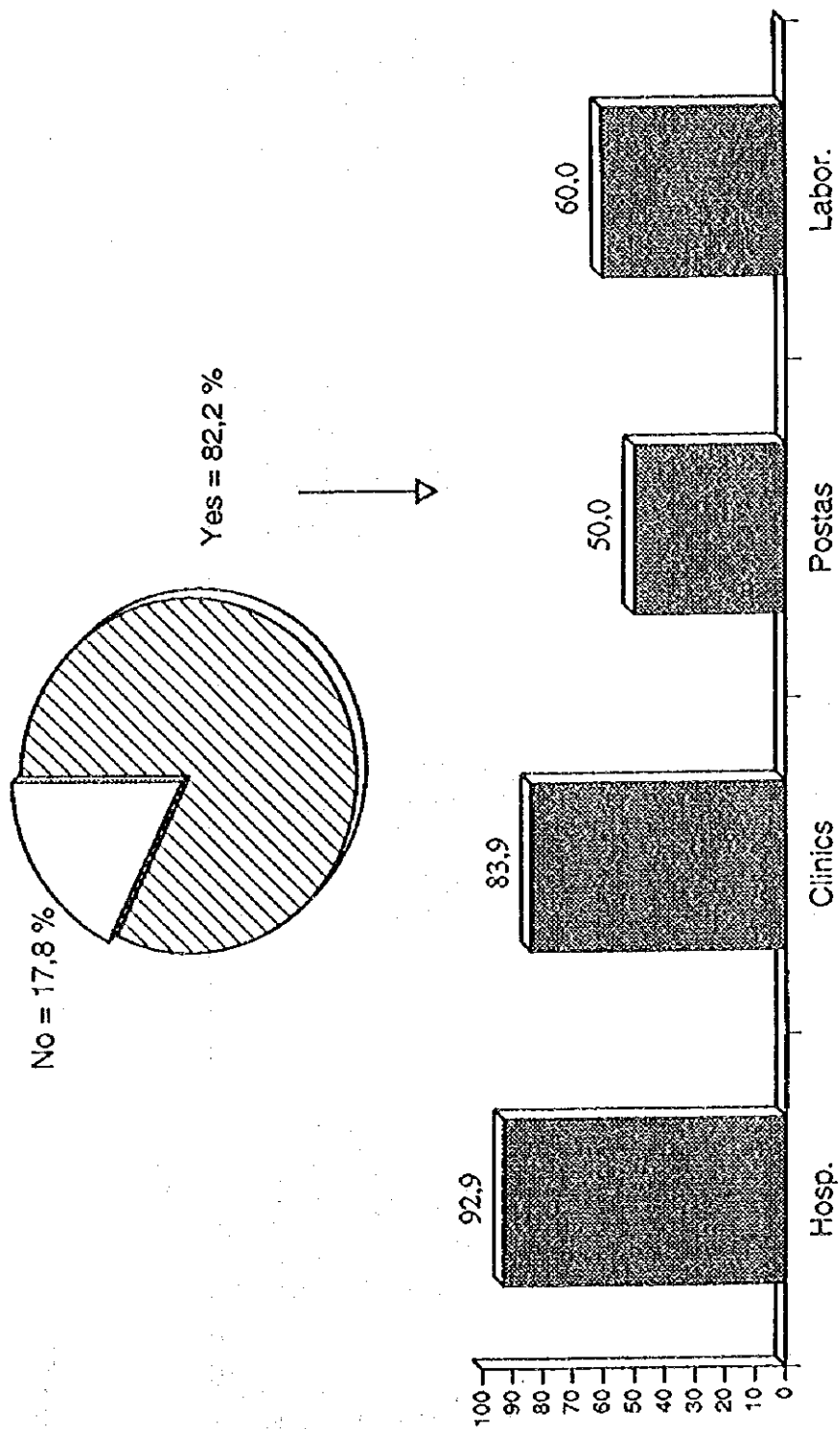
Table D.3.10k Total waste generation estimate (Q-10)

Sample: Hospitals (42) and Clinics (31) interviewed

Tonnes / year

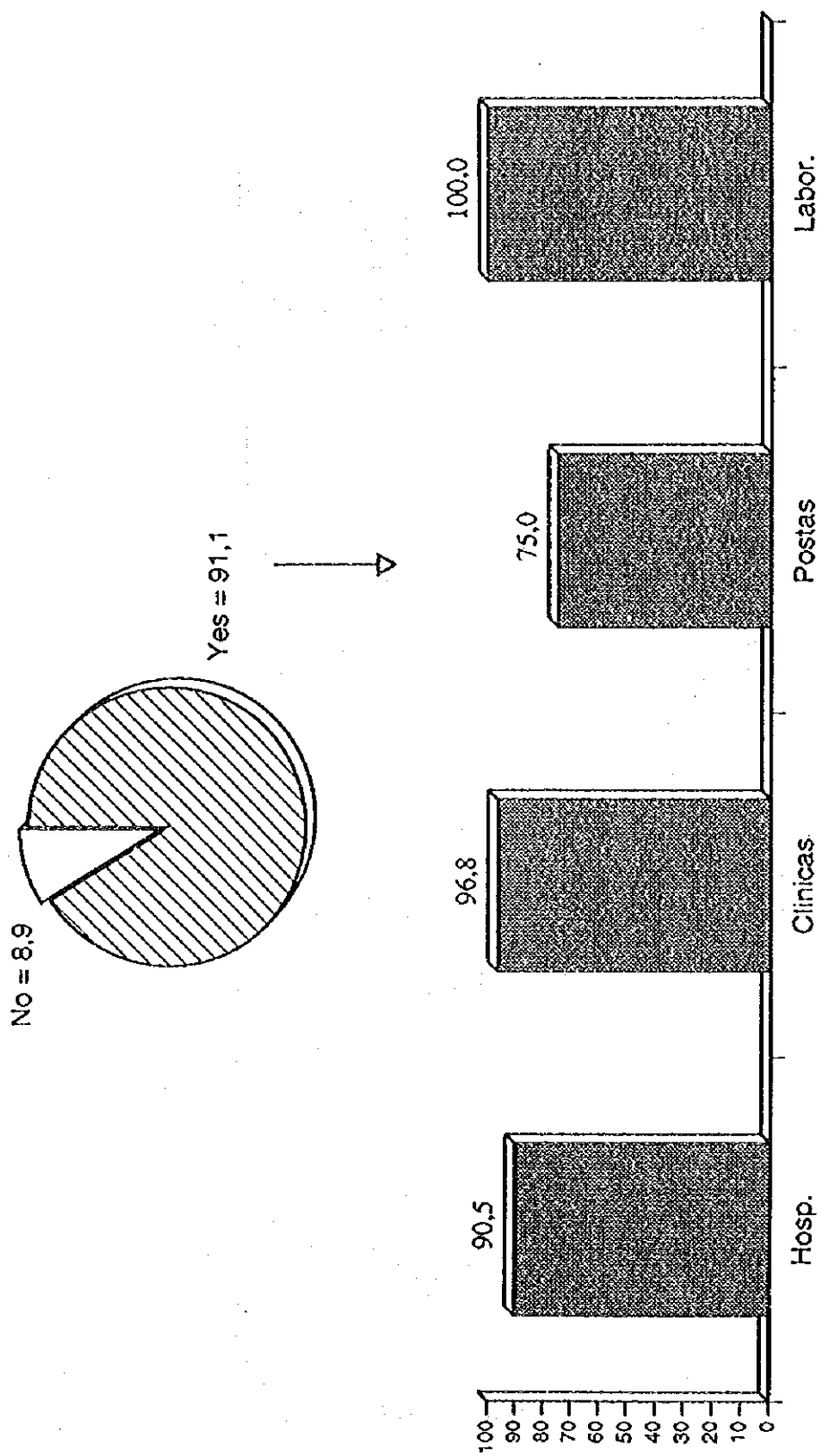
	Total	Hosp.	Clinics
<i>Path. waste</i>	1.277,6	1.145,3	132,3
<i>Infectious waste</i>	7.384,4	6.693,1	691,3
<i>Common waste</i>	18.653,9	17.154,8	1.499,2
<i>Hazardous waste</i>	86,9	70,4	16,5
<i>Radioactive waste</i>	36,0	36,0	0,3
<i>Animal waste</i>	39,8	39,8	0,0
TOTAL	26.201,0	23.994,1	2.207,3

Waste /bed	Total	Hosp.	Clinics
Tonnes/year	1,88	1,87	2,01



Total Sample: 90

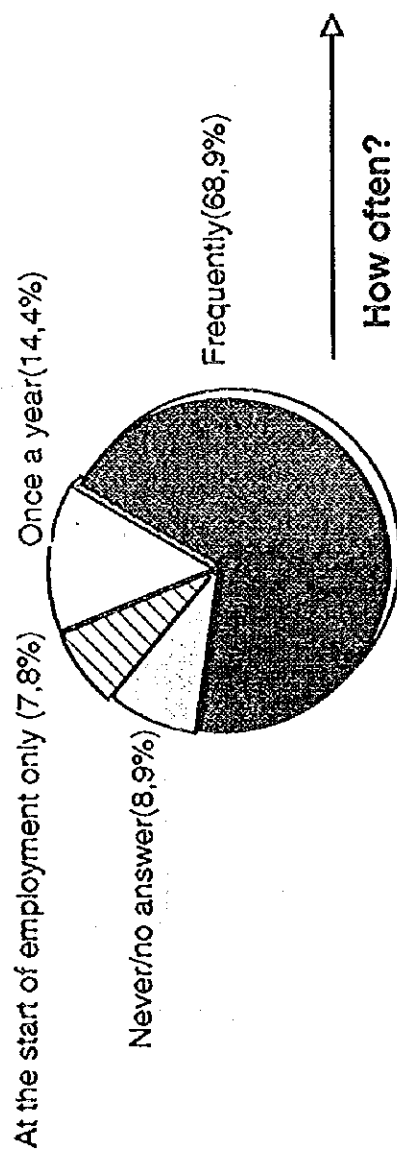
Figure D.3.10ag Are there written instructions for sorting and handling waste in your institution? (Q-10)



Sample: 90

Figure D.3.10ah Is contaminated/risky waste specifically identified and are special precautions taken? (Q-11)

Permanently	33,9
Once a week	3,2
Twice a week	4,8
Every month	11,3
Every 3 months	9,7
Every 4 months	6,5
Every 6 months	11,3
On special occasions	11,3
Others	8,0
Doesn't know	3,2



Total Sample: 90

Figure D.3.10ai How often are waste management personnel trained in precautions against contaminated/risky waste? (Q-12)

Table D.3.101 Present collection system used at the departments (Q-13)

Total Sample: 90

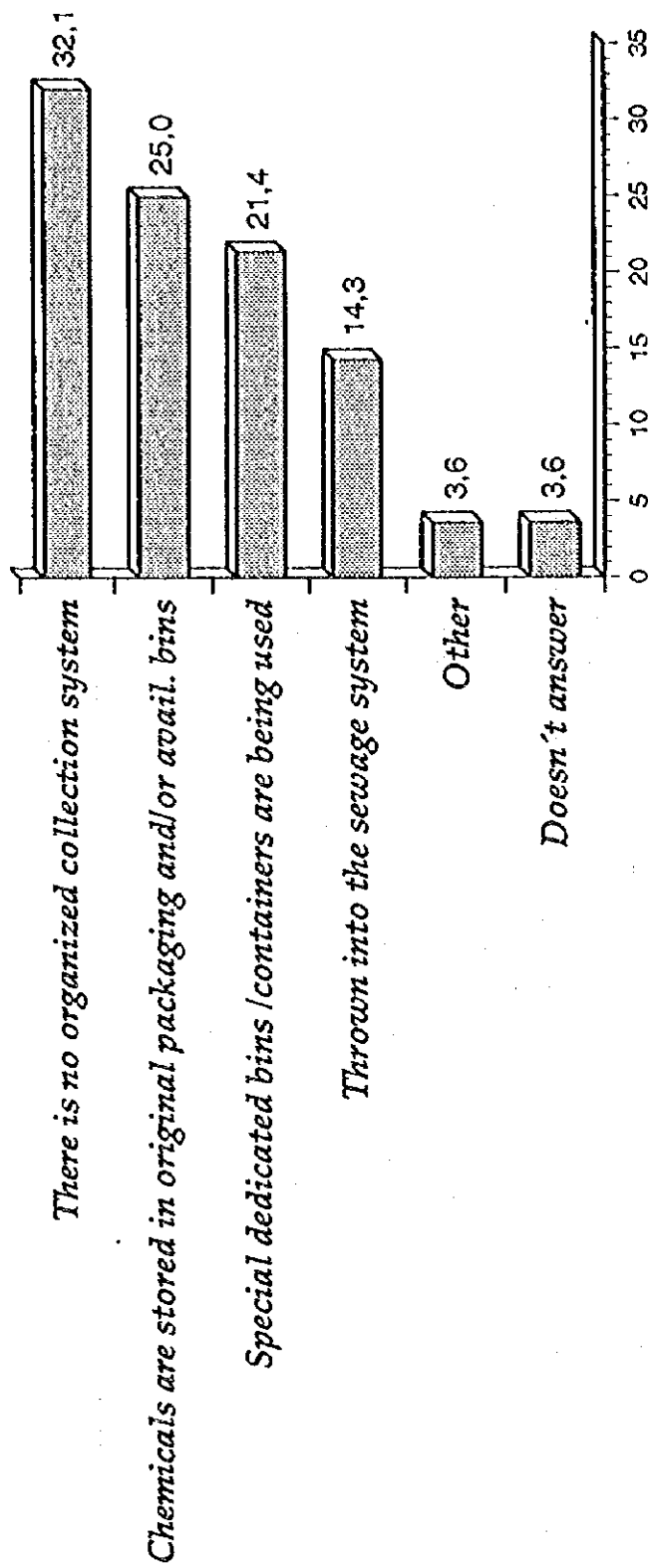
TOTAL SAMPLE: 90

	Total	Hosp.	Clinics	Postas	Labor.
Standardized system with coloured bins/bags and fixed labelling	50,0	61,9	51,6	25,0	0,0
Receptacles / bags without labelling	24,4	26,2	12,9	41,7	40,0
Different kinds of receptacles with fixed labelling	22,2	11,9	32,3	16,7	60,0
Cardboard boxes	2,2	0,0	3,2	8,3	0,0

Table D.3.10m Collection frequency of pathological and contaminated waste (Q-17 and Q-18)

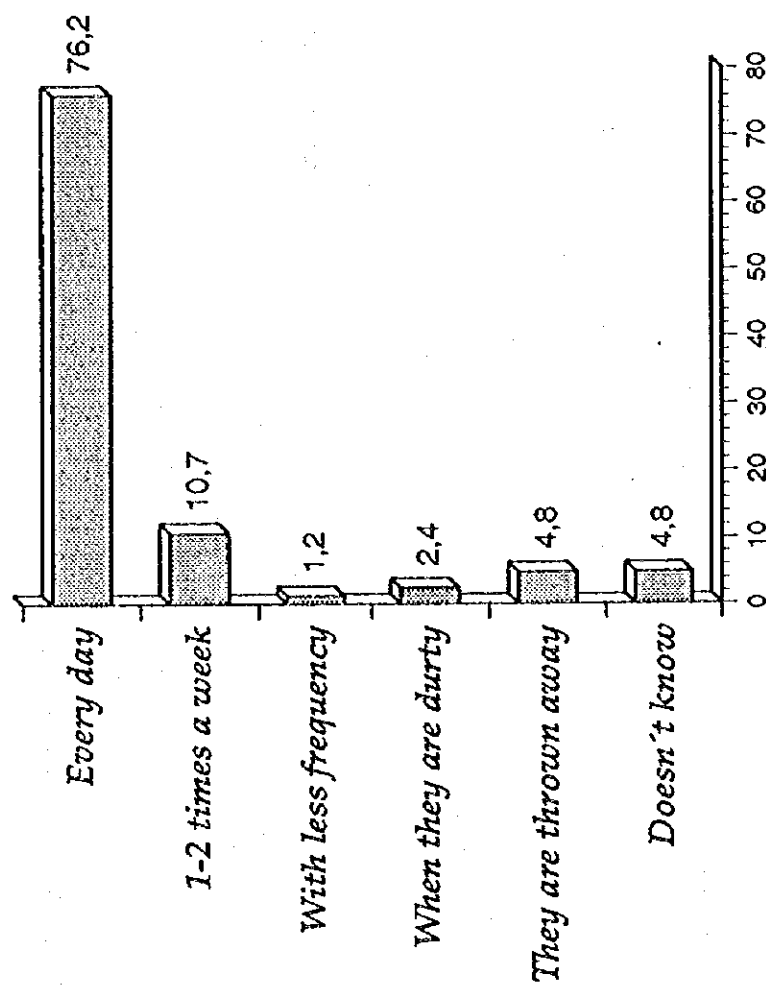
Sample: Those who generate each type of waste

	Path. waste	Contam. waste
	S: 61	S: 75
A few times a day	11,5	9,3
Once a day	32,8	42,7
Twice a day	16,4	28,0
A few times a week	8,2	4,0
When there is waste	27,9	14,7
Other	3,2	1,3



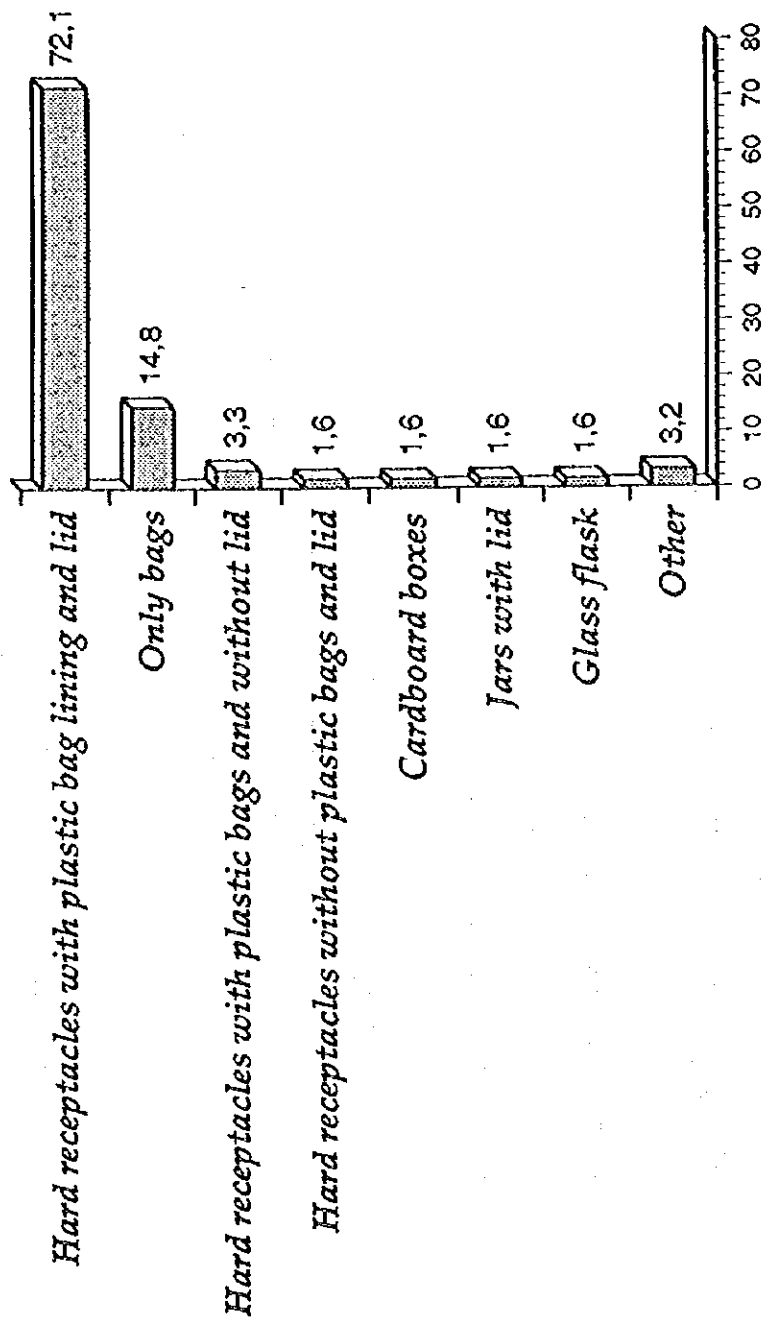
Those who generate chemical waste = 28 (31.1%)

Figure D.3.10aj Collection system used for hazardous chemicals (Q-19)



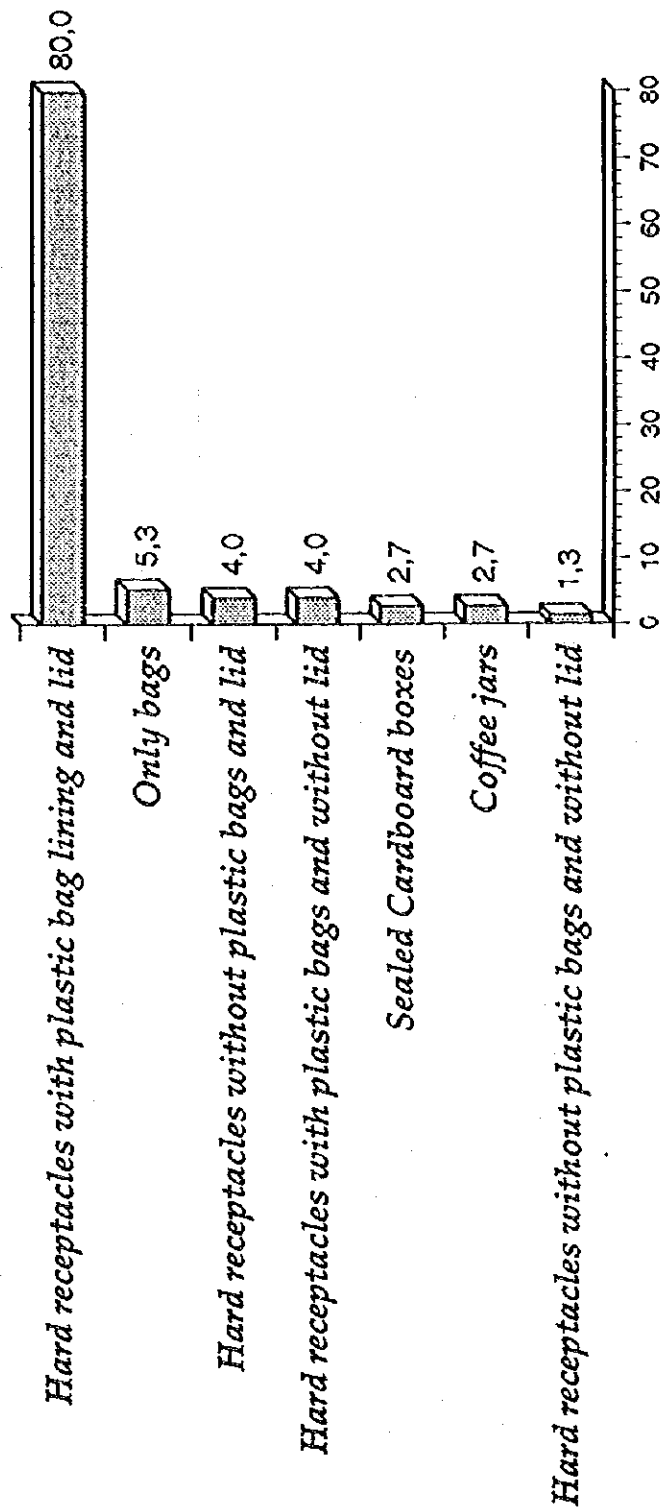
Sample: Those who use hard receptacles = 84 (93.3%)

Figure D.3.10ak How often are the hard receptacles being washed? (Q-20)



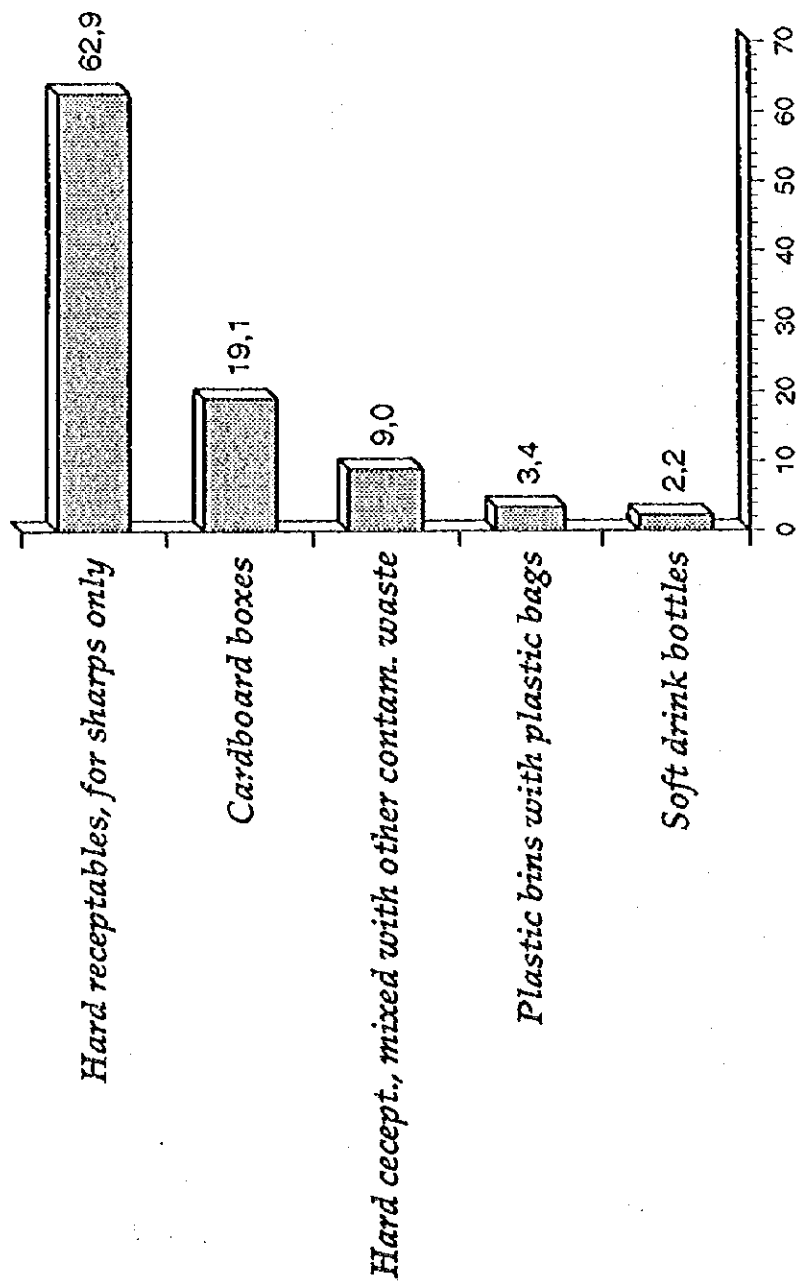
Sample: Those who generate pathological waste = 61 (67.7%)

Figure D.3.10a1 Type of receptacles used for pathological waste (Q-15)



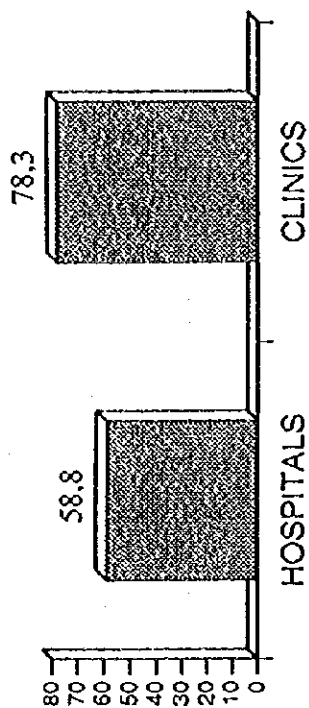
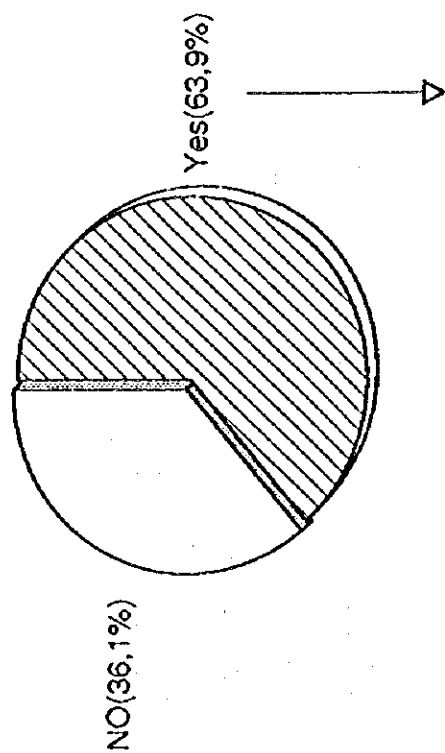
Sample: Those who generate contaminated waste = 75 (83.3%)

Figure D.3.10am Type of receptacles used for contaminated waste (Q-14)



Sample: Those who generate sharps = 89 (98.9%)

Figure D.3.10an Type of receptacles used for sharps (Q-16)



Sample: Those who generate pathological waste = 61 (67.7%)

Figure D.3.10ao Are there cooled storage facilities for pathological waste? (Q-21)

Table D.3.10n Are there central collection points for waste at the institution? (Q-22)

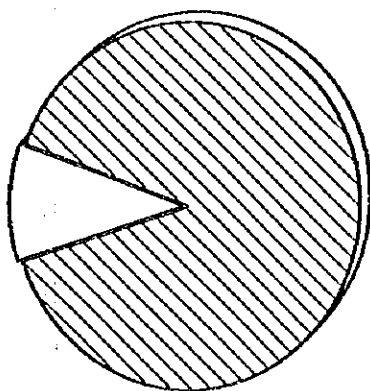
Total Sample: 90

	Total	Hosp.	Clinics	Postas	Labor.
Yes, one	57,8	57,1	74,2	25	40
Yes, more than one	17,8	23,8	16,1	0,0	20,0
No, waste is collected at the depart. and sent for disposal	24,4	19,0	9,7	75,0	40,0

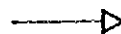
Not a separate building, destined especially to waste (10,3%)



What type of place is it?



A separate building, destined to waste from the beginning (89,7%)



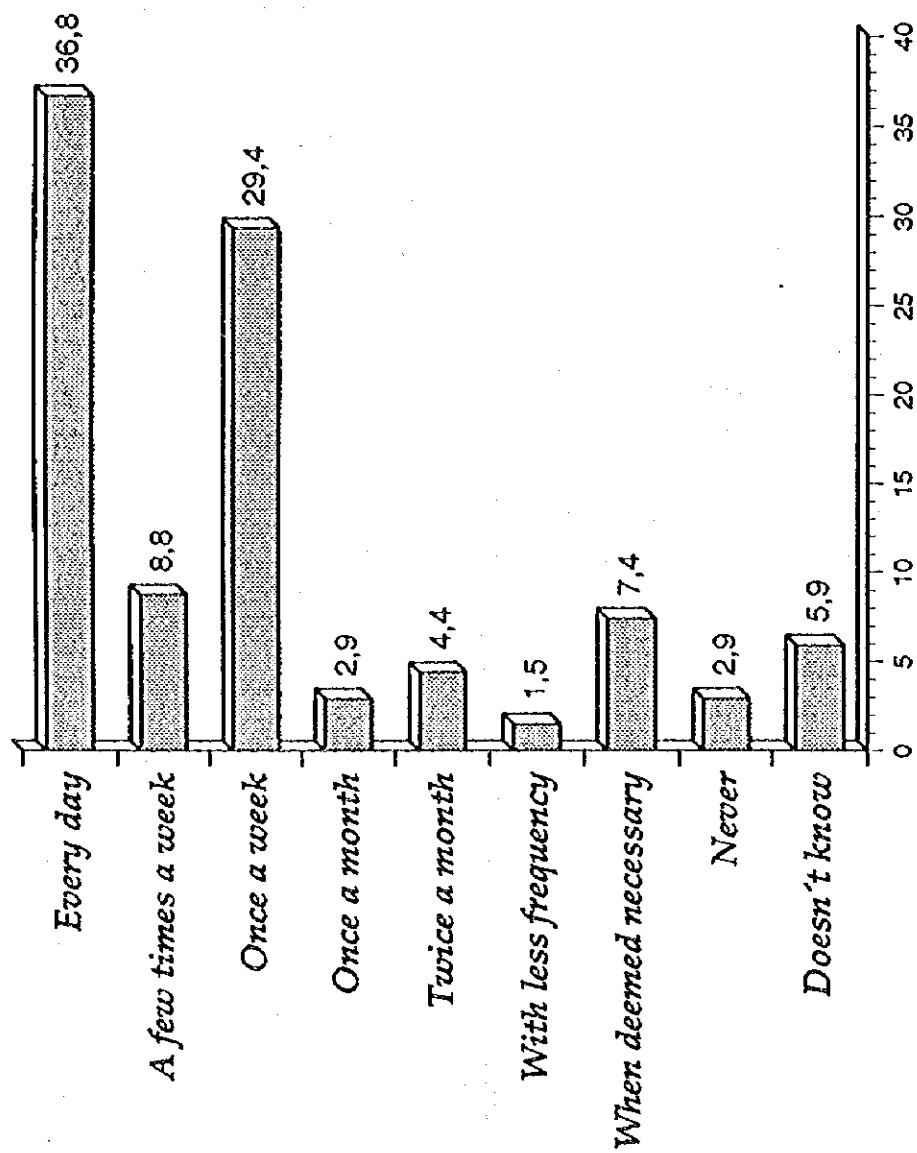
What type of place is it?

Originally designed for the purpose	68,9
Other building	21,3
Open storage area	9,8

Originally designed for the purpose	71,4
Other place	28,6

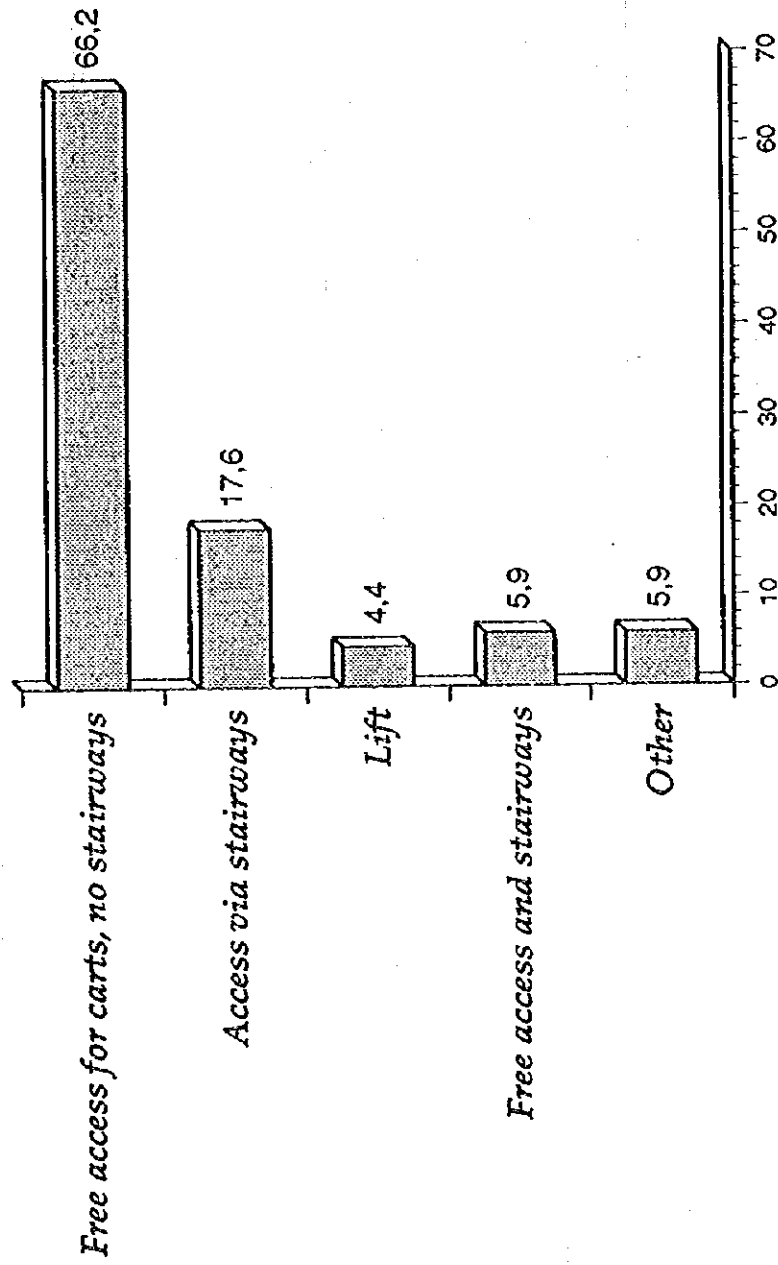
Sample: Those who have a central place of collection = 68 (75,6%)

Figure D.3.10ap How is (are) this (these) central place(s) of collection? (Q-23)



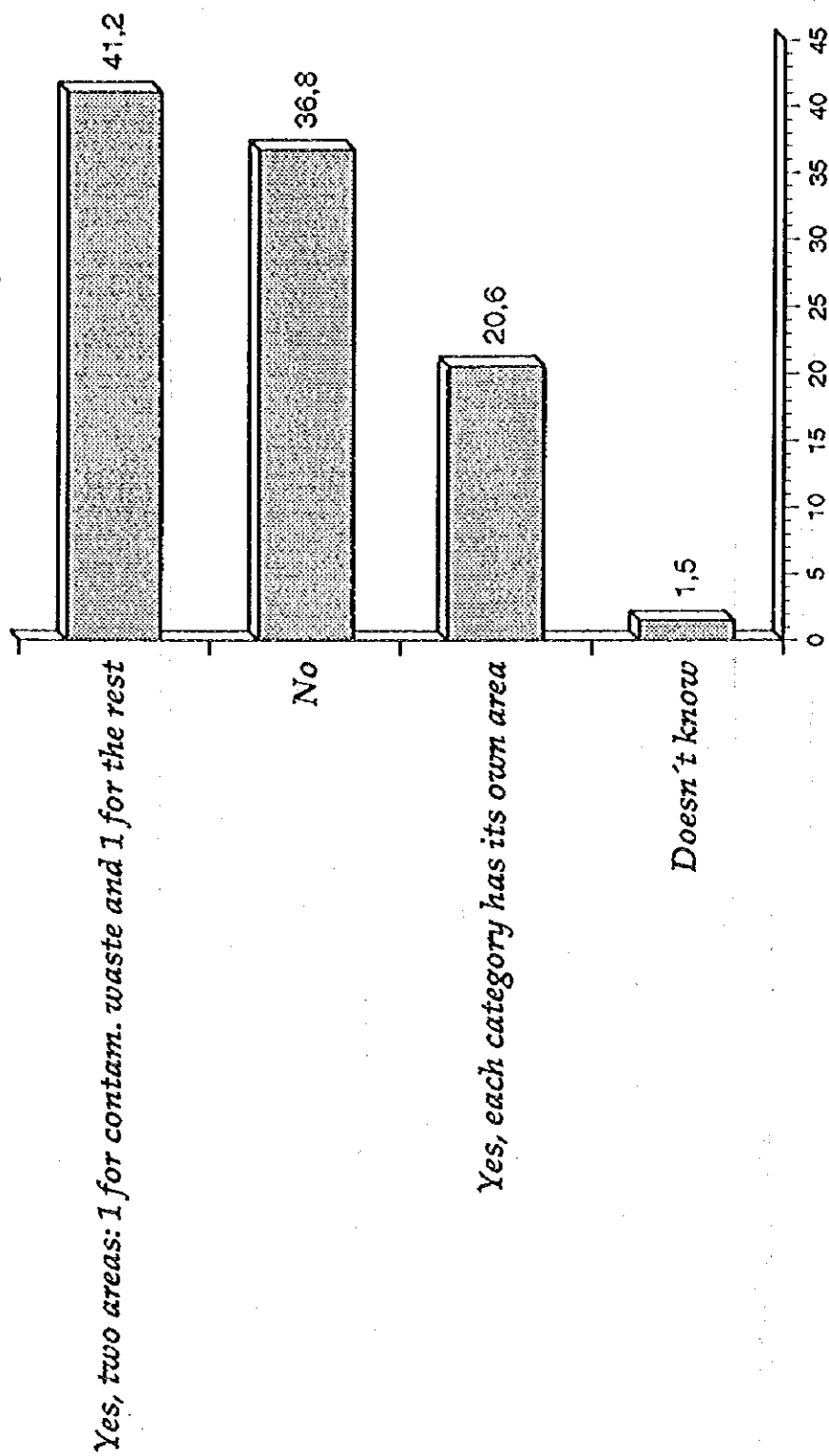
Sample: Those who have a central point = 68 (75,6%)

Figure D.3.10aq How often is the collection point disinfected? (Q-24)



Sample: Those who have a central collection point = 68 (75.6%)

Figure D.3.10ar Access to the collection point (Q-25)



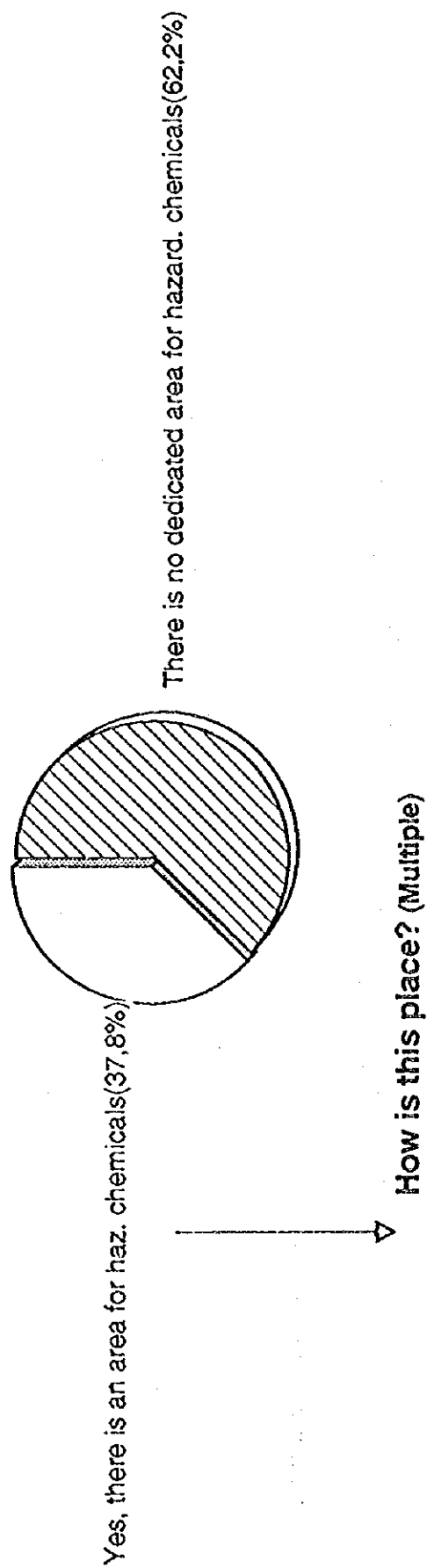
Sample: Those who have a central place = 68 (75.6%)

Figure D.3.10as Is the collection point arranged with special areas for different waste categories? (Q-26)

	Total	Hosp.	Clinics	Postas	Labor.
Yes, two areas: 1 for contam. waste and 1 for the rest	41,2	44,1	39,3	0,0	66,7
No	36,8	38,2	32,1	66,7	33,3
Yes, each category has its own area	20,6	17,6	28,6	0,0	0,0
Doesn't know	1,5	0,0	0,0	33,3	0,0

Sample: Those who have a central place = 68 (75.6%)

Figure D.3.10at Is the collection point arranged with special areas for the different waste categories? (Q-26)

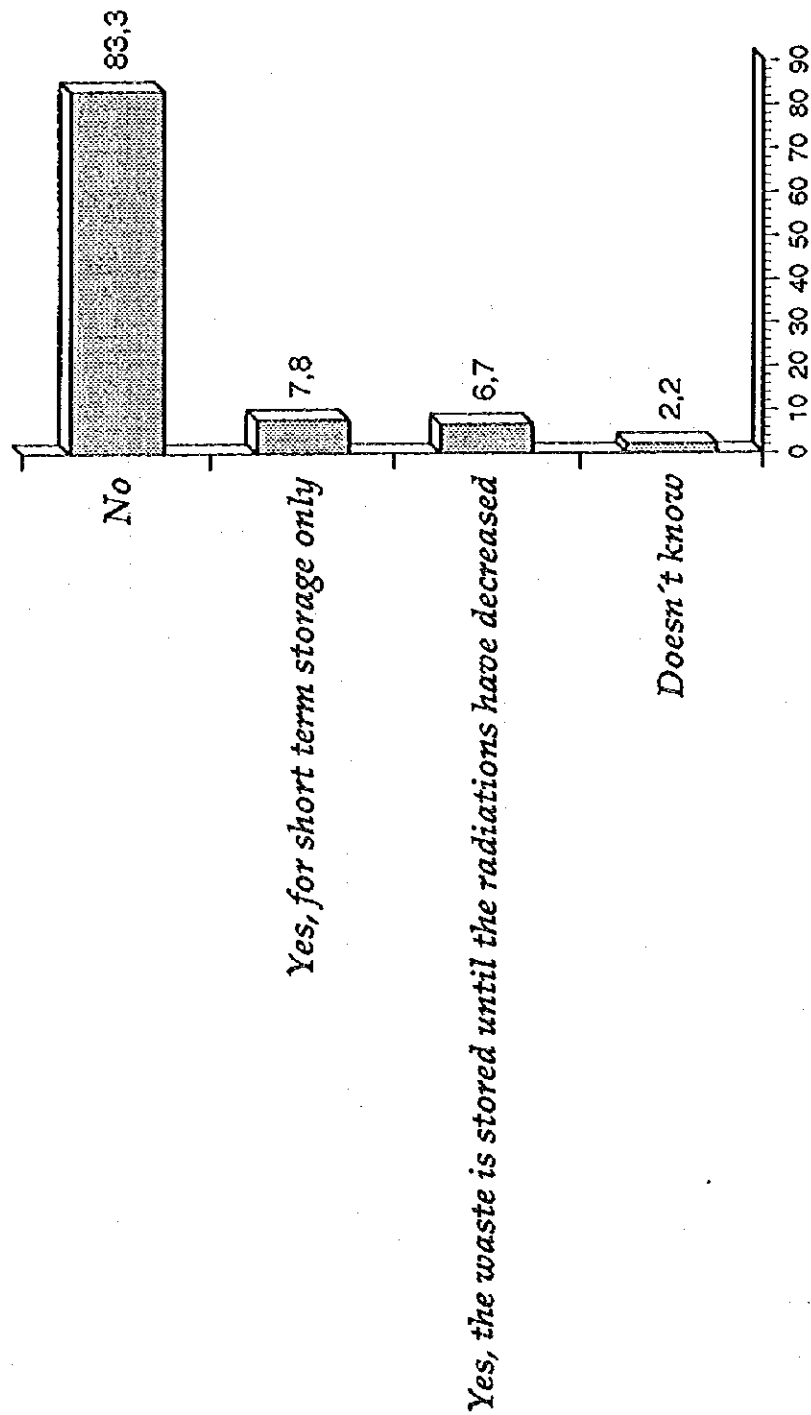


The place is fenced and locked	73,5
The area is well ventilated	50,0
The area has a separate drainage system	41,2

Total Sample: 90

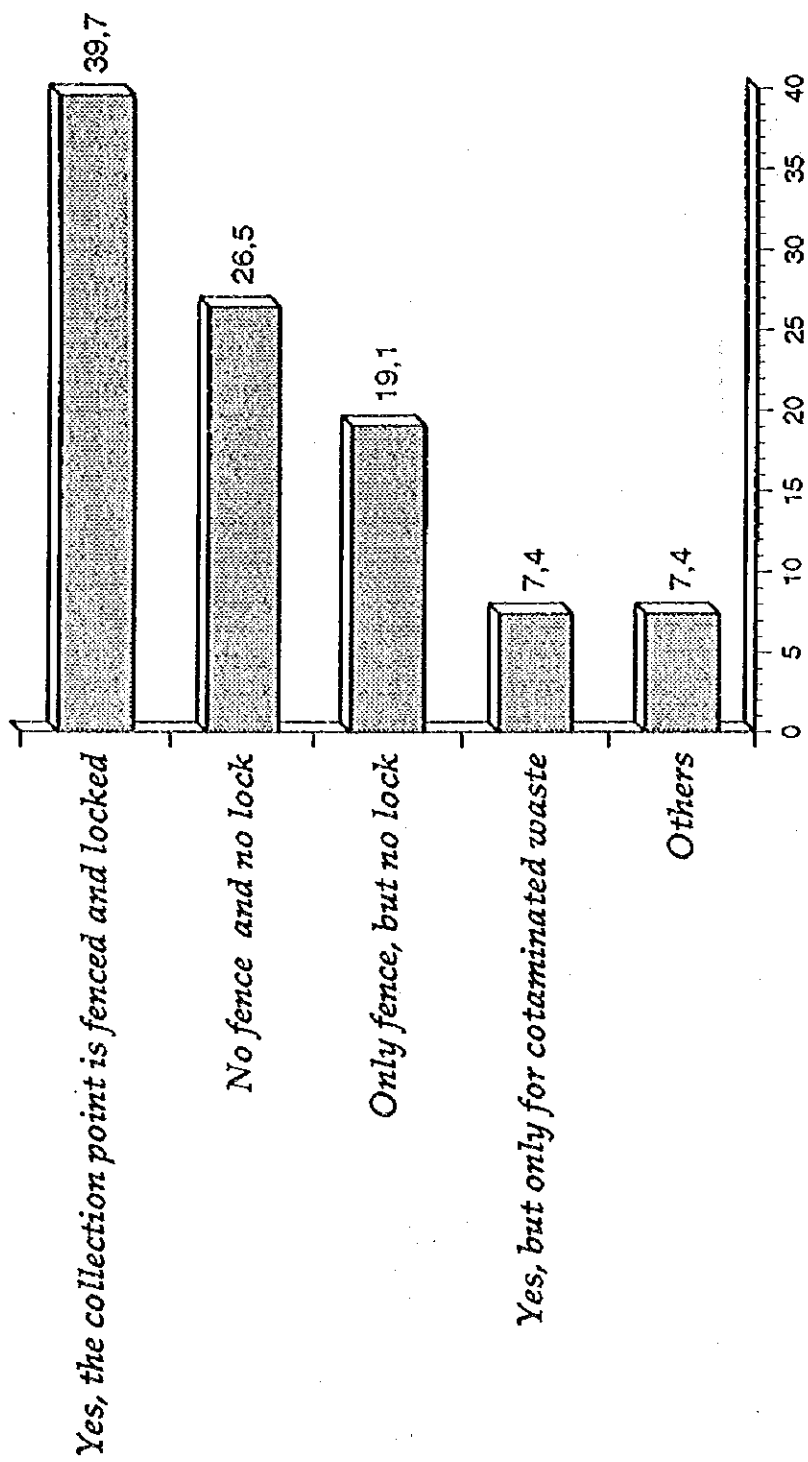
Figure D.3.10au Storage area for hazardous chemicals (Q-30)

% have rad. waste (B: 17)
35,3
23,5
29,4
11,8



Total Sample: 90

Figure D.3.10av Are there storage facilities for radioactive waste? (Q-31)



Sample: Those who have a central point = 68 (75.6%)

Figure D.3.10aw Is the collection point fenced and locked? (Q-27)

Table D.3.10o Is the collection point fenced and locked? (Q-27)

Sample: Those who have a central point = 68 (75.6%)

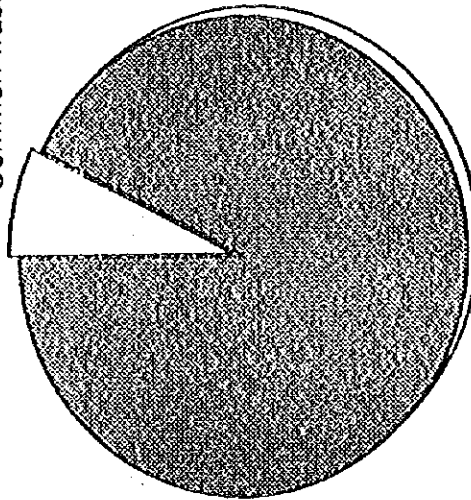
	Total	Hosp.	Clinics	Postas	Labor.
Yes, the collection point is fenced and locked	39,7	50,0	32,1	0,0	33,3
No fence and no lock	26,5	20,6	28,6	66,7	33,3
Only fence, but no lock	19,1	20,6	17,9	33,3	0,0
Yes, but only for contaminated waste	7,4	0,0	14,3	0,0	33,3
Others	7,4	8,8	7,1	0,0	0,0

Table D 3.10p Description of the access to the collection point for collection vehicles and the loading procedure? (Q-28)

Sample: Those who have a central point = 68 (75.6%)

	Total	Hosp.	Clinics	Postas	Labor.
Free access; The waste is loaded manually	51,5	67,6	39,3	33,3	0,0
Free access; containers are emptied automatically	25,0	26,5	25,0	0,0	33,3
No direct access for vehicles; waste is carried and loaded manually	19,1	2,9	28,6	66,7	66,7
Other	4,4	2,9	7,1	0,0	0,0

Common waste is sorted to select recyclable materials(7.4%)

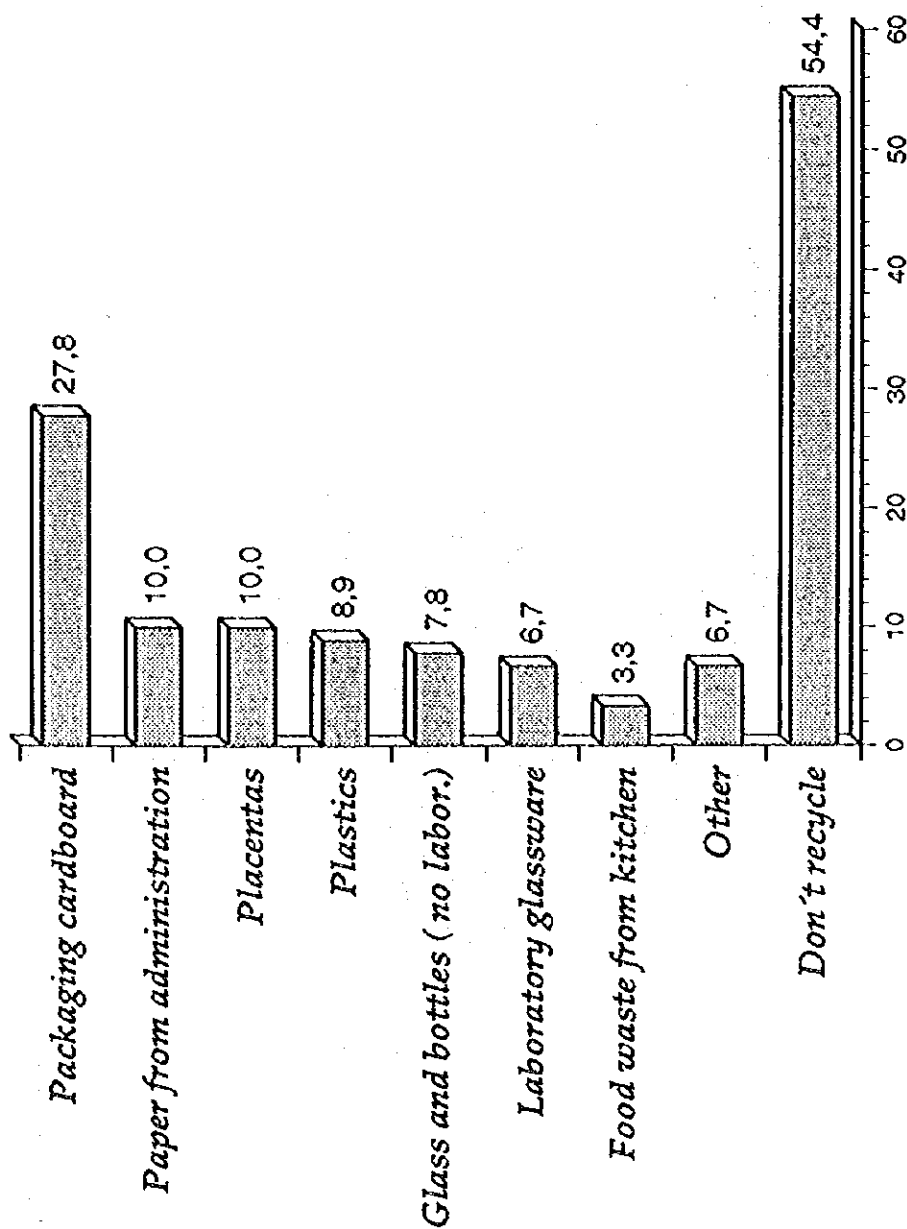


No manual sorting takes place(92.6%)

Sample: Those who have a central point = 68 (75.6%)

Figure D.3.10ax Manual sorting procedures carried out in the collection point (Q-29)

Multiple answer



Total Sample: 90

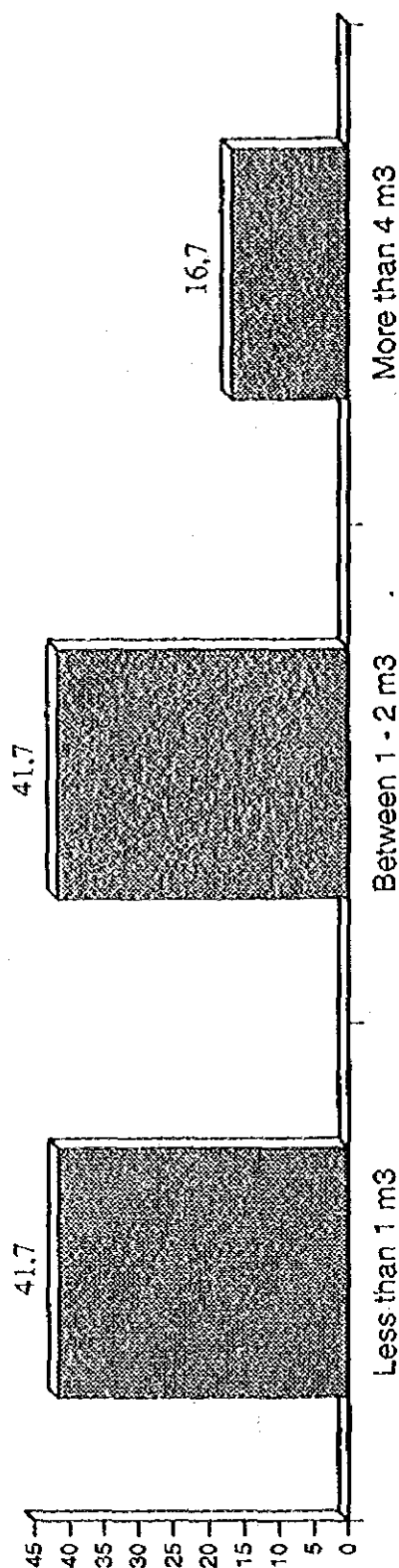
Figure D.3.10ay Waste materials recycled today in the institution (Q-47)

Table D.3.10q Existing internal treatment equipment (Q-32)

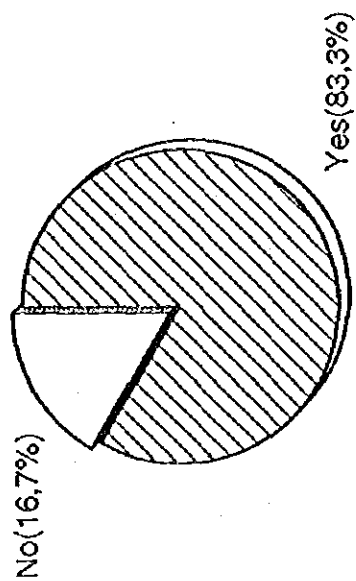
Total Sample: 90

Multiple answer

	Total	Hosp.	Clinics	Postas	Labor.
Autoclave	51,1	47,6	61,3	25,0	80,0
Incinerator	13,3	28,6	0,0	0,0	0,0
Pupinel (for steriliz.)	12,2	4,8	9,7	50,0	0,0
Home made incinerator	10,0	9,5	6,5	25,0	0,0

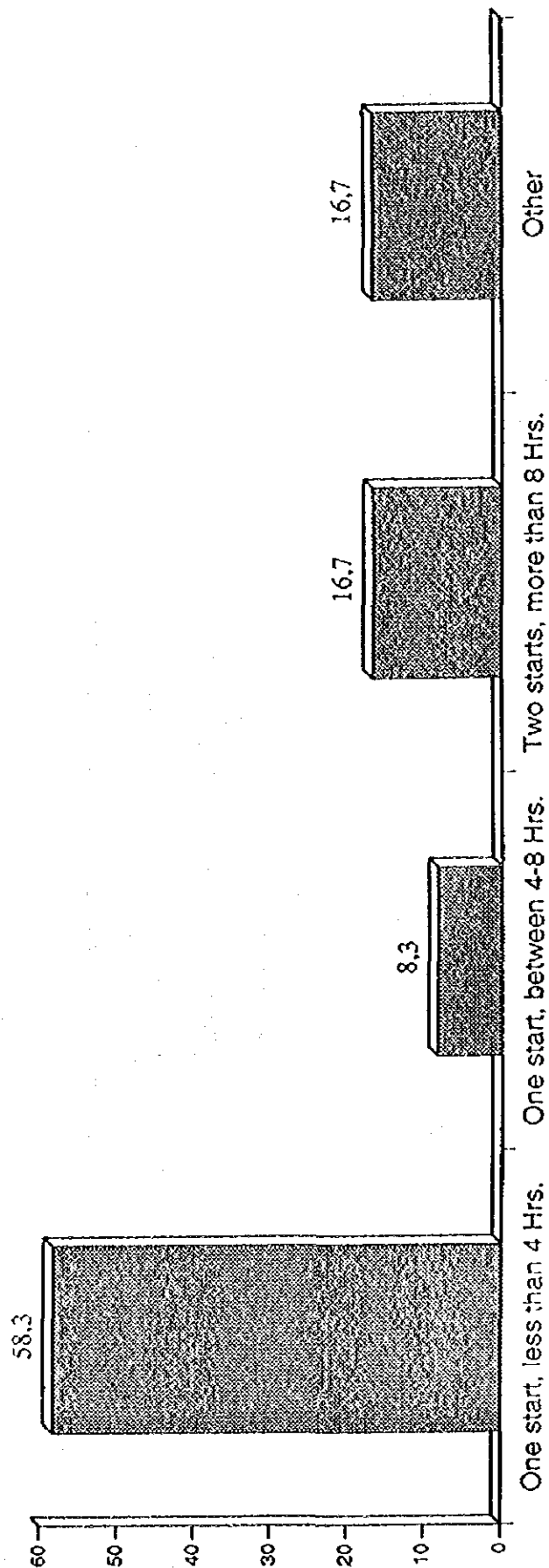


Is it possible to feed waste during operation?



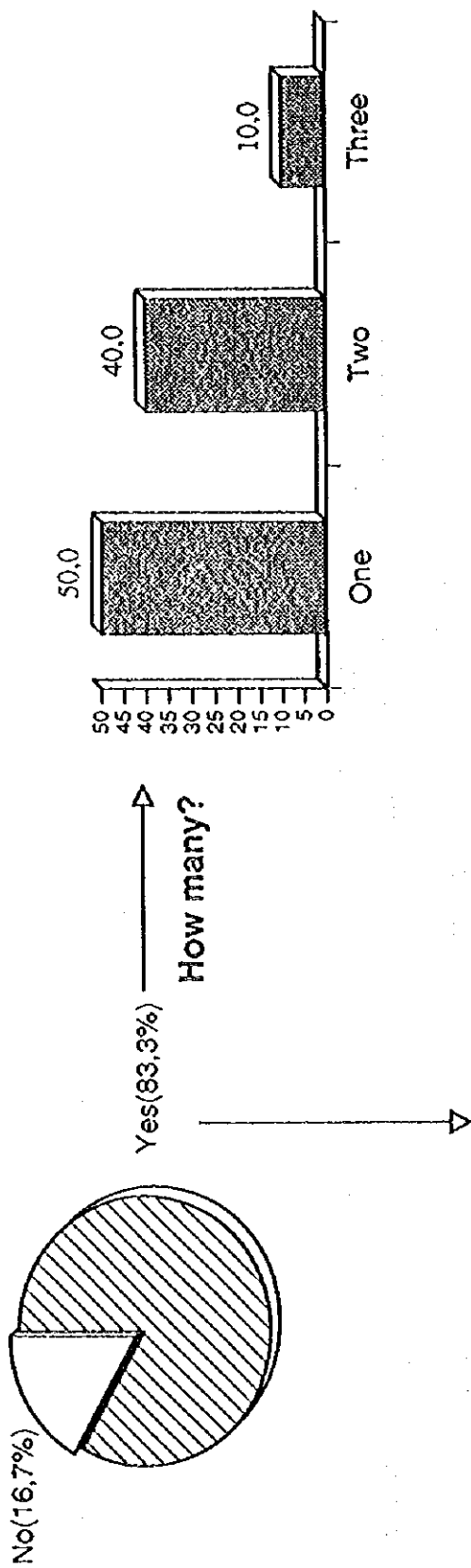
Sample: Those who use an incinerator = 12 (13.3%)

Figure D.3.10az Capacity of the incinerator (Q-33)

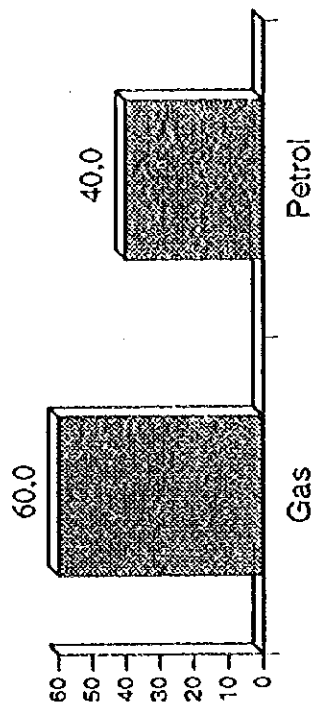


Sample: Those who use an incinerator = 12 (13.3%)

Figure D.3.10ba What is the typical time of operation of the incinerator per day? (Q-35)

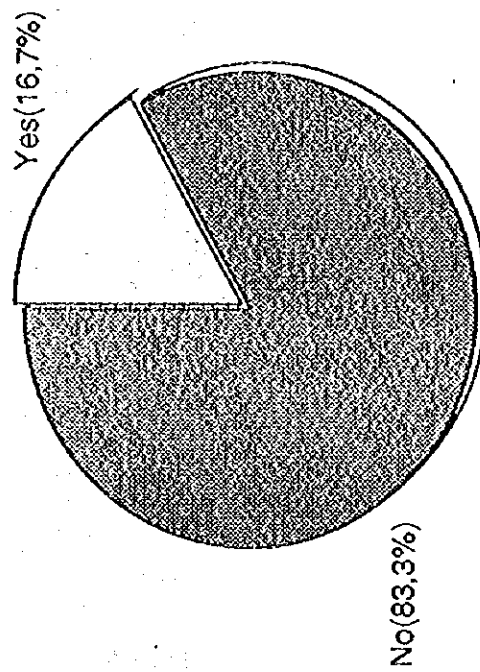


How does it function?



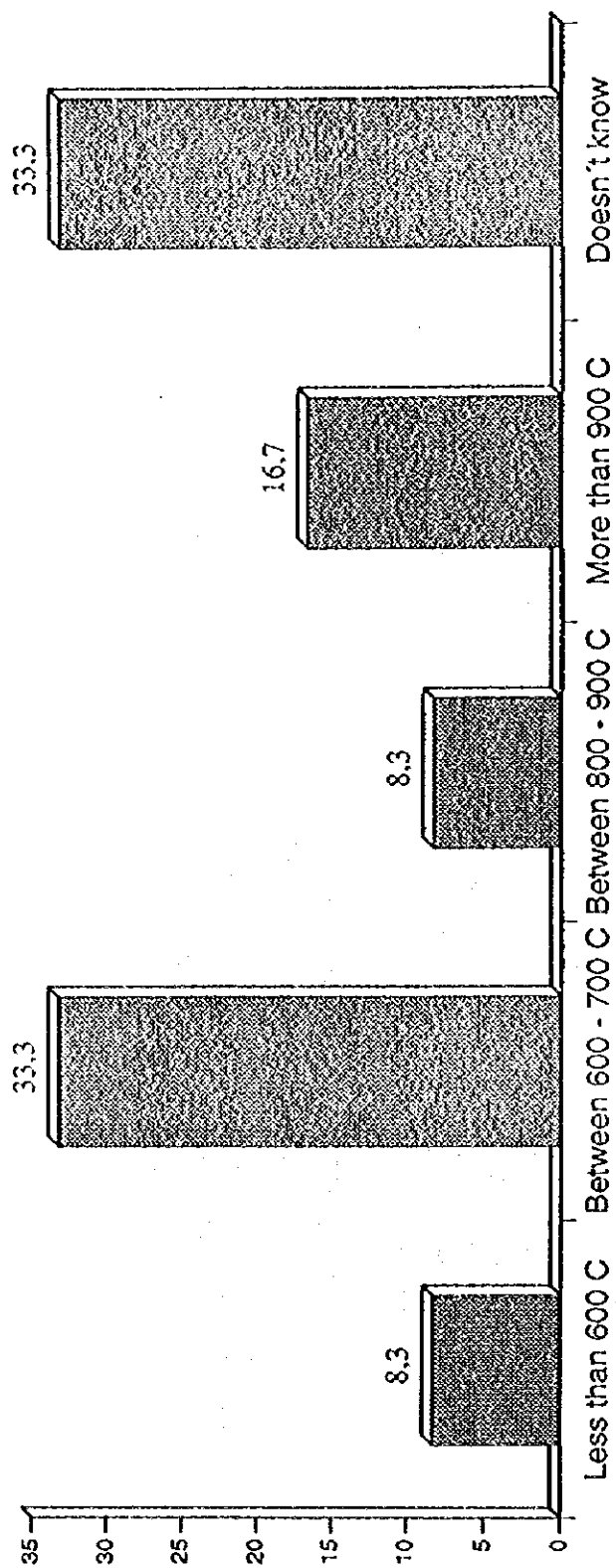
Sample: Those who use an incinerator = 12 (13.3%)

Figure D.3.10bb Is there an auxiliary burner installed? (Q-36)



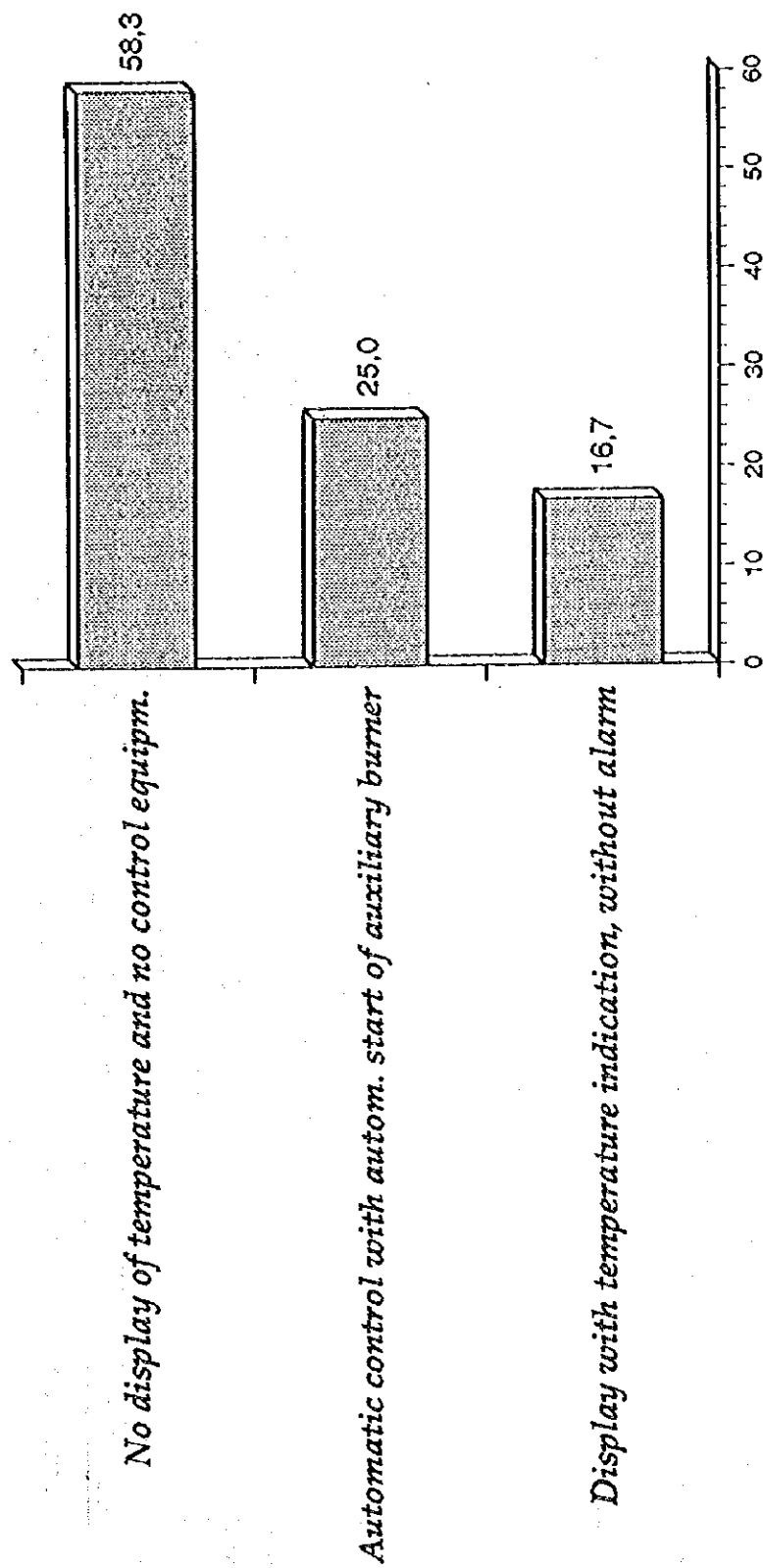
Sample: Those who use an incinerator = 12 (13.3%)

Figure D.3.10bc Is there a secondary chamber with auxiliary burner? (Q-37)



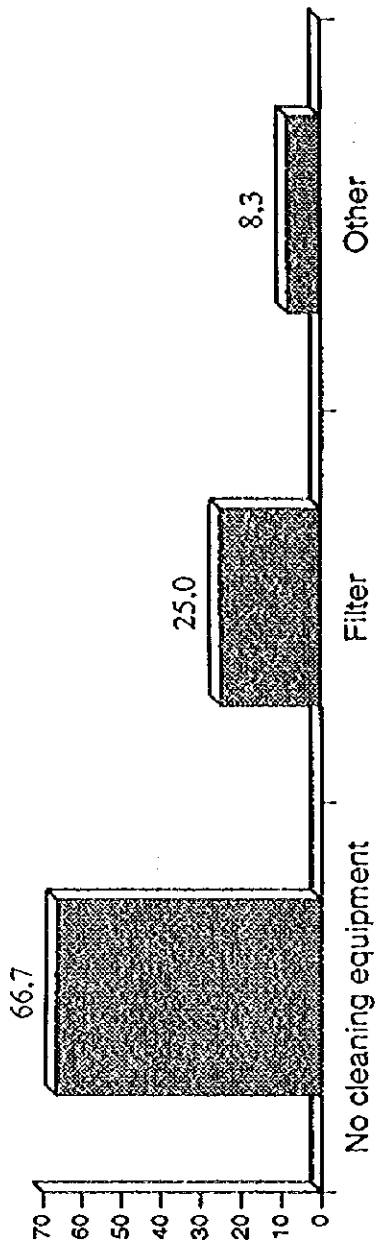
Sample: Those who use an incinerator = 12 (13.3%)

Figure D 3.10bd Combustion temperature of the incinerator = 12 (13.3%) (Q-38)



Sample: Those who use an incinerator = 12 (13.3%)

Figure D.3.10be Temperature control equipment of the incinerator (Q-39)



Sample: Those who use an incinerator = 12 (13.3%)

Figure D.3.10bf Flue gas cleaning equipment being used (Q-40)

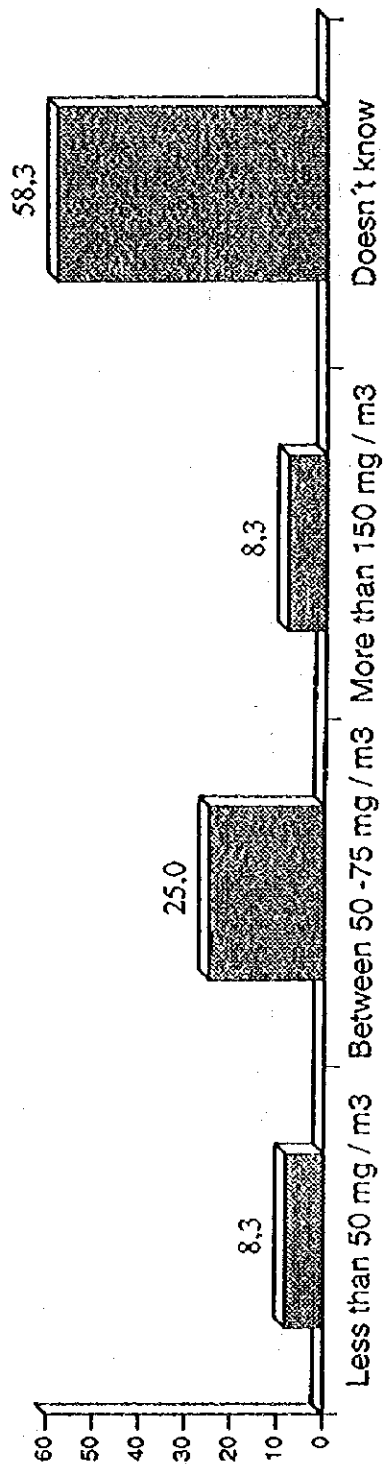
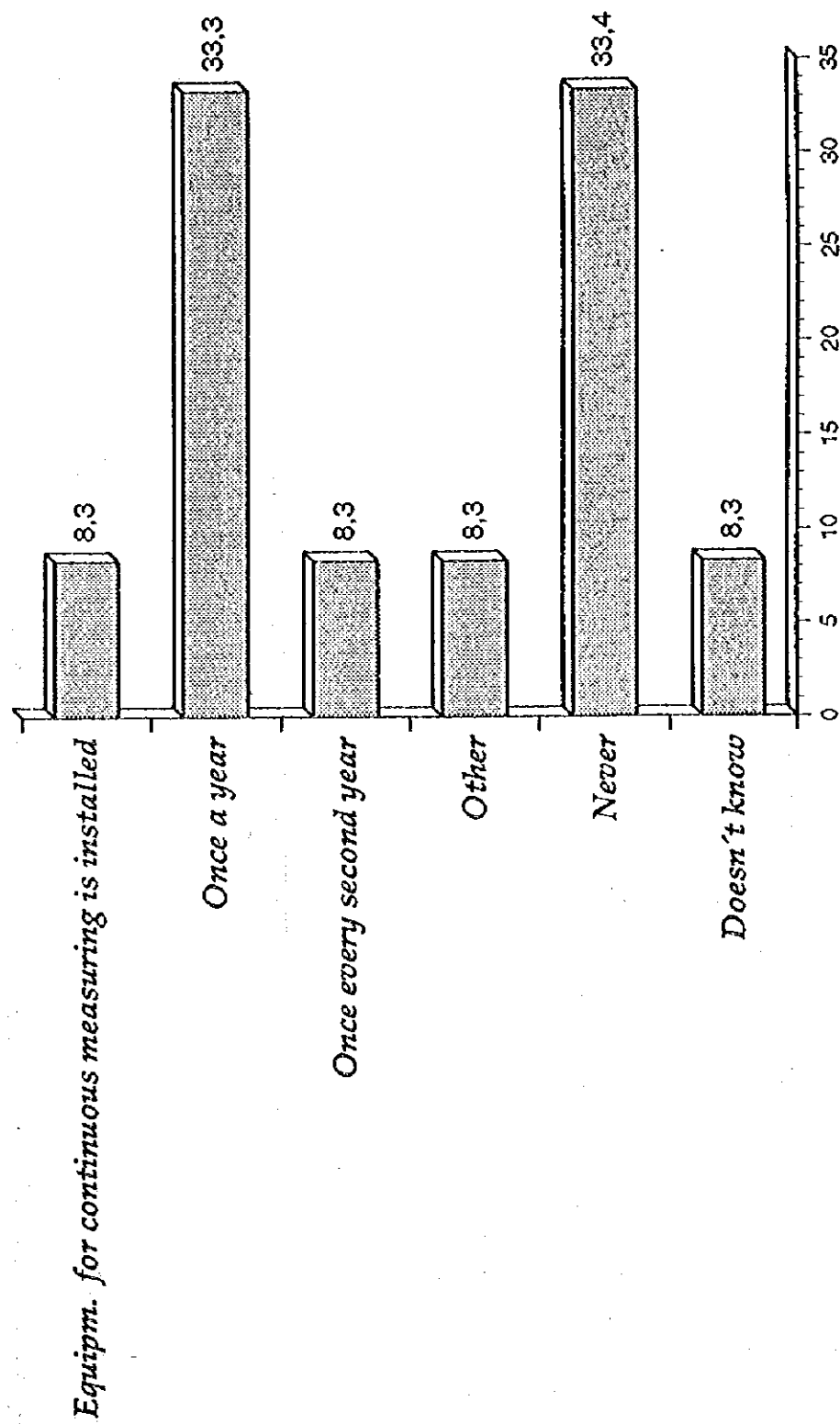
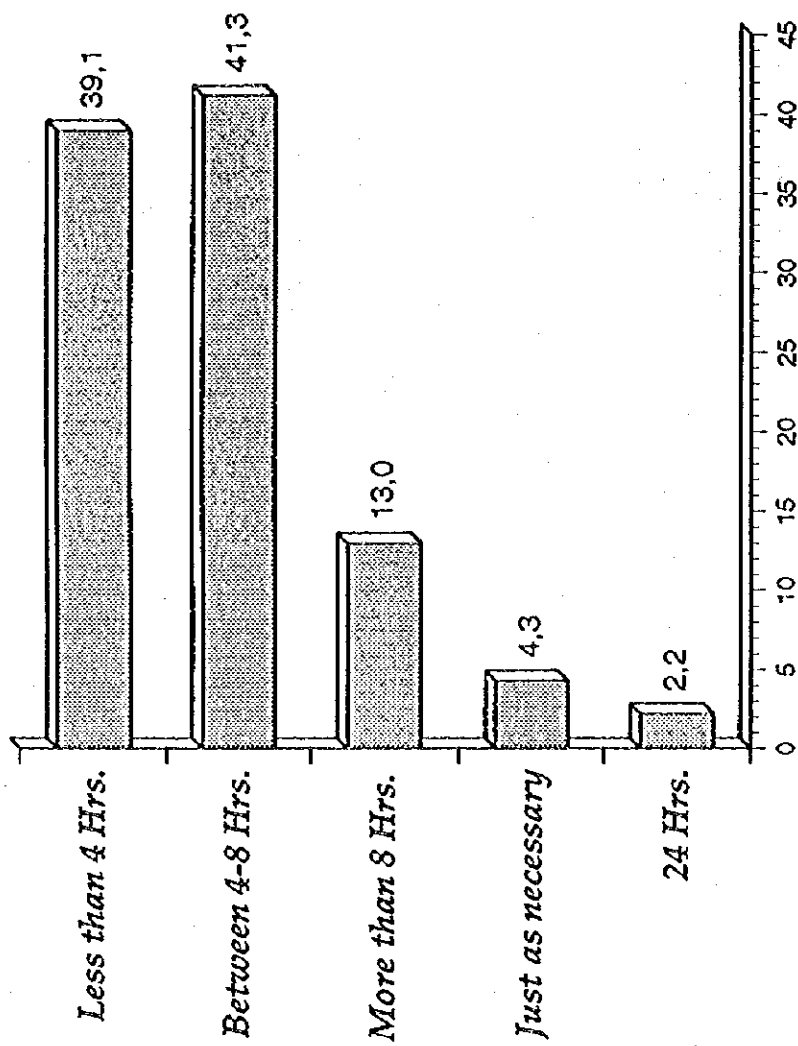


Figure D.3.10bg Dust content of the emitted flue gas (Q-41)



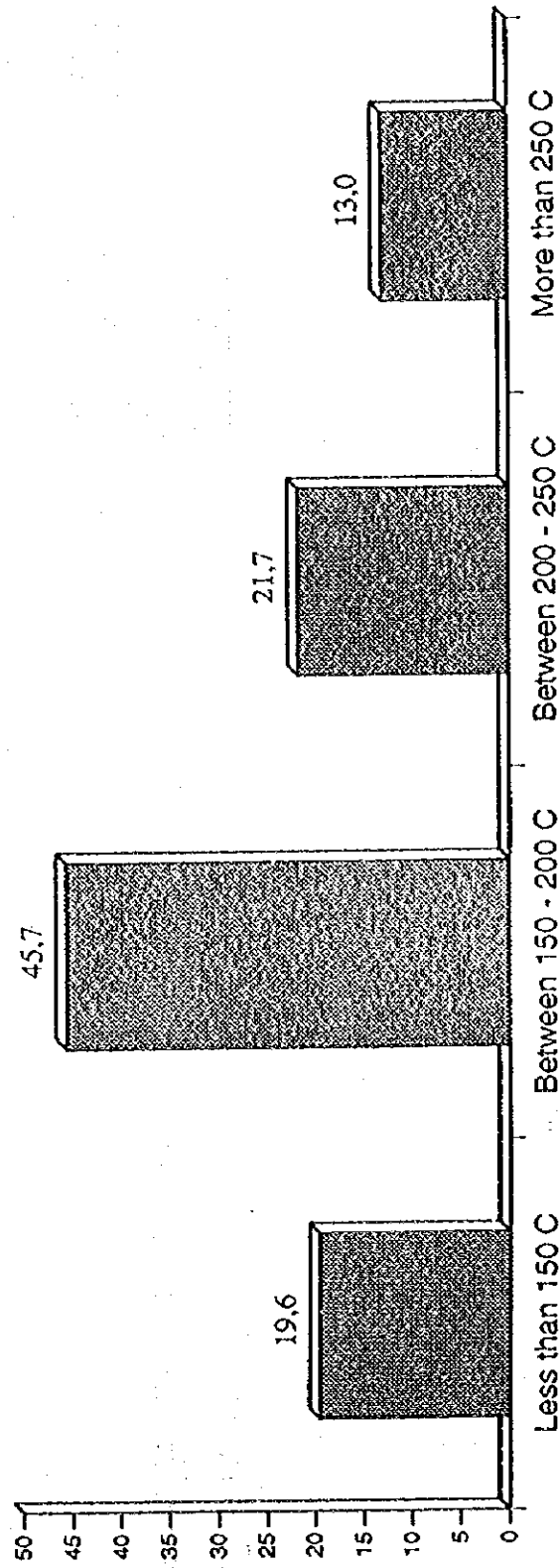
Sample: Those who use an incinerator

Figure D.3.10bh How often are gas emissions measured? (Q-42)



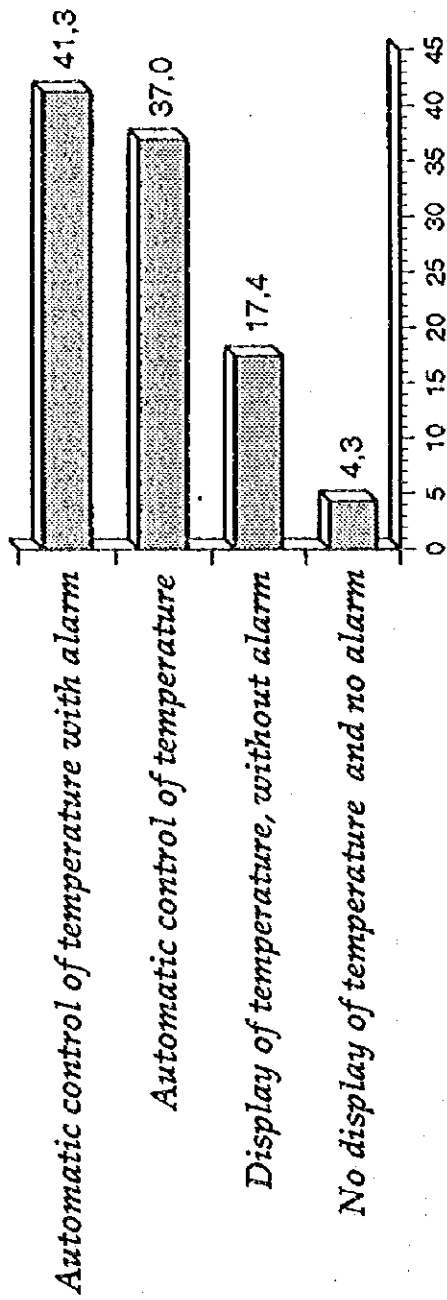
Sample: Those who use autoclave = 46 (51.1%)

Figure D.3.10bi What is the typical time of operation of the autoclave per day (Q-43)

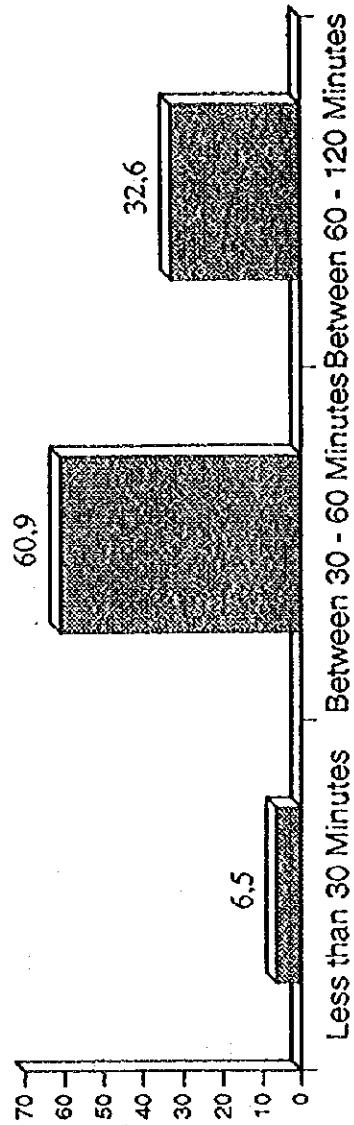


Sample: Those who use autoclave = 46 (51.1%)

Figure D.3.10bj What is the steam temperature of the autoclave? (Q-44)



Duration of the sterilization periods?



Sample: Those who use autoclave = 46 (51.1%)

Figure D.3.10bk Temperature control equipment of the autoclave being used (Q-45)

Table D.3.10r Present costs of medical waste management in the institution (Q-48)

Sample: Those who generate each type of waste

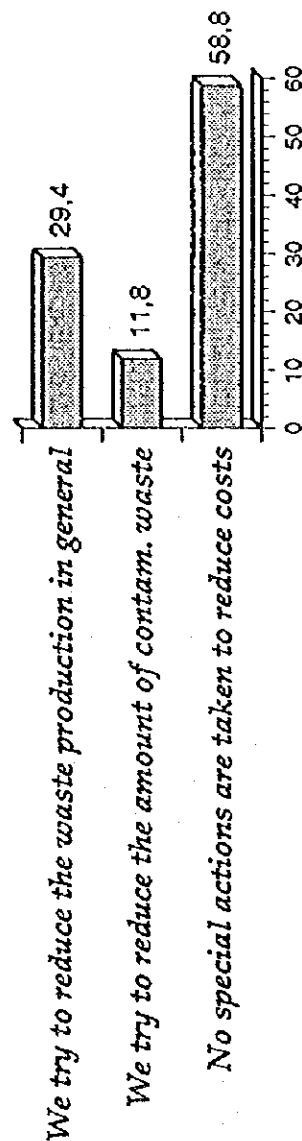
	Pathol. waste		Contam. waste
	S: 61	S: 75	
Less than 50 \$ / kg	9,8	9,3	Common waste
Between 50-100 \$ / kg	11,5	12,0	
Between 100-200 \$/kg	4,9	5,3	
Between 200-300 \$/kg	11,5	9,3	
Gratis	4,9	4,0	Common waste
Other	9,8	6,7	
Doesn't know	47,5	53,3	
			Common waste
Less than 3.000 \$/ton.			
Between 3.000-5.000 \$ /ton.			
Between 5.000-8.000 \$/ton.			
Between 8.000-12.000 \$/ton.			Common waste
Gratis			
Other			
Doesn't know			

Table D.3.10s Which of the following phrases describes best the present costs of medical waste management in the institution? (Q-50)

Total Sample: 90

	Total	Hosp.	Clinics	Postas	Labor.
The costs are insignificant	46,7	40,5	54,8	41,7	60,0
The costs are important	18,9	28,6	16,1	0,0	0,0
I don't know the costs	34,4	31,0	29,0	58,3	40,0

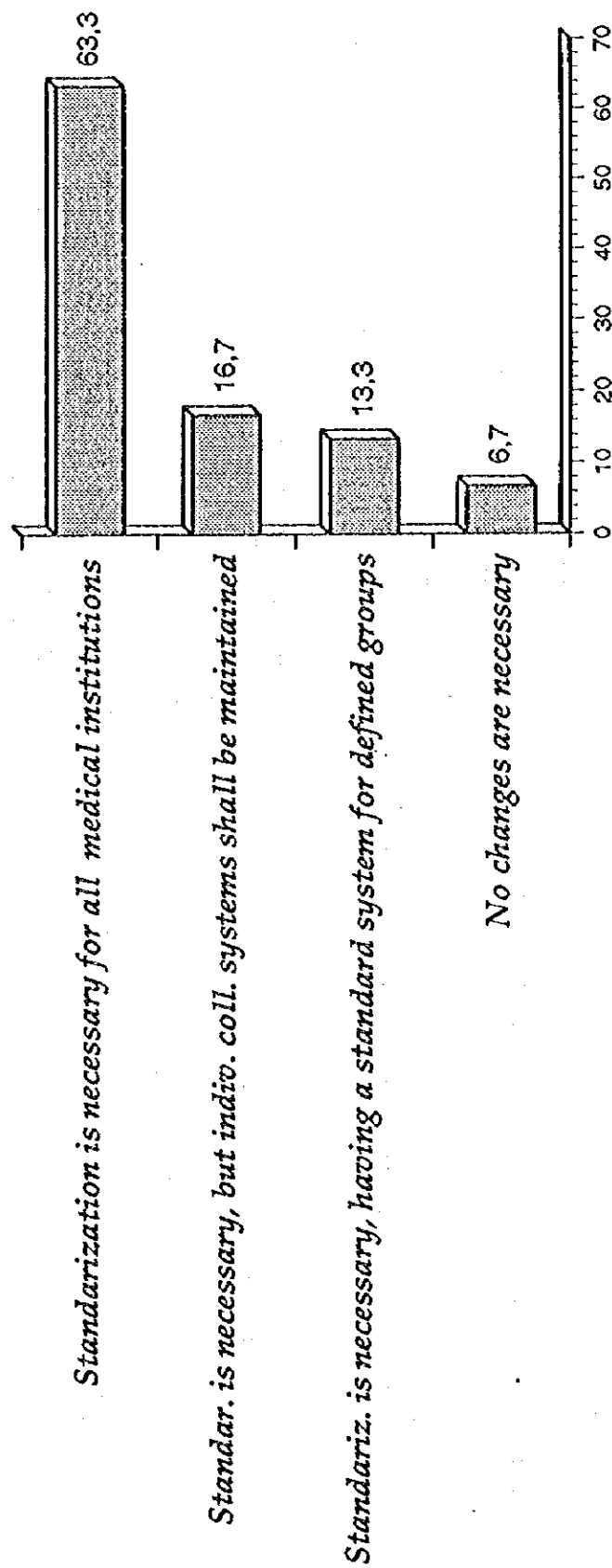
Which of the following actions are applied?



Sample: Those who consider the costs important

Figure D.3.10bl Actions being applied (Q-51)

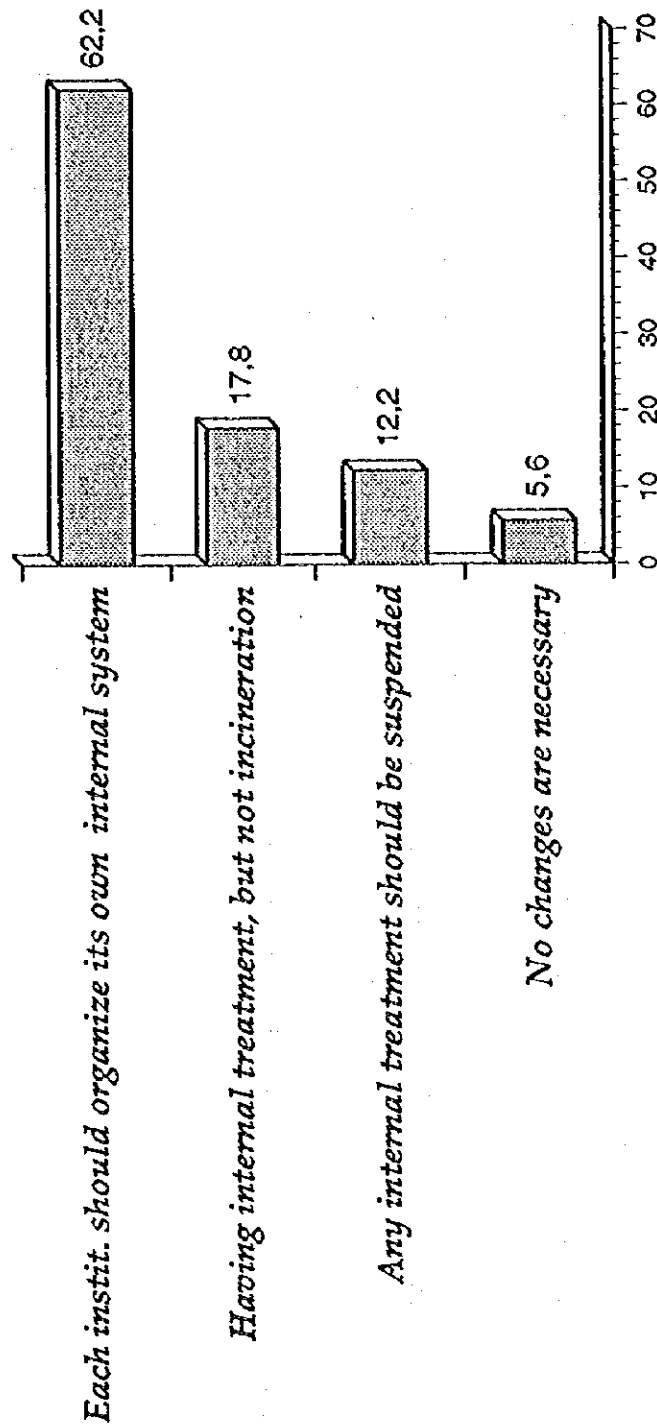
As regards the collection system



Total Sample: 90

Figure D.3.10bm What are your ideas concerning the future medical waste management? (Q-52a)

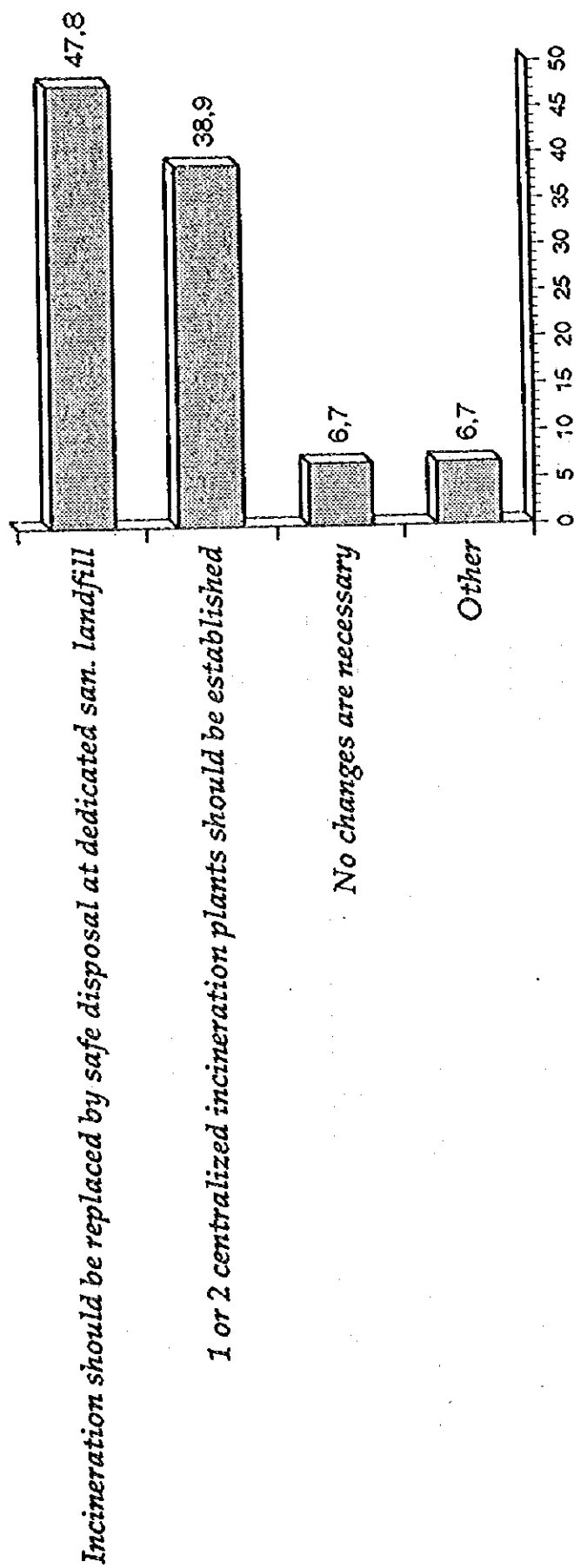
As regards internal treatment



Total Sample: 90

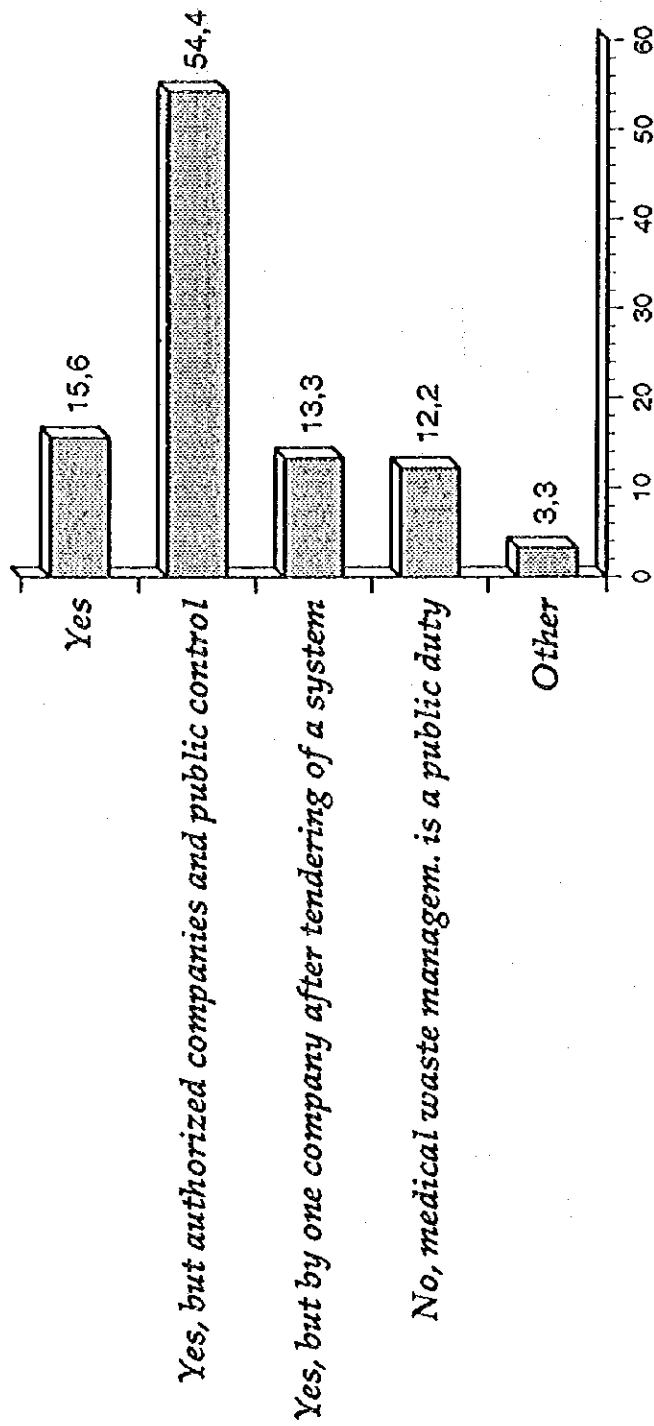
Figure D.3.10bn What are your ideas concerning the future medical waste management? (Q-52b)

As regards external treatment



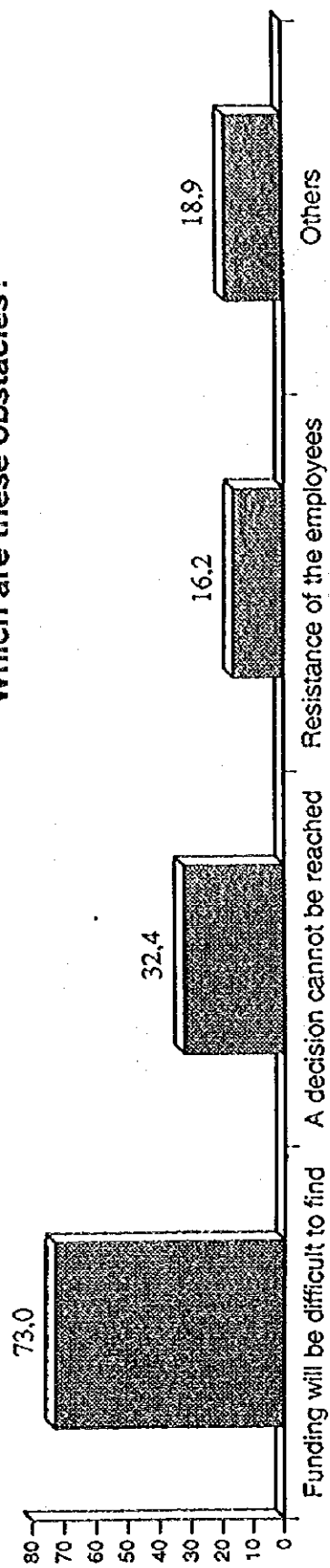
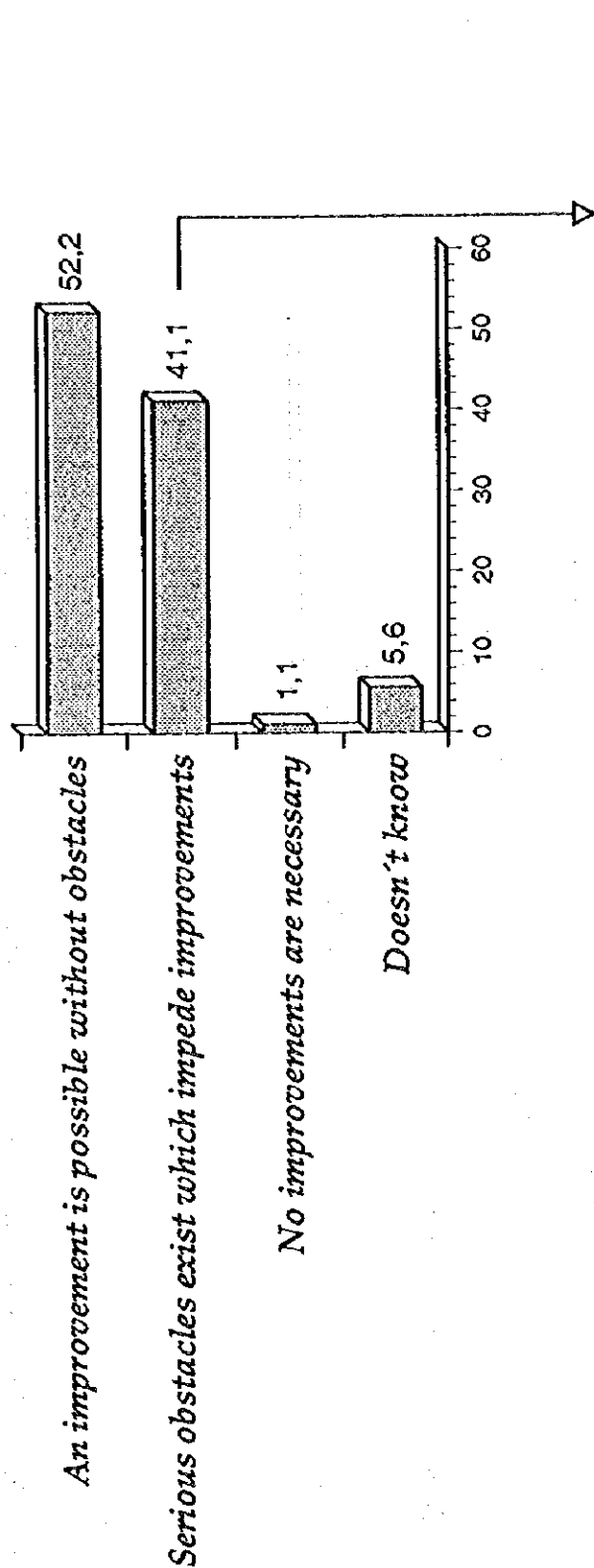
Total Sample: 90

Figure D.3.10bo What are your ideas concerning the future medical waste management (Q-52c)



Total Sample: 90

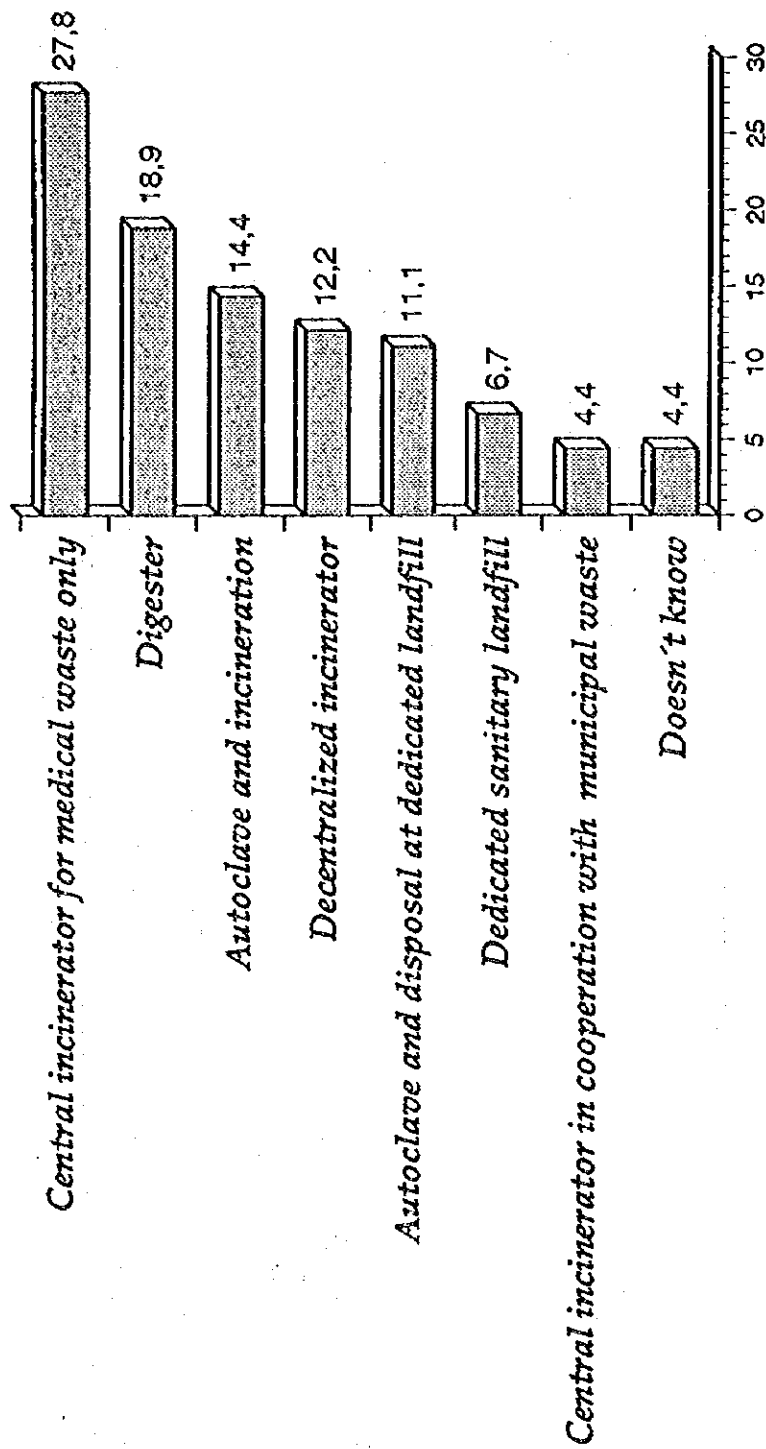
Figure D.3.10bp Do you have confidence in a privately operated medical waste management system? (Q-53)



Total Sample 90

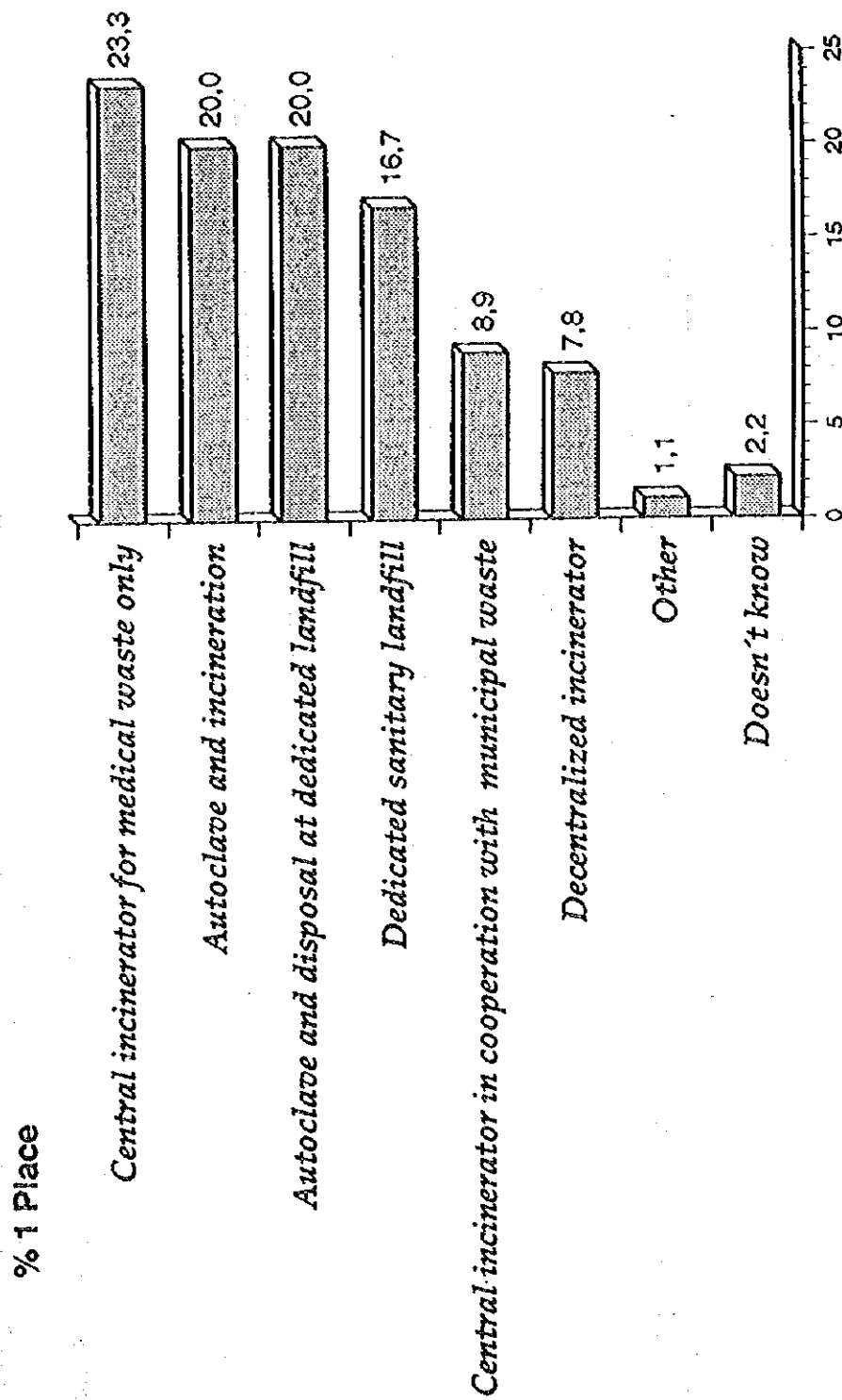
Figure D.3.10bq What obstacles do you think exist for improving the present system? (Q-54 & Q-55)

% 1 Place



Total Sample: 90

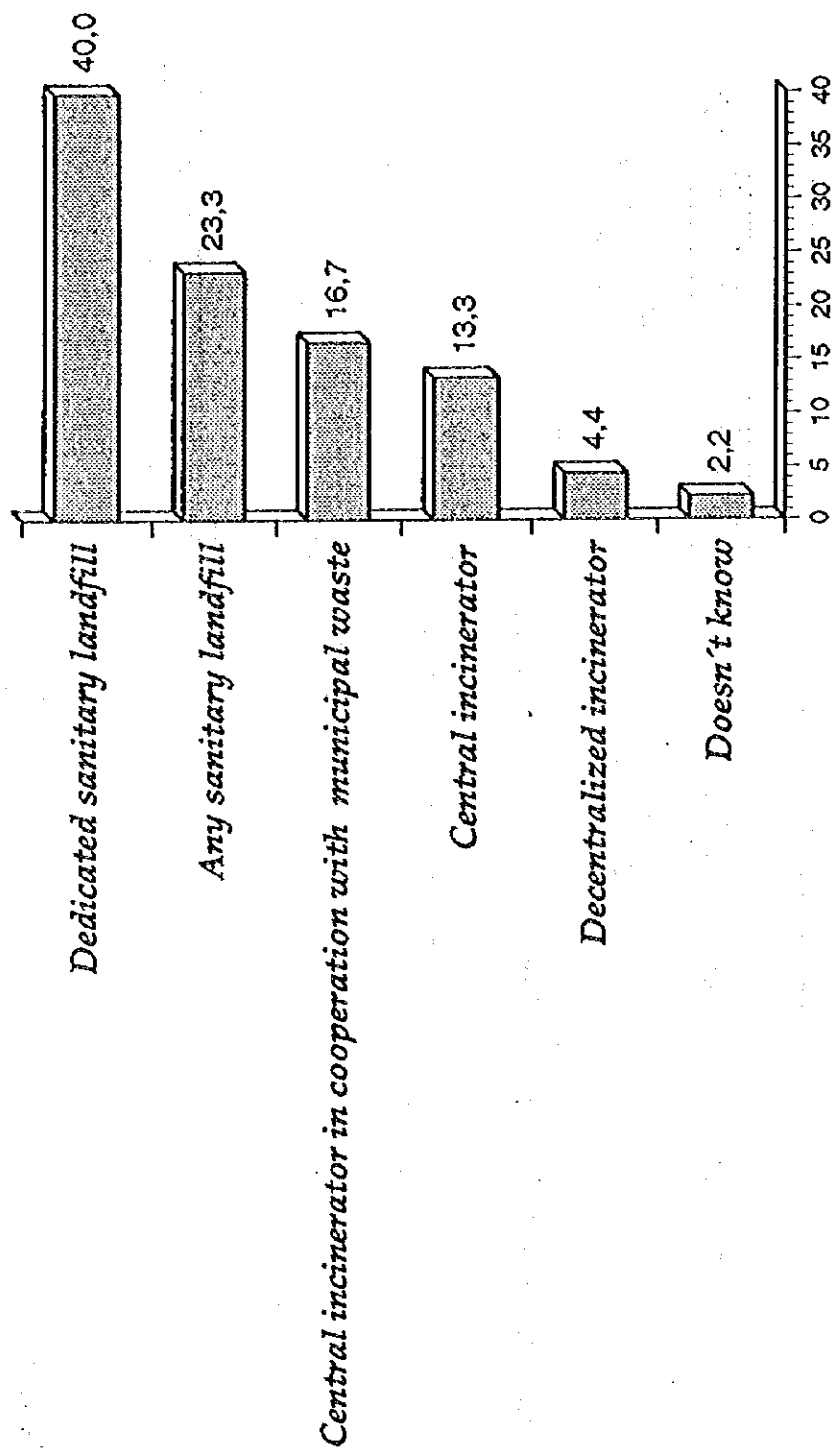
Figure D.3.10br Kind of treatment/disposal considered most appropriate for pathological waste (Q-56a)



Total Sample: 90

Figure D.3.10bs Kind of treatment/disposal considered most appropriate for contaminated waste? (Q-56b)

% 1 Place



Total Sample: 90

Figure D.3.10bt Kind of treatment/disposal considered most appropriate for common waste (Q-56c)

D.4 Overall Assessment of the Survey of Medical Institutions

ADIMARK's RESHOS Study provides a comprehensive documentation of the actual medical SW management in the Metropolitan Region and the results are beneficial for identification of deficiencies in the present waste management and where and how to eliminate these.

The questionnaire study leaves the impression that the present medical SW management generally receives little attention from the management of the medical institutions (lack of commitment). Little attention in the sense of provision of basic equipment, maintenance of existing technical systems and implementation/enforcement of internal instructions and guidelines.

This conclusion is supported by field observations made by the JICA Study Team. In many cases considerable improvements could be implemented for low costs - in some cases even without extra costs. A typical example of the lacking commitment is collection of sharps, where acceptable hard receptacles often is employed, but due to missing lids, they are not being properly secured.

The lack of internal supervision not only leads to negligence of basic hygiene requirements during the internal waste handling, during storage at the internal collection point etc. it also leads to negligence of proper sorting and packaging of the waste and the transportation of the waste to the right destinations. The latter is crucial for protection of the external environment.

The survey discloses that the incinerators at the hospitals are inadequately equipped and poorly operated in terms of minimization of air pollution, burning out of ashes etc. This is a general problem, limited to small incinerators, and is being magnified in cases where incinerators are old and no modifications have been made to update the equipment and the operational parameters.

ANNEX E

PUBLIC OPINION SURVEY

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ANNEX E PUBLIC OPINION SURVEY

E.1 Objective of the Survey

The objective of the public opinion survey (POS) is to identify:

- i. the awareness and intention of citizens on environmental protection, which includes:
 - inclination to use environmentally friendly products (e.g. willingness to pay for environmentally friendly products with higher prices than conventional products);
 - impression of enterprises which produce environmentally friendly products; and
 - roles and duties of governmental authorities, industries and citizens for environmental protection.
- ii. the awareness and possible reaction of citizens to the construction of treatment and disposal facilities for industrial/medical solid waste, which include:
 - awareness of the necessity of facilities;
 - conditioning for proceeding to construction of facilities;
 - citizens' reaction regarding procedures and construction; and
 - prerequisite for neighborhood consensus for construction of facilities (e.g. transparency in procedures, completeness of environmental protection measures of facilities, consolidation of local infrastructure as compensation, etc.).

E.2 Selection of the Samples for POS

a. Target citizens and area for POS

Since the mass can not answer questionnaires to be prepared for the objectives mentioned above, this was discussed with the Chilean side at the meetings of the Inception Report. It was agreed at the meeting that the target citizens and areas for the "Public Opinion Survey" were to be selected from the following groups:

- Environmental NGOs;
- University students;
- Governmental officials and politicians;
- Citizens who live nearby the present municipal landfills (i.e. Lo Errazuriz, Cerro de Renca and Lepanto) according to the distance from the landfill sites; and
- Citizens who live nearby the candidate municipal landfills (i.e. Batuco and Runge).

Based on the discussion of the meeting, the samples (target citizens and areas) for the POS were determined below.

Table E.2a Target Citizens and Areas for POS (Proposed)

Target Citizens and Areas	Number of Samples
1.Environmental NGOs	30
2.University Students	30
3.Government Officers and Politicians	
3.1 National Officers	30
3.2 Local Officers	30
3.3 Politicians	30
4.Citizens Who Live nearby the Present Municipal Landfills	
4.1 Lo Errazuriz	30
4.2 Cerro de Renca	30
4.3 Lepanto	30
5.Citizens Who Live nearby the Candidate Municipal Landfills	
5.1 Batuco	30
5.2 Runge	30
Total	300

b. Time Schedule of the POS

Based on the above-mentioned target citizens and areas, a questionnaire was prepared by the Team. The content of questionnaire was discussed with counterpart personnel and finalized, then the survey work was consigned to a local consultant (Adimark Ltda.) through a tendering procedure. The work was completed in the beginning of May 1995. The reports were prepared both in English and Spanish. The reports produced by Adimark were submitted to the counterpart.

c. Sample interviewed

The final samples interviewed are categorized into i. Homes and ii. Institutions. As for Homes, citizens, 18 years and more, living nearby the present municipal landfills (Lo Errázuriz, Cerro de Renca and Lepanto) and the candidate municipal landfills (Batuco and Rungue) were selected at random.

In terms of Institutions, people with responsibilities in the following institutions were interviewed.

- NGOs: NGOs related to environmental issues.
- Students: 6 in each of the following universities: Chile, Católica, Santiago, Diego Portales, Blas Cañas y La Republica.
- Politicians: Belonging to the various existing parties; a representative sample was taken.
- Central Gov.: Officials in the different ministries and dependent institutions.
- Local Gov.: Officials in the different municipalities.

Finally, the samples shown in Table E.2b were interviewed.

Table E.2b Samples for POS

Category of Sample		Number of Samples
Home	Lo Errázuriz	31
	Cerro Renca	31
	Lepanto	31
	Batuco	30
	Rungue	31
Sub Total		154
Institutions	NGOs	30
	Students	30
	Central Gov.	31
	Local Gov.	30
	Politicians	33
Sub Total		154
TOTAL		308

E.3 Outcome of the POS

E.3.1. General Perception

a. Seriousness of Environmental problems (Q-1 and Q-2)

At the beginning of the questionnaire, some questions were asked about the general attitude towards environmental problems and related aspects, being the main objective getting some feedback about what people think about the environment.

A list of existing problems (air pollution, water pollution, waste, insects, inundations, noise, lack of environmental education, lack of green areas) were read and the people interviewed were asked to respond how much each problem affects them in their daily life.

The problems considered to affect most their proper lives, are lack of green areas (71.4%), lack of environmental education (67.2%) and air pollution (67.2%). Waste, too, is mentioned with a quite high percentage (56.5%), more than noise and water pollution.

If we analyze the answers according to the group of belonging, one can draw very important conclusions: first of all, there is a big difference of opinion between institutions and homes. Secondly, also according to the area of residence of the citizens, the difference is notorious.

People belonging to the institutions, mention as the most serious problems the air pollution (82.5%), noise (61.0%) and lack of environmental education (75.3%), while the people living near the actual or potential landfills, say that the most important problems are lack of green areas (79.9%), waste (61.0%) and lack of environmental education (59.1%).

Waste is considered to be especially a big problem in Lo Errazuriz and in Renca (83.9% and 74.2% respectively). The lack of green areas is particularly felt in Rungue and Lepanto (87.1% and 83.9% respectively). The presence of insects seems to be a serious problem in Rungue and Batuco, too.

Especially interesting is the high percentage reached by the aspect "lack of environmental education", which shows that the public are aware of this problem.

Afterwards, it was also asked about which of these various problems affect most seriously the live of the people in general. Air pollution, waste and water pollution occupy the first three places. Of less importance are lack of environmental education and lack of green areas. The problems considered being the less serious ones, are: noise, insects and inundations.

b. Responsibility of the existence of the environmental problems (Q-3)

For each of the previous problems, a further question was asked about who is principally responsible for the problems.

The results are as follows: the two most responsible ones, are:

Air pollution	All, Traffic / transport
Water pollution	Industries, Citizens
Waste	Municipalities, citizens
Insects	Municipalities, citizens
Inundations	Municipalities, Government
Noise	Traffic/ transport, all
Lack of environ. educ.	Government, all
Lack of green areas	Municipalities, Government.

These results show that the people recognize, on the one hand, their own responsibility, but involve, on the other hand, strongly the central and local Government with responsibilities.

It is clear, that as far as waste problems are concerned, the municipalities are thought to be most responsible.

c. Responsibility in solving the environmental problems (Q-4)

To the question who should cope with the various problems, the following answers were given:

Air pollution	Government, Municipalities
Water pollution	Government, Municipalities
Waste	Municipalities
Insects	Municipalities
Inundations	Municipalities
Noise	Polluters

Lack of environ. educ.

Government

Lack of green areas

Municipalities, Government.

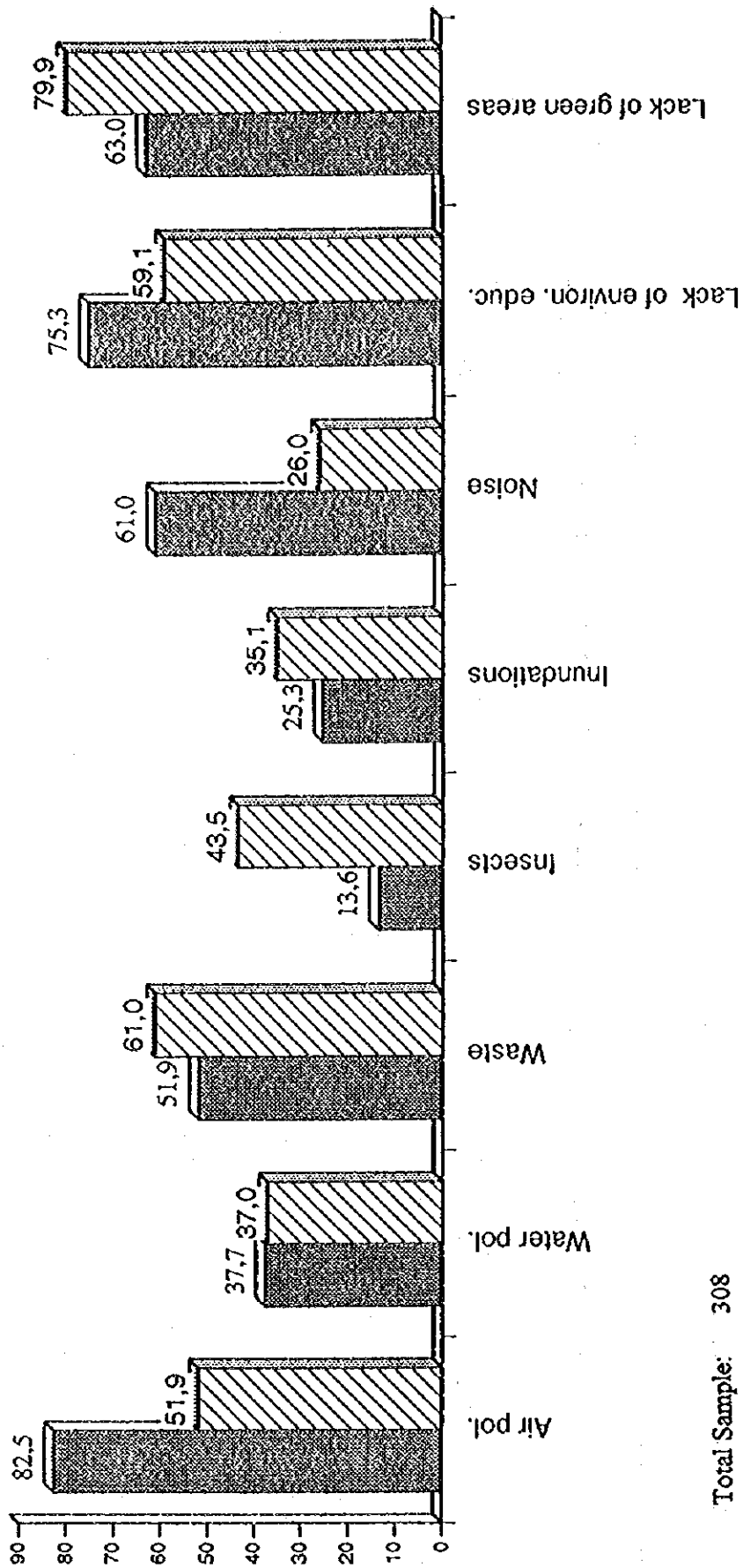
Here it becomes clear that people think that the government and the municipalities (the authorities) should mainly cope with the different problems, but not so much the citizens themselves.

Table E.3.1a How much do these environmental problems affect your daily life?

Total Sample : 308

	Air pol.	Water pol.	Waste	Insects	Inundations	Noise	Lack of environ. educ.	Lack of green areas
Much	67,2	37,3	56,5	28,6	30,2	43,5	67,2	71,4
Somehow	12,7	23,4	22,1	22,7	20,1	20,5	19,8	16,6
Doesn't know	0,6	0,6	0,0	1,9	0,0	0,3	0,6	0,3
Little	11,7	19,5	13,0	26,9	20,8	17,9	7,5	9,1
Not at all	7,8	19,2	8,4	19,8	28,9	17,9	4,9	2,6

%who say "Much"



Total Sample: 308

Figure E.3.1a How much do these environmental problems affect your daily life ?

Table E.3.1b Environmental problems considered as most serious for people's life.

Total Sample : 308

% 1st and 2nd place (with given alternatives)

	Total	Instit.	Homes
Air pollution	61,7	81,8	41,6
Waste	35,7	23,4	48,1
Water pollution	28,2	34,4	22,1
Lack of environm. education	23,1	26,0	20,1
Lack of green areas	21,8	9,7	33,8
Noise	12,0	18,2	5,8
Insects	10,7	1,9	19,5
Inundations	5,8	5,8	5,8

Table E.3.1c Who has the main responsibility for the existence of each environmental problem?

Total Sample : 308

	Air pol.	Water pol.	Waste	Insects	Inundations	Noise	Lack of environ. educ.	Lack of green areas
All	24,4	16,2	20,8	14	7,8	19,5	19,8	9,1
Traffic and transport	20,1	0,3	0,0	0,3	0,0	39,6	0,6	0,0
Government	17,9	17,5	9,1	6,2	31,5	5,2	40,9	16,6
Industries	15,9	26,3	0,3	3,6	0,3	7,8	1,0	0,0
Municipalities	11,7	14,9	39,6	21,8	48,4	9,1	18,2	68,8
Citizens	8,4	18,8	28,2	20,1	3,2	14,0	16,2	4,2
Other / Don't know	1,6	5,8	1,9	34,1	8,7	4,9	3,2	1,2

Table E.3.1d Who should cope with and solve each of these environmental problems, in the first place ?

Total Sample : 308

% 1st PLACE

	Air pol.	Water pol.	Waste	Insects	Inundations	Noise	Lack of environ. educ.	Lack of green areas
Government	47,7	38,3	13,3	8,8	41,6	16,2	53,2	21,1
Municipalities	15,6	19,8	59,7	31,2	45,8	14,9	18,8	67,9
Polluters	15,6	16,2	3,9	5,2	1,6	35,7	1,6	0,6
All	10,1	5,2	7,1	13,0	3,2	10,4	13,6	2,9
Citizens	5,5	8,8	10,7	15,9	2,3	13,0	6,5	3,6
Other Govern. agency	4,5	8,1	4,5	8,8	2,6	6,5	3,2	1,3
Other / Don't know	0,9	3,6	0,6	17,2	2,9	3,2	2,9	2,6