CHAPTER 3

RESEARCH METHODOLOGY

3.1 Designed of Samples Surveys

The first phase of the study focused on the analysis of quantification, physical characterization and management of generated hospital waste from private and public hospitals in Chiang Mai Municipality area. Four public hospitals and eight private hospitals in Chiang Mai city were selected for this task. The sampling was based on the grouping of selected hospitals by number of beds they have as shown in table 3-1.

TABLE 3.1 Grouping of selected hospitals by number of beds in this study

	Group 1 **< 100 beds**	**Group 2** **100-299 beds**	**Group 3** **300-499 beds**	**Group 4** **>500 beds**
Number of surveyed hospital	**5**	**3**	**2**	**2**
Public Hospital	1	1	1	1
Private Hospital	4	2	1	1
Number of hospital in Chiang Mai City	**11**	**5**	**3**	**2**
Public Hospital	5	2	1	1
Private Hospital	6	3	2	1

The second phase of this research focused on the analysis of quantification and management of hazardous waste in hospital. One public hospital and one private

hospital were selected for this task. The Hazardous Waste Management Study was the assessment on the use of hazardous materials, inventory, storage and handling, disposal and minimizes or reduces hazardous waste and hazardous waste management cost. Specific hazardous materials in this study were Chemotherapy and antineoplastic chemicals, Formaldehyde, Photographic Chemicals, Solvents, and Mercury.

3.2 Hospital Waste Composition Survey

3.2.1 Apparatus

3.2.1.1 Apparatus for determining waste composition and quantity

1) Analytical balance

3.2.1.2 Questionnaires for hospital waste management study

There are 3 parts of questionnaires used in this study, which developed from World Health Organization. All of 3 questionnaires were shown in Appendix A.

3.2.2 Data Collection

There were 12 hospitals were involved in hospital waste composition survey. Wastes from selected hospitals were weighted at the collection point every day for two week or the determination of waste composition and waste generation rate.

In Hospital waste management survey, the onsite investigation, interviewing, and questionnaires were used for the study of their waste management. The management included segregation, storage, transportation, treatment, and disposal. Questionnaires were distributed to the selected hospitals before the interviewing of the hospital's staffs.

Data collected were as shown in Table 3.2. Information and data obtained were later analyzed.

3.2.3 Procedure

3.2.3.1 Waste composition and waste generation rate

In order to determine hospital waste composition and waste generation rate, hospital waste will be classified into 3 categories, medical waste(including infectious waste, chemical waste, radioactive waste and chemotherapy waste), general solid waste(including rubbish and garbage), and recyclable material (paper and corrugated cardboard).

Each sample was weighed on site everyday for two week. Amount of in-patients and out-patients were recorded everyday. Then Waste generation rates were then calculated (as *kg/ occupied bed/day* for all type of hospital waste and, *kg/examined-patient/day* for medical waste).

These surveys were done during the period of October 2002 – January 2003. Method and parameters analyzed are as shown in Table 3-3.

Generation rate of waste composition were calculated as follow:

Generation rate of waste A, as kg/occupied bed/day

$$= \frac{\text{Quantity of waste A, (kg/day)}}{\text{Number of occupied bed, (bed)}}$$

Generation rate of waste A, as kg/patient/day

$$= \frac{\text{Quantity of waste A, (kg/day)}}{\text{Number of total patient, (patient)}}$$

* Total patient = In patient + out patient

TABLE 3.2 Hospital waste composition data

Data collected
• Quantity of solid waste including garbage and rubbish • Quantity of recyclable materials including paper, corrugate card board, glass, plastic • Quantity of medical waste including infectious waste, chemical waste, Chemotherapy waste, and radioactive waste. • Quantity of total hospital waste generation including solid waste, medical waste, and recyclable materials. • Number of occupied bed • Number of examined patients

TABLE 3.3 Parameters to be studied in Hospital waste composition and survey

Parameter	Methodology/Tool
1. Number of hospital beds and bed occupancy rate	Questionnaires, Review hospital records
2. Amount of patient	Questionnaires, Review hospital records
3. Quantities of waste generated by waste categories	Questionnaires, Site observation, Direct weighing onsite
5. Personnel involved in the management of hospital waste	Questionnaires, Interviewing
6. Current hospital waste management practice - Segregation and handling practice - Collection and storage - Final disposal - Cost of Management - Obstacles	Questionnaires, Interviewing, Review hospital records and site observations

3.3 Hospital Hazardous Waste Management

3.3.1 Apparatus

3.3.1.1 Questionnaires for hazardous waste management study

There were 2 parts of questionnaires used in this study, which were developed from World Health Organization. All of 4 questionnaires were shown in Appendix B.

3.3.2 Data Collection

Onsite investigation, interviewing, and questionnaires were used for the study of waste management including segregation, storage, transportation, treatment, and disposal. Questionnaires were distributed to the selected hospital before interviewing with hospital's staff.

Surveys were done during the period of December, 2002 – February, 2003. Data collected were as shown in Table 3.4. Information and data obtained were later analyzed.

3.3.3 Procedure

The hazardous waste management study is the assessment on the use of hazardous materials, inventory of, storage and handling, disposal and minimizing or reducing of hazardous waste and also hazardous waste management cost. Specific hazardous materials in this study included: chemotherapy and antineoplastic chemicals, formaldehyde, photographic chemicals, solvents, and mercury. Other wastes were excluded from the scope of the assessment.

Onsite investigation, interview, and questionnaires were used for the study of the exiting management of waste in 2 selected hospitals. Method and parameters analyzed are as shown in Table 3.5.

TABLE 3.4 Hazardous Waste Management data

Data	SPECIFIC HAZARDOUS MATERIALS IN THIS STUDY				
	Chemotherapy Waste	**Formaldehyde Waste**	**Photographic Chemicals Waste**	**Solvents Waste**	**Mercury Waste**
Source and Waste Generation	•	•	•	•	•
Existing Management and cost of management	•	•	•	•	•
Disposal Quantity	•	•	•	•	•

TABLE 3.5 Parameters to be studied in Hospital Hazardous Waste Management.

PARAMETERS	METHODOLOGY /TOOL
Source and waste generation	Questionnaires and on site investigation
Existing management	Questionnaires and onsite investigation
Cost of Management	Questionnaires
Disposal Quantity	Questionnaires