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Waste management practices, perceptions and attitudes in Tonga

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WASTE MANAGEMENT PRACTICES, PERCEPTIONS AND ATTITUDES IN TONGA

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CERTIFICATION

I, Vika Lutui, declare that this thesis, submitted in fulfilment of the requirements for the award of Master of Science (Honours), in the School of Geosciences, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualifications at any other academic institution.

Vika T. Lutui

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ABSTRACT

The Kingdom of Tonga faces critical problems with regards to managing waste. Increasing generation of solid waste in the household accompanying the changes in the Tongan lifestyle with a dependence on imported tinned and packaged goods, far exceeds the island Kingdom's ability and capability for safe disposal. Littering in the household and throughout the Kingdom is a persistent problem despite various clean-up and anti-litter promotional campaigns and programs run by government organizations, non-government organizations and other community groups.

The persistent problems of litter and mismanaging solid waste in the household need to be addressed. This study was undertaken to investigate why Tongans persistently litter and mismanage waste. The hypothesis for this study is littering and waste management problems are related to the perceptions and attitudes of the Tongan people. To investigate this hypothesis, the entire household waste management operations (waste generation, handling, waste storage, waste transportation and collection, final waste disposal, and waste minimization) were examined.

A survey was compiled and distributed to 220 persons during January to March 2001. Data from the survey were collated and examined statistically using the program StatView. The responses to most questions were consistent for all categories of respondents irrespective of respondent background; the responses generally were not influenced by gender, age, location, educational level, household size, income or occupation. The study showed that the respondents' waste management practices for the entire waste management operations are related to their perceptions and attitudes and it appears all Tongans think similarly about waste management.

To improve waste management in Tonga, the following are recommended:

i. The Tongan government needs to consider formulating waste management laws and policies to guide the waste management practices and activities in the Kingdom.

ii. Respective Tongan government departments need to improve waste management services and facilities.

iii. The Tongan government and businesses have to consider waste minimization incentives.

iv. The Government and non-government organizations, and community groups should consider awareness, education and training programs on wise waste management.

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GLOSSARY

ADB	Asian Development Bank
EU	European Union
GDP	Gross Domestic Product
ISCO	International Standard Classification of Occupation
MOH	Ministry of Health
NEP	New Environmental Paradigm

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CHAPTER ONE: INTRODUCTION

1.1 Background to the study

Many countries in the South Pacific face critical problems with regard to waste management. The common problems as described by Morrison and Munro (1999:232) include:

> *"insufficient government priority and political support for action; lack of finance; no long-term planning or business planning; poor landfill siting, design, planning and management; lack of skilled personnel; lack of awareness of the problems caused by poor waste management; physical limitations to the establishment of landfill sites; poor handling of clinical waste; insufficient recycling and re-use, including limited re-use of organic wastes, septic sludge, sewage sludge and effluent."*

The failure to adequately address these problems leads to escalating environmental and health problems for Pacific Islanders, and serious consequences for economic development based on tourism, export agriculture and small 'clean' industries.

The situation described above applies to the Kingdom of Tonga on which this study is focussed. The issue of managing wastes is significant in the Kingdom as more and more waste materials are being produced. People are changing their lifestyle and become increasingly dependent on packaged goods, tinned foodstuff and other imported goods. Currently generated wastes far exceed the island's ability and capability for safe disposal.

The problem has not gone unnoticed. The author, a Tongan, has observed the problem for a number of years. Attempts had been made by various government departments and non-government organisations to alleviate the problem but only with short-term success.

1.2 Research Problem

The particular waste management issue that warrants the researcher's interest is the household management of solid waste. In Tonga, it is the household that generates most of the solid wastes and faces serious problems of disposal. In addition, littering in households and throughout the Kingdom is a persistent problem despite various campaigns such as anti-litter and 'keep Tonga beautiful'. Many waste-related programs are run by the Ministry of Health, Environment Department, non-government organisations and other community groups.

Because of the continued persistence of the littering problem and the mismanagement of wastes, it is the researcher's assumption that littering and waste management problems are related to the perceptions and attitudes of the Tongan people.

1.3 Objectives of the Study

The main aim of this study is to investigate if there are any links or relationships between the perceptions and attitudes of the people of Tonga and the way solid wastes in the households are managed. To do this, the entire household waste management operations were examined through a survey. These operations include initial processes of waste generation, followed by waste handling, storage, collection and transportation, minimisation of waste and the final stage of disposal.

The specific objectives of the study are:

1. To identify the current household practices for each waste management process.
2. To uncover peoples' perceptions and attitudes (affective, cognitive and behavioural) towards their current waste practices.
3. To identify the community's general awareness of different aspects of waste management and the impacts of mismanaging wastes.
4. To identify any changes in waste management people would like to implement.

Given the ineffectiveness of anti-litter and clean-up programs to date in Tonga, it is believed that uncovering the perceptions and attitudes of the people may help the decision makers in government departments, non-government organisations, diverse community groups and other interest groups, to address the waste management issue in a manner that will be beneficial economically, environmentally, socially and health wise.

1.4 Definitions and Concepts of Waste and Waste Management

For the purpose of this study, the following definitions are used.

Waste refers to household solid waste and is defined by Wray (2000) as 'any materials that currently have a negative value to their owner and are to be disposed of'.

Waste management is defined as the process of dealing with or controlling solid waste.

As mentioned earlier, the waste management processes covered in this study include waste generation, handling, storage, collection and transportation, minimisation and final disposal. It is imperative at this stage to define these processes, before embarking on other aspects of the study.

Waste generation refers to the production of waste.

Waste handling covers the action of dealing with the waste (sweeping, tidying and clearing) after generation and prior to final disposal.

Waste storage refers to the action of accumulating and piling of rubbish before disposal.

Waste collection and transportation refers to the action of removing the waste from the household, by the Ministry of Health's waste collection services or own private collection, with the intention of final disposal.

Waste final disposal refers to the methods used by the households to get rid of their wastes, such as burning, burying, landfill and others.

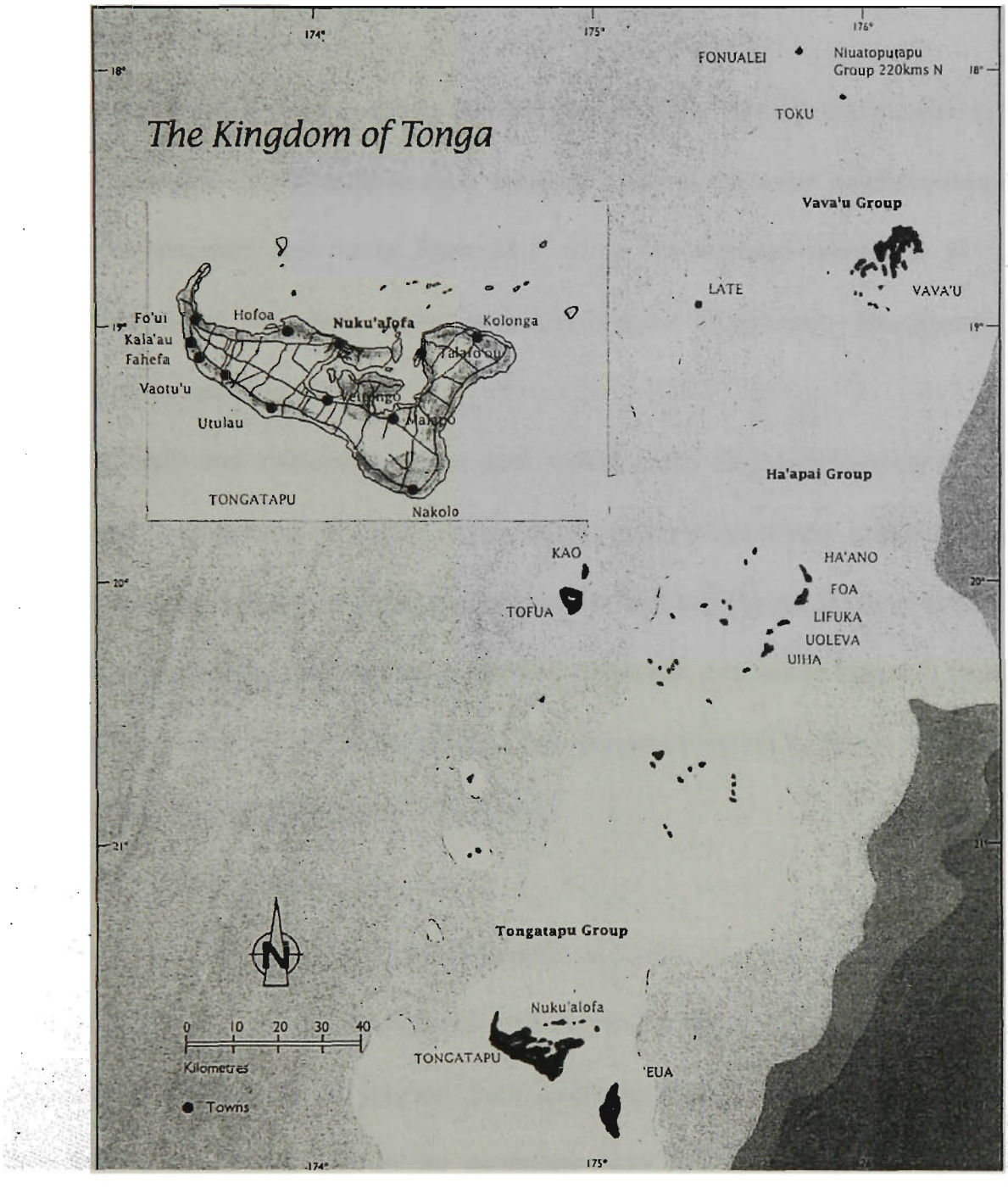
Waste minimisation covers the methods used to avoid or reduce waste such as recycling, re-use, reducing waste production and recovering energy from waste materials.

1.5 Setting and Justification for the Study

The study was conducted in the Kingdom of Tonga on the main island, Tongatapu (Map 1.1).

1.5.1 Geographic Background

The Kingdom of Tonga, also known as *the Friendly Islands* as named by Captain Cook, consists of approximately 150 islands located between 15° and 23° 30' S latitude and 173° and 177°W longitude (Map 1.1). There are three main island groups: Tongatapu and 'Eua (370 square km), Vava'u (120 square km) and Ha'apai (110 square km). Other islands extend beyond the three main groups but have fewer inhabitants. Only 36 islands are inhabited and Tongatapu is the main island in which the capital Nuku'alofa is located (Douglas, 1989).



Map 1.1 Map of the Kingdom of Tonga (Thistlethwaite, 1993)

The islands of Tonga run NNE to SSW in two parallel chains. The western chain consists of volcanic islands, which are largely uninhabited and the eastern chain consists of raised coral atolls. Tonga straddles the Tonga trench, an area of active geological subduction.

Tectonic activity is frequent and the country is prone to earthquakes. Some of the volcanic islands are still active.

The climate varies, becoming cooler and drier in the south. The average rainfall in the most northern island is 2500mm whereas it drops to 1500 in the more southern islands. The average temperature also varies from 23.5° C on the northern islands to 21° C at the southern island of Tongatapu. Mean humidity is about 77 per cent. Hurricanes are more frequent in the northern islands.

Tonga is small and vulnerable and as such would easily be jeopardized by the effects of poor waste management practices. As the environment plays a very important role in the lifestyle of the people who depend so much on the land and the sea for their livelihood, it is imperative to consider the waste management practices that would secure a near pristine environment both now and in the future. One important aspect of this is to determine the attitudes and perceptions of the Tongan people.

1.5.2 Economic Systems

The Tongan economy is based predominantly on agriculture with most of the population depending on it for livelihood. Agriculture accounts for about 90 percent of export revenue (main crops include squash, tropical fruits and vegetables, vanilla and kava). However, there was a significant shift in the economic base from agriculture to manufacturing, indicated by the drop in the percentage of workforce engaged in agriculture from 49.1 percent in 1986 to only 33.8 percent in 1996, and an increase in the share of manufacturing from 2.7 percent in 1986 to 22.8 percent in 1996 (Statistics Department, 1999).

Tourism is a growing industry in Tonga and has become a major component of the economy with every indication that the rate of growth will continue. Tonga is luring

pleasure yachts, tour groups, tourists and cruise passengers in increasing numbers. Tourism is now a significant employer and the hospitality trade is likely to expand.

In addition to tourism, migrant remittances and aid flows are also characteristics of Tonga's economy. Remittances sent from Tongans working abroad are a significant component of the Tongan economy. Although difficult to detail in exact terms, it was estimated that approximately 43 percent of the total receipts in the balance of payments came from private remittances. In 1987/88, 1988/89 and 1989/90 remittances amounted to TP$36.8 million, TP$35.6 million and TP$43.9 million respectively. Official remittances for the same years were TP$9.2 million, TP$13.5 million and TP$13.9 million (Vertiko International LLC, 1997-1999).

Tonga relies heavily on foreign aid for both grants and technical assistance for funding the development expenditure. In 1992 this amounted to TP$69.2 million, an increase of over 100 percent over the development budget of the previous financial year, which amounted to TP$34 million. Bilateral grants generally account for about 60 percent of these funds with Australia, New Zealand and Japan being the major sources. Grants from multinational agencies including the European Union (EU) and the Commonwealth Fund for Technical Co-operation follow in importance. Concessionary loans from the Asian Development Bank (ADB), the World Bank and the European Investment Bank were also obtained (Vertiko International LLC, 1997-99).

Table 1:1 shows the GDP for the Kingdom of Tonga in comparison to Australia for the years 1995, 1998 and 1999. It is expected the comparison between Tonga and Australia will be similar in 2001.

Table 1.1: The Real GDP and GDP Growth

Unit: Million US$ (Tonga), Billion US$ (Australia)

Country	Year	GDP	GDP Growth	Agriculture (% of GDP)	Industry (% of GDP)	Services (% of GDP)
Tonga	1995	164.4	2.6	35.9	12.3	51.8
	1998	172.8	-1.5	38.3	11.5	50.2
	1999	159.7	3.5	..	..	..
Australia	1995	376.7	4.5	3.4	25.2	71.5
	1998	372.7	4.5	3.1	24.7	72.3
	1999	404.4	4.4	..	..	..

Source: World Development Indicators Database, July 2000

The growth of the tourist industry has impacted on waste management in Tonga. Tourists' needs have to be met, and those needs typically involve heavily packaged and canned goods. The disposal of waste such as packaging and cans has already been a problem to the environment and indirectly on the health of the people. Most of these wastes are non-biodegradable and have become breeding sites for insects and vermin. A rise in the tourism industry implies increased generation of such waste, and Tonga is likely to face further disposal problems thus causing more damage to the environment. However, tourism development is very important for solid waste management as the tourism industry requires and encourages tidy towns and clean beaches.

Becoming more dependent on remittances and aid may also have implications for waste management. As money becomes more available, people tend to spend more on imported goods, resulting in more non-biodegradable waste to dispose of. This will result in disposal problems for which the country may not be prepared.

1.5.3 Social Systems and Demographic Structure

Tongans are Polynesians. The population of Tonga is 97784 (Statistics Department, 1999) of whom about half are under the age of 20 years. More than half of the population (68.5%) lives in Tongatapu, the main island. Tongatapu has historically been the most densely populated area of the Kingdom and also its political, economic and cultural centre. Tables 1.2 and 1.3 show the population by division and population by age group and median age.

Table 1.2: Population by Division

Division	1976	1986	1996
Tongatapu	57,411	63,794	66,979
Vava'u	15,068	15,175	15,715
Ha'apai	10,792	8,919	8,138
'Eua	4,486	4,393	4,934
Niuas	2,328	2,368	2,018
TOTAL	90,085	94,649	97,784

Source: Statistics Department 1999: p.xiii

The concentration of the population in Tongatapu has a significant impact on waste production. Age structure and social roles influence waste management roles shared in families and this is explored further in this study. The large proportion of young people in the population indicates a continued population increase, which also has implications for waste production and disposal in the future.

Tonga has a stratified social system and is very conscious of rank at all levels. The traditional social class structure subdivided the society into three levels:

King,

Nobles/Chiefs, and

Commoners.

Table 1.3: Population by Age Group and Median Age, 1986 and 1996

Age Groups (years)	1986 Census	1996 Census
Less than 5	13,919	13,479
5 - 9	12,674	12,258
10-14	11,852	12,521
15-19	12,390	10,895
20-24	8,951	8,722
25-29	6,070	7,757
30-34	5,086	5,918
35-39	4,117	4,686
40-44	3,844	4,122
45-49	3,570	3,498
50-54	3,248	3,310
55-59	2,788	3,008
60-64	2,103	2,562
65-69	1,606	1,971
70-74	1,061	1,370
75 and over	1,373	1,707
ALL AGES	94,649	97,784
MEDIAN AGE	18.6	19.9

Source: Statistics Department 1999: p.xix

The complexity of the social stratification does not end in the context of its social classes but also extends to linguistic distinctions used to address and refer to persons of different social ranking. There are three different types of vocabularies used, with a different vocabulary for each respective social class. In speaking or referring to the King and the nobles, special terms are used that are different to those used for commoners.

Tonga's stratified social system has an influence on who is responsible for waste handling, storage, collection and disposal. The King and nobles, who are the highest in the social hierarchy, are not expected to share the responsibility of managing waste. However, the commoners at the lower end of the social hierarchy are responsible for waste management.

Tonga is a patriarchal society. Men are the heads of the families and traditionally the decision makers. Unlike many Pacific countries, women in Tonga have traditionally had a nominal status generally superior to that of men, based on the cultural obligation of men to their sisters. This status of women has gradually been declining as a result of demographic and social changes, including the trend towards giving greater precedence to women's status as wives, rather than their cultural status as sisters.

The division of labour is quite distinctive between male and female and has some influences on household waste management. Many household chores are designated as women's work and managing wastes in the household is thus expected to be the responsibility of women. Despite these expectations, anecdotal evidence suggests men may have an increasing share of the waste management responsibility for some waste types in the household. This thesis seeks to determine if there are differences in the waste management roles of men and women.

Tonga has a well established 'English-based' education system. Primary education has been compulsory since 1876, and the 1974 Act provides free education for children between the age of six and fourteen. In 1998, there were 117 primary schools of which 106 (90.6%) were operated by Government, with the remainder being managed by missions and private authorities (Ministry of Education, 1998).

For the year 1998, there were 39 secondary schools of which eight (19.5%) were operated by Government with the remaining schools managed by missions and private authorities.

Again in 1998, at the post secondary education level, the Government provided 53 percent of the facilities and training, compared to 32 percent in previous years. The remaining 47

percent was owned and administered by missions and private authorities (Ministry of Education, 1998).

The 1996 census results indicated improved educational attainment compared to 1986 census, with more persons going into secondary and tertiary education. The proportion of students going onto secondary level education increased from 55.8 percent in 1986 to 60.4 percent in 1996 and the proportion of students going on to tertiary education increased from 1.5 percent to 3.6 percent in 1996 (Statistics Department, 1999). Tables 1.4 and 1.5 show the distribution of levels of educational attainment and qualification obtained by gender respectively.

Table 1.4: Distribution of Tongans and Part-Tongans Aged 5 Years and Above by Level of Educational Attainment, 1986 and 1996

Educational Level	1986 Persons No.	1986 %	1996 Persons No.	1996 %	Percentage Change 1986/1996
No schooling	2371	3.2	1685	2.0	-28.9
Primary	289242	39.5	28057	34.0	-3.0
Secondary	40889	55.8	49925	60.4	22.1
Tertiary	1083	1.5	2998	3.6	176.8
TOTAL	73267	100.0	82665	100.0	12.8

Source: Statistics Department 1999: xxvii

Environmental issues are normally part of the school curriculum in developed countries such as Australia and New Zealand. Although Tonga has a well-established education system, it is unclear how well-informed Tongans are on key waste management issues, hence the need for this study. Furthermore, gender as well as the different educational attainments, may have implications on the waste management issues.

Table 1.5 : Highest Qualifications Obtained for Tongans and Part-Tongans Aged 11 Years and Above by Gender, 1996

Qualifications/Gender	Male	Female	Total
No qualification	5,170	5,073	10,243
Primary School	19,044	19,251	38,295
Some Secondary	509	492	101
Secondary	7,485	7,941	15,426
Certificate	226	180	406
Diploma	889	745	1,634
First Degree	486	300	786
Postgrad.Certificate/Diploma	21	7	28
Masters Degree	83	35	118
PhD	19	6	25
Others	8	1	9
TOTAL	33,940	34,031	67,971

Source: Statistics Department 1999: xxvii

The general health of the population is good. There are no serious endemic diseases. According to a report of the Minister of Health (1998) the leading causes of death are influenza, acute respiratory infections, diarrhea and broncho pneumonia. In the first quarter of 1998, there was an outbreak of dengue fever, which was ultimately brought under control with the assistance of World Health Organisation and collaborative efforts by outpatients, laboratory, environmental health, health education sections and community participation. The predominant illnesses encountered are those related to poor sanitation and hygiene. Poor waste management has health implications. The fact that the community was strongly involved in the dengue fever episodes suggests they are willing to be proactive when a specific cause arises. As such, a study of the Tongans' attitudes and perceptions to waste management would assist health educators in their efforts to provide appropriate programs to address the issue of poor waste management and thus contribute to good sanitation and hygiene with good health as the ultimate goal.

1.5.4 Political System

The Government of Tonga is a constitutional monarchy, with three main decision making bodies. These are the King and the Privy Council plus the Cabinet; the Legislative Assembly which comprises nine representatives of the people, nine noble representatives plus the members of the Cabinet; and finally, the Judiciary which the Court of Appeal is the highest power, followed by the Supreme Court, the Land Court and the Magistrate Court.

There are no political parties and therefore no official distinction between 'government' and 'loyal opposition'. Cabinet Ministers are appointed directly by the King from outside parliament, and become Members of Parliament on appointment as Ministers.

The Parliament's role has generally been regarded as endorsing the actions of the government. The Parliament discusses the bills in the House, which are then presented to the King in Privy Council for approval before becoming law. The King has enormous power to initiate legislation and to veto proposals initiated elsewhere.

The political system has implications for the importance and attention given to waste management. Waste management is regarded as a very low priority item and as such it is not surprising that Tonga still has no waste management legislation or waste management policy. With regards to litter, there is no specific law to control or regulate the disposal of litter in public places such as on streets and in shopping areas. Environmental legal provisions are scattered throughout a range of legislation such as The Public Health Act 1913, The Garbage Act 1949, The Parks and Reserves Act 1976 and others, administered by a number of Ministries and Departments.

In Tonga, the responsibility for solid waste management rests with the Ministry of Health. The Ministry has 22 health inspectors covering a wide range of responsibilities throughout

Tonga. The management and operations for solid waste management are under-resourced both in staff numbers and funding and there is little enforcement of waste related regulations (Sinclair Knight Merz, 2000).

The Environmental Planning and Conservation Section which was previously located within the Ministry of Land, Survey and Natural Resources (but currently, in 2001, with the Ministry of Works) is regarded as the leading institution in environmental matters. This section administers environmental programs jointly with other departments, which have legal sectoral environmental responsibilities as part of their function. The shared environmental responsibilities depend upon a co-operative relationship, with no legal obligations for these various departments to consult with the Environmental Planning Section, or with one another, on environmental matters (Sinclair Knight Merz, 2000). The local government however, under the supervision of district and town officers, has major influences on waste management in the village communities. Village and inter-village clean-up programs and competitions are organised and these have major impact on the cleanliness of the villages and the entire country.

The Tongan land system is unique. Its two most distinctive features being that land rights are granted solely to individuals, and that every taxpayer (that is, every male Tongan aged sixteen years and over) is entitled to eight and one-quarter acres of agricultural land and a small town allotment to build his house (Pulea, 1992). All land in Tonga is the property of the King and he may, at pleasure, grant to the nobles and titular chiefs one or more estates to become their hereditary estates. However, it is not lawful for anyone, at any time, whether he be King or any one of the Chiefs, or the people of the country, to sell any land in

the Kingdom of Tonga. Land can be leased only in accordance with the constitution. Land granted as a hereditary estate must descend to the lawful heirs of the grantee.

The land tenure system has implications on waste dumping and waste disposal sites. The choice of most suitable sites for dumping is often hampered by individual land ownership. Also illegal dumping of waste in unoccupied land is a current practice. However, it depends on the landowner whether to prosecute or not.

1.6 Presentation of the Study

The study is presented in eight stages. Chapter One deals with the general nature and purpose of the study. Chapter Two discusses the theoretical approach and perspectives employed by this study in an attempt to understand and uncover the perception and attitude of the Tongan community towards managing waste. A critical review of previous studies on different aspects of waste management that have been carried out in both the developed and developing countries is presented in Chapter Three. Chapter Four provides the methodological approach employed in the study for data collection, in particular the construction and administration of a household questionnaire. Chapters Five and Six present the results and findings of the study with Chapter Seven providing a discussion of these results and findings. Conclusion and recommendations are presented in Chapter Eight.

CHAPTER TWO: APPROACHES USED IN THIS STUDY

2.1 Introduction

The aim of this chapter is to identify the philosophical concepts that underpin this thesis. It is apparent that no one theory can provide a comprehensive approach for the proper understanding and uncovering of a community's perceptions and attitudes to waste management. This study therefore employs a cross-disciplinary approach by drawing on theories in human geography and sociology, so that the deficiencies of one are compensated by emphasis on another.

This chapter will firstly introduce different approaches used in waste management studies, followed by a section on the relevance of perceptions, attitudes and behaviour to this study. Finally, the behavioural approach and collective behaviour are discussed as they apply in this study.

2.2 Different Approaches to Waste Management Studies

There are numerous approaches to the study of waste management such as the economic, engineering, scientific, environmental and behavioural approaches. The studies from the economic approach concentrate on finding the most appropriate waste management methods or options to use, primarily considering cost and benefits. Such an approach was employed by Ray *et al.* (1999) in studying waste minimisation in five military installations in the United States, assessing the most economical mode/s of waste management, and investigating options that could be cheaper to allow for development of cost-effective alternative plans for implementation. This economic approach has also been used in other studies such as a multi-dimensional research project to determine and analyse urban solid waste management in Kuwait (Koushke

and Al-Khalecfi, 1998), in order to examine trends and to develop relationships between households' socio-economic traits and solid waste management.

The engineering approach explores the practical solutions for managing waste such as designing landfill sites, installation of incinerators, and other waste management practices. This approach was taken by researchers such as Bullard *et al.* (1998), in a study conducted on the disposal of low level radioactive waste, to examine the design of a disposal facility.

Studies which employ the environmental approach, investigate the effects of contamination on the environment (land, water and atmosphere) from waste management practices. This approach has been employed by numerous studies such as a study carried out on the characteristics of lead leachability from cathode ray tubes using the toxicity characteristic leaching procedure (Stephen, 2000), which examined the environmental effects of discarded cathode ray tubes from television tubes and computers.

The scientific approach investigates such aspects as the health impacts of chemicals released from waste materials and related matters. A three-year study was conducted employing the scientific approach to investigate the health effects associated with exposure to atmospheric aerosols in areas that experience frequent dust storms (Haller *et al*, 1999). A similar study was conducted to find the potential health effects of fine particle exposures, by examining the nature and magnitude of fine particle emissions from the motors that operate a typical vacuum cleaner (Lioy *et al*, 1999).

Each approach addresses particular questions, is governed by particular paradigms and theoretical constructs and implements particular methodologies. However, this study differs in that the waste management issue is being studied from the behavioural

perspective, with the view that the way in which people particularly manage waste is closely related to their perceptions and attitudes.

2.3 Perceptions, Attitudes and Behaviour

> *"Perception and attitude studies represent a fertile hole for digging. We must discover new approaches for extending this hole."* (Mitchell 1979:143).

Research on perceptions, attitudes, and behaviours emerged as a distinctive area of geographic inquiry in the early 1960s. Rooted in the "*man*-environment" research tradition, and closely tied to the emergence of the behavioural approach to geography, patterns of belief, preference, and behaviour have attracted attention as topics having their own inherent interest as well as for their potential contribution for improving environmental decisions (Lowenthal, 1972a cited in Mitchell (1979)).

This emerging area of inquiry has been characterised by interdisciplinary studies, and has been given a variety of labels such as environmental psychology, environmental perception, environmental behaviour, human ecology, sociophysical design, ecological psychology, behavioural geography, and psychogeography (Saarinen 1976 cited in Mitchell (1979)). Numerous reviews (Saarinen, 1969; Mercer, 1971; Sewell and Burton, 1971; Pocock 1973 all cited in Mitchell (1979)) are available for a field that Saarinen (1976) described in the mid 1970s as lacking an agreed-upon name, body of theory, or well-developed methodology. This assessment was shared by Lowenthal (1972b) who commented that

> *"...the field as a whole remains essentially unorganized and disjointed. Work in environmental perception and behaviour falls short of realizing its full potential because it lacks commonly accepted definitions,*

objectives, and mechanisms for applying research results to the needs of environmental planning and decision making. Above all, studies in this field now require a more systematically organized theoretical base."

It was in this growing but diffuse field that one psychologist complimented geographers for persistent, vigorous, and enterprising research (Craik, 1970 cited in Mitchell (1979)). Investigations in perceptions, attitudes, and behaviour have been conducted by geographers and others in related disciplines. As geographers have investigated perceptions, attitudes, and behaviour, they have gradually become aware of the necessity to become better informed about basic issues. More specifically, geographers became conscious that behavioural work would only make a significant contribution if attention was given to relationships between verbal and overt behaviour, measuring procedures, and research paradigms (Mitchell, 1979).

A fundamental problem hindering the comparability and verification of findings from the proliferation of studies on environmental matters and resource management has been the wide range of definitions of the terms 'perceptions' and 'attitudes'. Schiff (1971 cited in Mitchell (1979)) and Saarinen (1976 cited in Mitchell (1979)) drew attention to the complexity of these concepts. Schiff (1971 cited in Mitchell (1979)) defined perception as

'the impression one has of a social stimulus or set of stimuli, as that impression is modified by the perceiver's past experience in general, his/her previous experience with the same or similar stimuli and the individual's state at the moment he/she is viewing the stimulus of interest'.

Since an individual's perception is governed by past experience plus present outlooks, conditioned by values, moods, social circumstances, and expectations, two people viewing the same stimulus may 'see' different images, in accordance with the definition

of perception by Hornby (1995) as 'a way of seeing, understanding or interpreting something'. This is the whole rationale for the behavioural approach to geography, with its explicit concern for the '...subjective geographical conceptions of the world about them which exist in the minds of countless ordinary folk' (Wright, 1947:10).

The concept of *attitude* is even harder to define than perception. It is defined as 'a way of thinking' (Hornby, 1995), or 'an organised set of feelings and beliefs which will influence an individual's behaviour' (Mitchell, 1979). Many psychologists agree that attitudes may be broken into three basic dimensions, namely affective, cognitive and behavioural. The affective component consists of feelings with regards to liking and disliking an object. The cognitive component incorporates the beliefs, which may or may not be true about an object. The behavioral component covers the way in which a person will react or behave relative to the object (Mitchell 1979).

These three components are built into this study to uncover and reveal the attitudes of the Tongan community to littering and waste management, that is, to find out the likes and dislikes of Tongans, what they think, and how they react, or are likely to react, to waste management processes.

It is vital to understand that attitudes are pre-eminently social. Society acquires them through, or they are held in place, or modified by, direct or indirect social interaction. Through behaviour, people learn about each other attitudes, and they can make public or conceal their own attitudes. Social context is critical for attitudinal phenomena.

To varying degrees, attitudes tell a great deal about people. The process of finding out about people, often involves trying to discover what they really think - what their attitudes really are. Attitudes can be important markers of, even the defining attributes of, identity. In many, perhaps most cases, attitudes are shared and attitudinal discontinuities among people provide the contours of social groups. In this way,

attitudes can be the content of social norms - the stereotypical attributes, even the criterial attributes, of social groups. People in different groups may hold different attitudes, and indeed this may come about as the result of a process of accentuation of intergroup differences (Terry and Hogg, 2000).

It is hoped that this study would help uncover Tongans attitudes to waste management and how they relate to the way people manage their household wastes.

2.4 Behavioural Approach

The behavioural approach in human geography originated in the 'landscape school' of North American Geography. The school focused on humans as shaping agents and therefore attempted to highlight how behavioural processes influenced human landscape patterns (Johnson 1986). The consensus within contemporary geographers appears to be in labeling behavioural geography as an approach rather than a sub-discipline. Authors such as Gold (1980) expressed the view that behavioural geography is an expression of 'behaviouralism'. Behaviouralism attempted to advocate revising, renewing or finding new approaches that acknowledged the complexity and diversity of human behaviour (Walmsley and Lewis 1993). Scholarly dispute on the consensus of what constituted 'behavioural geography' in the discipline, centred upon the debate surrounding the importing of psychological terms like 'perception', 'attitudes' and 'cognition' without full appreciation of their constitution.

Much of the early behavioural work in geography comprised what has now become known as 'perception studies'. These studies include 'The Perceived World' (Kirk 1952) and Perception of Natural Hazards' (White 1945). Generally early behavioural research approaches were concerned with overt behaviour patterns and investigations of perception. These 'perception studies'- centred approaches examined themes such as

preferences for places (Gould and White 1974), cognitive maps (Stea 1969; Downs 1970) and the general process of acquiring spatial knowledge (Golledge and Zannaras 1973). Attempts were made at developing frameworks such as the behavioural matrix of Pred (1967) that dealt with environmental cognition. Research focused on inductive and deductive approaches whilst essentially maintaining a positivistic view using tried and tested scientific method with the appreciation for what was measurable. Due to the strength and influence of the 'scientific method', there was a general malaise in accepting humanistic approaches that dealt with the abstract concepts of human values, consciousness and intention.

Not until the 1960s did behavioural approaches become more widely accepted within the discipline of geography (Guelke 1989; Walmsley and Lewis 1993). In the 1960s Lowenthal (1961) appreciated that perceptions of the world are personal, thus behaviour based on these outcomes is unique and thus there is a complex interplay between behaviour and environment that shapes our world. Kirk (1963) stressed that the environment was not a static backdrop but a dynamic one that takes shape and acquires meaning by human perception. Kirk (1963) recognised the interplay between both the phenomenal and behavioural environment. In contrast to behavioural work, the work by Lowenthal (1961) and Kirk (1963) was not positivist in orientation. 'Freed' from the 'scientific method', a substantial body of literature emerged in humanistic research in the behaviouralist vein from the 1960s to the 1980s. Perusal of the literature suggests a small but consistent flow of behavioural work in geography which includes 'The Relevance of Imagination' (Lowenthal, 1961); 'The Nature of Environmental Meaning' (Tuan, 1974); 'Place and Placelessness' (Relph, 1976); 'Cultural Patrimony' (Roundtree,1988); 'The Aesthetics of Landscape and Architecture' (Cosgrove, 1989) and aspects of the emotional significance of place in human identity (Pocock 1981; Entrikin

1991). Aitken asserted that in the 1980s behavioural geography had 'come of age' (1991).

In the 1980s and 1990s new orientations in behavioural geography focused attention on four elements (listed below) partly as a response to the emergence of postmodernism and new cultural geographies.

i. how social constraints influence the people-environment relationships;

ii. how people develop a sense of attachment to some places and not others;

iii. the importance placed upon both acted out (overt behaviour) and processes in the mind (covert behaviour); and

iv. an emphasis on the world as it is, rather than theoretical assumptions on how it should be.

Relevance of the behavioural approach to this thesis is that, this approach addresses the overt and the covert behaviour of Tongan people towards waste management. In studying the waste management processes, the relationship between overt and covert behaviour is being explored for any ambiguity or ambivalence.

2.5 Collective Behaviour

2.5.1 What is collective behaviour?

As might be expected of a field, which has been underdeveloped scientifically, even its name is not standardised. 'Collective behaviour' is the most common general term. However, different terms were used to refer to approximately the same range of data (attitudes, activities) that was encompassed by 'collective behaviour'. Psychologists used the term 'mass phenomena', 'mass behaviour' and 'collective dynamics'. Because of the ideological polemics which 'mass' had accumulated, this term was misleading. More neutral, but equally misleading terms were 'collective dynamics' and 'collective

outbursts and movements' (Smelser, 1963). Collective behaviour however, was chosen and used as a specific kind of shorthand. In certain respects, the term was too general. In its broad sense, it refers to the behaviour of two or more individuals who are acting together, or collectively. To conceive of collective behaviour in this way would be to make it embrace all of group life (Smelser, 1963).

2.5.2 Nature of Collective Behaviour

In collective behaviour, a large group is said to convey a sense of 'transcending power', which 'serves to support, reinforce, influence, inhibit, or suppress the individual participant in his activity'. To mobilise for action, new devices such as 'incitation, agitation, gaining attention, the development of morale, the manipulation of discontent, the overcoming of apathy and resistance, the fashioning of group images, and the development of strategy' gain precedence (Smelser, 1963:6).

Collective behaviour is therefore defined as 'mobilisation on the basis of a belief which redefines social action' (Smelser, 1963:8). In order for behaviour to become collective, some mode of communication of this belief and some mode of bringing people to action must be available. The belief may be communicated by "gesture or sign, face-to-face rumour...one way communication..." (Smelser, 1963:11). No particular type of communication or interaction, however, is a central defining characteristic of collective behaviour.

The 'collective behaviour' theory is relevant to this study in that the behaviour of individuals in managing wastes may be derived from, explained by, and understood from the perspective of the community (village, church, and others). In so far as individuals are members of these local communities, their behaviour is influenced by the transcending power of the larger social group.

Further to collective behaviour, Terry *et al.* (2000) conceptualised a collective self as group membership and strictly in terms of social identity and self-categorisation theories. When people categorise themselves in terms of a contextually salient in-group, there is a process of depersonalisation that cognitively, behaviourally, and affectively assimilates self to the in-group prototype. That is, it produces in-group normative behaviour regarding attitudes, feelings, and behaviours. The clear prediction is that attitude-behaviour consistency should increase under conditions in which people identify strongly with a group for which the attitudes and the behaviours are prototypical or normative. This is particularly relevant to this study in explaining the attitude-behaviour relationship within particular groups in the community at large.

2.6 Conclusion

This study employs the behavioural approach of human geography and collective behaviour theory (a sociological theory), to understand and uncover the perceptions and attitudes of the Tongan people with respect to managing household wastes. The behavioural approach addresses the overt and the covert behaviour and thus exploring the perceptions and attitudes of the Tongan people. The collective behaviour theory helps in explaining the behaviour as influenced by the transcending power of the community.

CHAPTER THREE: LITERATURE REVIEW

3.1 Introduction

Although the concept of 'waste' is quite new in historical terms, it has drawn the attention of countries on a large scale, down to individuals on the small scale due to the impacts 'waste' has on health, environment and the economy. This chapter reviews the literature by firstly examining the concept of 'waste', secondly identifying the different ways of managing waste, and lastly by reviewing research on waste management, with the application of the behavioural approach.

3.2 Concept of Waste

Waste is defined by different countries and organisations according to their own purpose. Great Britain's Waste Disposal Authority (1976:186) described waste as

> *"any substance which constitutes a scrap material or an effluent or other unwanted surplus substance, arising from the application of any process, and any substance or article which requires to be disposed of as being broken, worn out, contaminated or otherwise spoiled".*

According to the Australian Waste Database (Wray, 1999:5), waste is defined as

> *"materials that currently have a negative value to their owner, that is, the generator incurs costs in managing them (importantly this does not prevent them from having positive value to another owner at another location in space or time)".*

The United Nation Organisation (Morrison *et at.* 2000:46) defined waste as

> *"any matter prescribed to be waste under national legislation, any material listed as waste in appropriate schedules, and in general, any surplus or reject material that is no longer useful and which is to be disposed of".*

The above definitions have a common theme in that 'waste' is neither wanted nor of value to the owner (generator) and therefore has to be disposed of in one way or another.

The concept of 'waste' is actually quite new in historical terms. It is said to be an unwelcome and often unnoticed effect of "development" and "civilisation" (Kim and Gobalan, 1997) and can be traced to the growth of industrialisation in modern economies (Holmes, 2000). While it may be incorrect to say that 'waste' did not exist before industrialisation, the notion that waste is a structural feature and inevitable consequence of our social and economic systems is something quite different.

To date, there is no complete inventory either globally or for any individual country on the sources, types and amounts of waste produced. Obtaining accurate data on any component of waste is a constant problem. Many wastes are not regulated and thus neither is the responsibility for data collection and dissemination. Waste is produced in the form of solid, liquid or gas. In the case of gaseous waste, it is particularly difficult to get good and reliable information on waste discharges into the atmosphere. Liquid wastes have quite limited information in some national databases. It is the solid waste that has been given more attention, but the information is sporadic and not fully comprehensive (Morrison *et al.* 2000).

Solid waste is described as all the wastes (garbage, rubbish, trash, refuse) arising from human and animal activities that are normally solid and are discarded as useless or unwanted (Tchobanoglous *et al.,* 1993). The sources and composition of solid waste fall

under five categories namely domestic household waste, commercial solid waste, building and demolition waste, industrial waste and agricultural waste.

Domestic household waste, which is the concern of this study, is generated in residential sites. The types of solid wastes generated include plastic bags, plastic packaging, paper and cardboard packaging, food wastes, waste papers, cloth, diapers, garden and yard wastes, glass jars and containers, tin cans, aluminium, and others (including bulky items, consumer electronics, white goods, batteries, tyres).

The type and quantity of waste generated may depend on how affluent a country is. According to Purcell (1998), people in the industrialised countries create up to one ton of solid waste per person per year. The United States alone produces the greatest amount of solid waste, that is, around 160 million tons each year. The United Kingdom, according to European Statistics (Kingston, 2000) produces 29 million tons of municipal waste every year. This is equivalent to half a ton of rubbish per person. Moreover, Japan's annual household waste is around 50 million tonnes (Kakuchi, 2000).

Accra, Ghana's capital city, a middle income country, generates approximately 750 to 800 tonnes per day (Asomani-Boateng, 1999), which is about 273,750 to 292,000 tonnes per year.

It is evident that countries with high per capita income generate and dispose huge amounts of waste in comparison to the middle and low-income countries. This is illustrated in Table 3.1. On the world scale, Tonga is a low generating country but waste in Tonga is problematic in terms of environment, economic and practical ability to manage. Also, waste generation in Tonga is increasing. One problematic aspect for Tonga is that the population is becoming increasingly aware of, and practised in the use of packaged food and other items that generate large volumes of waste.

Table 3.1: Typical Solid Waste Generation-Disposal Rates

Country	Waste Generation (Disposal) Rate (kg/person/day)
Industrialised Countries (1)	0.7-1.8
Middle Income Countries (1)	0.5-0.9
Low Income Countries (1)	0.3-0.6
Australia (2)	1.8-4.4
United States 1990 (3)	2.8
Asia 1990 (1)	0.5-0.9
Pacific Island Countries (4)	0.2-0.7
Tonga 1999 (5)	0.08

Sources:
(1) United Nations Centre for Human Settlement (Habitat)
(2) Egis Consulting (2000)
(3) Tchobanoglous, Tiesen, and Vigil (1993)
(4) World Health Organisation (1996)
(5) Tonga Environmental Planning & Management Strengthening Project (2000)

3.3 Managing Solid Wastes

Managing solid waste (storage, handling, collection and transportation, disposal) has become a pressing problem in the 20th Century as more and more waste is generated. Although more waste is generated in the industrialised countries, their modern technology has taken good care of handling, storage, collection, transportation and disposal of waste. In New York (USA), Toronto in Canada, Liverpool in England, Australia and New Zealand, to name a few, waste/garbage is secured in bags and placed in large steel or plastic containers properly fitted with lids. These containers are lifted mechanically by compactor trucks or loading mobile packers and other modern collection equipment (Civic Correspondent, 2000). However, developing countries are experiencing serious problems of managing their solid waste. In Mumbai, India (Civic Correspondent, 2000) and many Pacific Island countries, the solid wastes are not securely stored prior to collection. In Tonga, wastes are stored in a haphazard manner (open baskets, containers), and therefore

exposed to roaming pigs and dogs. This problem is explored and investigated in detail in this study.

The disposal methods for solid waste include some old methods (dumping, burning, burial), which have been used since antiquity and are still practiced particularly in many underdeveloped countries. In the African cities, urban solid waste collection and disposal are serious problems faced by municipal governments (Asomani-Boateng, 1999). Open dumping and burning are practiced and problematic. In Accra, capital of Ghana, more than 100 dumps are scattered throughout the city, and the co-disposal of hospital, industrial and household wastes at these dumps causes serious health and environmental problems.

Likewise, the Pacific Island countries face similar problems. Dumping in the ocean is a common practice and this attitude has led to widespread pollution of the marine environment. Similarly, dumping on unoccupied land and indiscriminate dumping is quite a common practice in small Pacific Islands and in Tonga.

Moreover, burning of solid wastes that are combustible, and burying of non combustible wastes are commonly practised throughout underdeveloped countries including the South Pacific islands. Again, these are further explored and investigated in this study.

Common disposal methods that are used today include landfill and incineration.

Since the late 19th century, the volume and nature of waste generated has increased considerably, and has led to the need for disposal to land specifically allocated for the purposes of disposal – landfill. Landfill is a controlled site for disposal of refuse on land without creating nuisances or hazards to public health or safety. It utilises the principles of engineering to confine the refuse to the smallest practical volume, and cover it with a layer of earth at the conclusion of each day's operation or at such more frequent intervals as may be necessary (Arbuckle, 1995). Landfill has become the dominant waste disposal method

in many developed countries. The United Kingdom has approximately 4000 licensed landfill sites (Phillips and Robinson, 1998) which accommodate 29 millions tonnes of yearly household waste and 45 million tons from other sources (Kingston, 2000). Likewise, the United States placed most of its solid waste in landfills. New York alone disposes of 26 million pounds of solid wastes as 'fresh kills' landfill daily (Hawken, 1997). Australia also disposes most of its solid waste in landfill sites.

In the developed countries, most of the landfill sites are kept to the standards (as defined by Arbuckle, 1995) required for safe disposal of non-hazardous solid wastes. However, most developing countries' landfill sites are far below the required standards, and cannot cope with the huge inflow of solid wastes. This is evident in Pakistan (Ahmad, 2000) which is facing both financial and logistical problems in designing, siting and operating safe landfill sites to cope with the huge volume of waste/garbage. Similarly, Accra's landfill sites are poorly managed and their location in built-up areas without proper management procedures for leachate, surface run-off, odours, landfill gas, and the practice of setting these dumps on fire for the purpose of reducing waste volumes, results in the pollution of the urban environment and constitutes a potential health risk to the city's residents.

Tonga likewise has only one landfill site and it can be described as an uncontrolled site. It is poorly managed and waste is haphazardly dumped and rarely covered. The landfill is exposed to scavengers and roaming animals. Odour and fire are major problems and it also becomes a breeding place for insects and vermin. Like other countries, health and environmental impacts of the landfill are a concern to Tonga and have become a pressing problem to those who reside immediately close to the area. Compounding the problem is the fact that finding a new dump site is increasingly difficult due to land shortages, the effect of the land tenure system, and likely public opposition considering the impacts on

health and the environment. This issue of waste disposal is further investigated and explored in this study.

Incineration is the combustion of solid waste under controlled conditions in an appliance specifically designed for the quantity and composition of the waste involved (Thom, 2000). It has been chosen by many nations around the world as the preferred way to dispose of solid waste and this is particularly the case where landfill sites are scarce. Japan is notable for its preference for incinerators. It has around 2,800 municipal incinerators (Purcell, 1998) which incinerate 75% of its municipal waste. Sweden and Denmark have 55% and 65% respectively of their municipal wastes being incinerated (Petts, 2000). On the other hand, incineration has fallen strongly out of favour in some countries like the United States. Despite the significant improvements in the technology, concerns that the incineration process may release toxic pollutants such as dioxins have brought this once-popular technology to near obsolescence (Purcell, 1998).

Although incineration is a common disposal method for solid waste, this is not explored in this study, as this method is not available for household waste disposal use in Tonga.

3.4 Review of Waste Management Studies

There is a vast array of literature relating to waste management, and as discussed in Chapter Two of this thesis, the publications can be grouped into economic, engineering, scientific, environmental and behavioural according to the approaches taken by the researchers. This study employs the behavioural approach and, as such, the literature reviewed here concentrates on those (literature) pertaining to waste management activities undertaken from the behavioural perspective.

The literature review revealed that the behavioural approach to waste management is the least researched, especially with respect to attitudes and perceptions. Behavioural-based studies can largely be divided into four types; focusing on;

1) those focusing on recycling;
2) waste reduction;
3) littering;
4) awareness of waste management and knowledge.

3.4.1 Recycling

The most researched aspect from the behavioural approach is recycling which is concerned primarily with salvaging reusable wastes. Behavioural scientists have conducted a number of studies over the years to encourage people to recycle. These studies were concerned with manipulations of specific conditions the effects of which were measured to promote recycling behaviour (Porter *et al.,* 1995). Interventions designed to alter behaviour were conceptualised in terms of antecedent strategies that occur before the target behaviour and consequential strategies that occur after the target behaviour.

3.4.1.i. Antecedent Strategies

The antecedent interventions used to increase recycling include written and oral prompts, commitment strategies, environmental alterations, goal setting, and one experiment using both prompts and environmental alteration.

a) Prompting

Prompting strategies consist of either written or verbal communication given to target individuals to encourage a subsequent behaviour. Flyers, brochures, and newspaper ads that advocate recycling and to explain how to use existing recycling services are examples

of written prompts. Verbal prompts deliver the same types of information but are given in face-to-face contacts.

Geller *et al.* (1973) studied the effectiveness of using handbill prompting techniques against no prompts, in increasing the purchase of returnable soft drink containers from a local grocery store. There were six treatment phases rotating in daily, 2-hour periods across four weeks. Students distributed handbill prompting to some incoming customers encouraging the purchase of returnable bottle drinks, and publicly charted their bottle purchases, while some were not given the handbills. The results showed that returnable purchases increased by 25% in the group given handbill prompting, however the prompting effectiveness was short-lived.

A further study was carried out (Spaccarelli *et al.,* 1989-1990) to compare the effectiveness of written plus verbal prompts with written prompts only in increasing participation in curbside recycling. Using a multiple baseline design, the combination of written and verbal prompts was shown to increase participation 3% above baseline level during 7 to 16 week post-intervention periods. Those receiving only the written prompt showed little change from baseline. Unfortunately, this study did not include a group receiving only the verbal prompt.

The most effective prompting strategy appeared to have been the block leader approach that involved face-to-face, verbal prompting from residents to other residents (Burn, 1991; Hopper and Nielson, 1991; Everett and Peirce, 1991-1992). A study by Hopper and Nielson (1991) asked residents on selected blocks to act as leaders and tell their neighbours about a curbside recycling program during a 7-month period. The residents contacted by block leaders recycled more often than did groups receiving an informational brochure and monthly prompts about the program. The reason why this approach produced greater

effects could have been that verbal prompting gave the recipient of the prompt the perception that recycling was normative behaviour for residents of the neighbourhood, and to not recycle would risk placing the recipient's home in an outcast social position.

This thesis focuses on uncovering the practices, perceptions and attitudes to waste management, which include recycling. Such information would provide the basis for further studies using the prompt techniques to increase recycling behaviour.

b) Commitment

Commitment involves obtaining promises or agreements from people to recycle for a specified time period. Five experiments conducted found that commitment strategies increase recycling (Pardini and Katzev, 1983-1984; Katzev and Pardini, 1987-1988; Wang and Katzev, 1990; Burn and Oskamp, 1986). The simple act of promising to recycle influenced subsequent behaviour. For example, the experiment by Pardini and Katzev (1983-1984) that compared the minimal and strong commitment (that is, verbal versus written promises, respectively) with informational prompts only, for increasing household newspaper recycling, found that both commitment groups participated more often than the prompted group. Burn and Oskamp (1986) also found that household participation in curbside recycling per week was increased by written commitment more than by written prompt.

In general, the simple act of promising to recycle influenced subsequent behaviour and the strongest effects were found when the promise to recycle was in the form of a signed statement and referred to the individual's own behaviour.

c) Environmental Alterations

Environmental alteration techniques such as adding extra or special containers have consistently been found to increase recycling behaviour. By altering the environment,

researchers have made recycling more convenient and easier to perform, thus reducing the response cost of recycling. Examples of such techniques included adding more recycling containers to a particular area (that is, increasing the proximity of containers to potential recyclers), providing containers to people participating in a curbside recycling program, and changing the day of curbside pickup to be identical to regular trash pickup. Experiments that involved manipulating the proximity of recycling containers to the targeted individuals found that recycling behaviour increases with increasing proximity of recycling containers. Office employees recycled more paper during a 10-week period when they were given either two waste cans or a divided waste can for separating recyclable from non-recyclable paper (Humphrey *et al.,* 1977). Likewise, both aluminum (soft drink) and steel (beer) can recycling among college students increased 64% after additional recycling boxes were added to dormitories for 3 to 8 weeks (Luyben *et al.,* 1979).

Techniques such as scheduling curbside pickups to coincide with regular trash days also increased recycling while making trash receptacles more attractive or distinctive had been shown to decrease littering (Geller *et al.,* 1982).

d) Goal Setting

Goal setting was used in two experiments as the main technique to encourage recycling. Hamad *et al.* (1980-1981) found positive effects of goal setting on newspaper recycling in an elementary school, lead to high recycling. The goal set by the principal was 20,000 pounds of paper to be collected by the school in 3 weeks, and the result showed a high recycling volume. However, recycling immediately declined once the goal was discontinued. Similarly, McCaul and Kopp (1982) reported increases in aluminum can recycling by college students when goal setting was used. The positive findings of these

two experiments suggest that goal setting was a promising technique for increasing recycling.

3.4.1.ii. Consequence Strategies

Consequences that have been used to increase recycling included feedback, reward, and penalties. A discussion of each of these consequence strategies follows.

a) Feedback

Providing either individuals or groups with feedback concerning their behaviour is a commonly used technique for increasing pro-environmental behaviour. Dwyer *et al.* (1993) described 10 experiments using this technique. However only one experiment was found using feedback as the primary technique to increase recycling.

Katzev and Mishima (1992) studied how feedback affected paper recycling by college students. The result indicated that feedback was successful in increasing paper recycling. However because the follow-up period (two months) was so brief, long-term benefits of this feedback procedure could not be assessed. The positive results of this study were consistent with those of the majority of experiments reviewed by Dwyer *et al.* (1993), in showing a significant effect of feedback.

b) Reward

Reward-based strategies have been among the earliest and most prominent for increasing recycling behaviour. Providing a reward in the form of prizes or money has been used in nine experiments and consistently had been found to promote recycling. Two experiments involved rewards that were directly contingent upon recycling behaviour. Hamad *et al.* (1977) found that a rewards system was more effective than verbal information about the recycling program in increasing newspaper recycling among elementary school students.

Luyben and Bailey (1979) also demonstrated that offering prizes to individual children in trailer parks increased newspaper recycling.

The remaining seven experiments that evaluated the use of lotteries to increase recycling found that participation in paper recycling increased with the use of lottery (Geller *et al.*, 1975; Witmer and Geller, 1976).

All these studies effectively employ the behavioural approach to influence people's attitudes and action. Also, these studies are similar in their attempt to alter behaviour by influencing perceptions and attitudes to what constitutes waste and its handling and disposal.

In spite of the success of reward-based interventions, there were some significant problems associated with applying these techniques. The first is the problem of low or declining participation rates while an intervention is in effect and maintenance of recycling once an intervention is terminated. Geller *et al.* (1975), Needleman and Geller (1992) and Witmer and Geller (1976) reported low levels of participation in their projects while the reward contingencies were in effect. Couch *et al.* (1978-1979) also showed steadily decreasing participation rates throughout their 8-week intervention, as well as decreasing amounts of paper recycled. Furthermore, all experiments in this section (except Diamond and Loewy, 1991; Jacobs and Bailey, 1982-1983 and Needleman and Geller, 1992, who did not report follow-up data) found that recycling decreased when the reward intervention was terminated.

c) Penalties

The final technique to promote recycling was the application of penalties for not recycling, and only one experiment evaluating the effectiveness of this technique had been published in the behavioural literature (Levitt and Leventhal, 1986). The study evaluated some of the

effects produced by the enactment of New York's "bottle law". Data were collected in several locations in both New York and in New Jersey, where no such law had been passed. The results showed a sharp decline in the number of returnable containers found in New York after the law (bottle law) went into effect, but there was no decline in New Jersey. The penalty strategy is not used in Tonga as there is no law for recycling.

3.4.1.iii Other Methods to Increase Recycling

Other than the behavioural-intervention approach reviewed above, which has produced many different techniques for improving recycling, other methods had been investigated to determine how to increase recycling mostly in developed countries. School-based educational programs have developed curricula for addressing general environmental problems. Many of these studies had reported successes in improving children's pro-environmental attitudes but most were also plagued by design flaws and lack of actual outcome variables (Leeming *et al.,* 1993).

Another area of research targeting recycling was concerned with identification of the individual differences between recyclers and nonrecyclers. Some of these variables include income, education, gender, knowledge, motivation, and attitude differences (Granzin and Olsen, 1991; Van Liere and Dunlap, 1980). These studies, however, had been riddled with inconsistencies thus making meaningful conclusions difficult. However these studies highlight the need to explore personal and household characteristics influencing and underpinning behaviour - attitudes, perceptions and actions.

Perhaps a further study could encourage manufacturers to design new products that involve less packaging material. Research efforts could also target other waste-prevention behaviours such as encouraging consumers to buy beverages that come in returnable bottles (Geller *et al.*, 1973) or encouraging them not to pick up grass clippings when mowing their

lawns. One experiment has demonstrated the success of commitment, an antecedent intervention, for increasing grass cycling (Cobern *et al.,* 1995).

A major concern with a behavioural approach to improve recycling and pro-environmental behaviour in general is the lack of evidence for long-term effects (Dwyer *et al.*, 1993). In the recycling studies reviewed, few reported that recycling was maintained after the intervention was discontinued and only one study, that by Levitt and Leventhal (1986), reported maintenance of an altered pattern extending to one year. However, Levitt and Leventhal's findings were not surprising, given the intervention under study: a bottle law still in effect.

More importantly, the problem of response maintenance is not limited to the study of the environment. Most of the research in applied behaviour change has had difficulties in finding interventions or treatment programs that encourage behaviour to be maintained after interventions have been concluded. The entire behaviour-change science could benefit from more studies assessing means for improving maintenance during long-term follow-up periods.

The above literature review targeting increasing recycling behaviour is relevant to this study, not only by illustrating the general paradigm in which the researcher was working, but also by providing information that would help further research in the area of recycling after the current recycling attitudes and behaviour are revealed from the study. Antecedent and consequence interventions provided by the literature and methods applied would provide a good basis for further research to address Tonga's problems of recyclables that end up in the landfill and other disposal sites.

3.4.2 Waste Reduction

In addition to recycling, another topic that behaviour-change researchers investigated is the reduction of input to the waste system. This line of research has received inadequate attention.

Margai (1997) conducted a study in East Harlem, New York to investigate the changes in waste reduction behaviour, before and after an educational outreach program, in an effort to increase participatory behaviour. The challenge was to identify the barriers in program participation and to then devise a strategy that would encourage greater involvement among all sectors of the population.

The research was divided into 3 phases:

a) baseline period ;

b) outreach or intervention period; and

c) post-intervention or follow-up period.

Focus group meetings (a common tool in humanistic approaches) were used which aided in designing a workable questionnaire, and were followed with interviews conducted by nine people who were hired and trained to conduct door-to-door interviews. During the intervention period, outreach programs were carried out and workshops, instructional seminars and meetings on waste prevention and recycling were held.

The results showed that there were improvements in the total daily recyclables collected. There were also widespread variations in environmental behaviour among residents in the public housing units. Specifically, waste recovery rates observed in the public housing units were restricted by structural constraints in the buildings, lack of resources, and relatively poor access to the drop-off sites. The results also showed that the age of the residents, apartment ownership, and household size were among the important predictors of

behaviour. Margai (1997) concluded that these findings provided important implications for developing and maintaining successful recovery and reduction programs in communities with similar demographic profiles.

Margai's study is concerned only with behaviours regarding reduction of waste and how to improve such behaviour. The study undertaken here, however, actually attempts to determine the general attitude to the whole process of managing waste in Tonga, which includes waste reduction, and does not consider changing those attitudes. The design of the questionnaire used in this thesis was based on the literature review and the researcher's personal observations and experience. The researcher did not consider focus groups as an appropriate method for questionnaire construction. Focus group interviews were not considered not only because the time for the research did not permit this, but also the presence of the interviewer may have caused respondents to be biased with their responses, thus giving answers that interviewers would like to hear instead of what the respondents considered to be their honest and correct responses. The questionnaire survey (discussed in Chapter Five of this thesis) was considered more appropriate because respondents were not under pressure to answer and could complete the questionnaire at a time convenient to them. Not having face-to-face contact may have allowed respondents to give honest responses to the questions.

3.4.3 Littering

One of society's enduring enigmas is its propensity to litter. This has also been the focus of much behavioural research. In the present age of heightened environmental awareness, litter not only remains primarily an eyesore, in perhaps a more subtle way, it is a threat to the environment. Litter is defined as misplaced waste material (Geller *et al.,* 1982), thus differentiating litter from waste management facilities, such as landfills and sewage plants.

Numerous strategies have been employed to examine ways to reduce the litter problem, however, the problem continues. Research on litter reduction has been conducted over the years to find strategies that would be most effective for a targeted population. Although the research does not usually suggest a single "cure-all" method to eliminate littering behaviour, many simple, creative, and cost-efficient strategies have proven to be effective (Huffman *et al.,* 1995).

A review of the different methodologies available to induce appropriate litter disposal showed that successful campaigns could be divided into either antecedent or consequence-based procedures (Dwyer *et al.,* 1993; Geller *et al.,* 1990). Reviews covering littering and various environmental issues (e.g. pollution), tended to focus on behavioural or social approaches. However, the study by Huffman *et al.* (1995) focused only on litter and attempted to integrate both behavioural and social strategies. The study by Huffman *et al.* examined 40 articles and 59 studies that employed either an antecedent or consequence strategy.

3.4.3.i Antecedent Strategies

Antecedent strategies that have been studied in relation to litter control, included written and verbal prompts, community involvement, the effects of prior litter, and trash/waste can design.

a) Prompts

Geller *et al.* (1976) examined the effects of written instructions or messages designed to prompt anti-littering behaviour. This strategy was effective in reducing litter, but methodological flaws prompted subsequent research. Geller and colleagues (Geller, 1973; 1975; Geller *et al.*, 1976; Geller *et al.,* 1977) showed that identifying a particular disposal location with specific instructions was more effective in increasing litter disposal than were

nonspecific instructions. Geller (1980) and Geller *et al.* (1982) concluded that failures of early prompting studies were due to the lack of specific disposal instructions and the lack of temporal proximity between the instructions and the desired behaviour.

Durdan *et al.* (1985) addressed the issue of sign specificity by comparing four types of anti-littering signs placed on tables in a university cafeteria. The study found no differential effects that were due to specificity for either the positive or negative signs, and that littering increased significantly when the signs were removed.

The effects of two differently worded anti-littering signs were compared by Horsley (1988) and the assertion that signs should be specific was supported.

The politeness of a sign is of significant importance. In three experiments by Reich and Robertson (1979), messages making explicit commands prohibiting litter (external pressure) actually generated more littering than a message making an appeal to social normative standards concerning littering (internal pressure).

Reiter and Samuel (1980) also assessed how the wording of a prompt affected littering. Three sign conditions (threatening, cooperative, or no sign) and the presence or absence of litter in a parking garage were examined. Predictions from earlier research were supported in that threatening signs reduced littering compared to no-sign controls, but the threatening sign was no more effective than was the cooperative sign.

The research in Tonga intends to elicit the current littering behaviour as well as the perceptions and attitudes of the Tongan community to litter disposal. Attempts have been made to decrease litter by placing message designs which are specific and positively worded 'Please place your litter in this can' on litter containers (Plate 3.1).

Further study should be conducted to explore how effective and successful these strategies are in reducing litter.

Written prompts, although relatively easy to implement, have minimal actual involvement with the persons from whom the behaviour change is desired. A verbal appeal to change the behaviour is a more socially involving technique.

Miller *et al.* (1975) used different types of verbal prompts. Two groups of students were compared by measuring the amount of trash that students littered on a pre-test and post-test. One group received an attribution condition while the other a persuasion condition. It was found that persuasion often suffered because it involved a negative attribution, whereas attribution was generally more effective because it disguised persuasive intent.

Oliver *et al.* (1985) studied the difference between written and verbal appeals to reduce littering and damage to trees in a forest campground area. The group receiving a personal appeal displayed significantly fewer problem behaviours than did the brochure-only group. Thus the more socially involving the intervention, the more effective the technique.

The appraisal of methods using the prompts technique is being used in cultural geography to elicit and assess individuals' responses and their attitudes and perceptions. Although this study does not incorporate any research on prompts, the effectiveness of this strategy is worth investigating by future researchers.

b) Community Involvement

Community involvement as an appeal to reduce littering is another antecedent condition that had been studied. In a series of four studies by Krauss *et al.* (1976), it was found that subjects who were asked to sign a petition about clean streets littered less than control subject.

Plate 3.1 Message Designs on Litter Containers

Three studies (Jason *et al.,* 1979; Jason *et al.,* 1980; Jason and Zolik 1985) examined the problem of removing dog litter with a community group as part of the intervention strategy. Jason *et al.* (1979) used a collaborative effort between an *ad hoc* community group and a university-based research team to reduce the amount of dog faeces deposited on sidewalks and lawns. Interventions that lasted only one day merely brought about temporary changes. In contrast, when the intervention lasted four consecutive Sundays, carryover effects were noted up to four weeks later. Jason *et al.* (1980), in follow up research, had community members patrol the street and ask dog owners to pick up faeces after their dogs. The results were effective in reducing dog litter. In another two studies, dog owners were given instructions and a demonstration concerning how to use a plastic bag to pick up dog feces. These two studies lasted 35 days and 12 weeks, respectively. Follow-up times ranged from

one month to 13 months. Considerable reductions in dog litter were noted, not only in target areas but in surrounding streets as well.

A large-scale intervention program that analysed three components of anti-littering behaviour was implemented by Roales-Nieto (1988). The three components included:

1. the availability of numerous trash receptacles;
2. publicity campaigns designed to make citizens aware of the importance of keeping the city clean and the negative social and legal consequences of failing to do so; and
3. active participation by citizens in cleaning up and maintaining their neighbourhoods.

Increasing the number of trash receptacles, when implemented alone or along with publicity campaigns, produced only a minimal decrease in litter. However, a substantial decrease in litter was observed when active participation by volunteers who cleaned up the dirtiest areas of their neighbourhood was added to the two previous components. This decrease in litter was maintained during the follow-up period of 3 months.

Community involvement in anti-litter campaigns is very common and effective in reducing litter in the villages and towns in Tonga. However, it is noticed that the anti-litter behaviour tends to stop once the community involvement program terminates. It is worth further investigation, using the finding of this study in Tonga, plus the information from this literature, to find out how best could the anti-littering behaviour be maintained.

c) Effects of Prior Litter

Another antecedent strategy that had been used in examining the litter problem had been the presence or absence of prior litter. It has been well documented (see Geller *et al.,* 1982, pp.84-97, a review) that littering is significantly more likely to occur in a littered setting than in a clean setting (e.g., Finnie, 1973; Geller *et al.*, 1977; Heberlein, 1971; Krauss *et al.,* 1976).

The effects of prior litter on littering behaviour have been examined in a social norm context. In considering the normative influence on behaviour, the descriptive and injunctive meaning of social norms were discriminated. The descriptive norm described what is typical behaviour, what most people tend to do. Injunctive norms refer to the rules or beliefs as to what constitutes morally approved or disapproved behaviours.

Cialdini *et al.* (1990) used five natural settings to examine the effect of norms on littering behaviour. The results appeared to show that norms had a beneficial impact on behaviour. For the subjects in the first three settings, the sight of a single piece of litter in an otherwise clean environment did not by itself lead to more littering (descriptive norm). In the fourth setting, litter on the ground was either swept into neat piles or unswept (descriptive norm). There was less litter deposited in the areas with swept litter. In the final setting, subjects were given one of four flyers that varied in relevance to the issue of littering. The first flyer asked subjects not to litter (identical relevance). The second flyer concerned recycling (close), the third concerned energy conservation (moderate), the fourth dealt with voting (far). The control flyer advertised a community event. Results showed that subjects littered the least after receiving a message that focused directly on the anti-littering norm ("Do not litter") (injunctive norm). As relevance to the subject of littering decreased, the amount of litter increased.

Moreover, a study by Reiter and Samuel (1980) examined the effect that the presence or absence of litter in a parking garage had on littering behaviour. Overall, the result from the two days of systematic observation indicated that the presence of prior litter was associated with a significant increase in littered handbills. The results of that study implied that the single most productive step to decreasing litter should be the removal of existing litter.

The studies of the normative behaviours are quite similar to the approach taken in this study in Tonga. The descriptive norm is applied in this study in exploring the typical behaviour of the Tongans in disposing litter, that is, what the Tongans actually do or in other words, their practice of litter disposal. The injunctive social norm is similar to their attitudes to litter disposal that this study is trying to uncover.

d) Trash/Waste Can Design

Environmental design is another antecedent strategy which provides an opportunity for a behaviour modification or to facilitate or encourage behaviour modification. The presence of trash receptacles and ashtrays are antecedent conditions because they help motivate disposal and lead to substantial reductions in environmental litter. It has been well documented that increasing the availability of trash receptacles and ashtrays can lead to substantial reductions in environmental litter (see Geller *et al.*, 1982, pp.84-97, for a review); a group of antecedent studies attempted to prompt a reduction in littering behaviour through the use of specially decorated and labeled trash receptacles.

The early work by Finnie (1973) suggested that the proper placement of a sufficient number of trash receptacle cans lead to substantial reductions in environmental litter. A principle weakness in Finnie's research was the failure to provide an estimate of inter-observer reliability in terms of the litter counts or behaviour observations. Also the research took place over very short time periods. Yet the research must be credited with laying much of the groundwork for similar studies that followed.

O'Neill *et al.* (1980) conducted studies using beautified trash containers, where ground litter was examined around the football stadium at Clemson University. Three experimental conditions were used. Results indicated that the decorated container collected twice the amount of litter than the standard oil drum in all but one collection period, where

the trash bags were of approximately equal weight. This research has been criticized by Geller *et al.* (1982) for lack of reliability checks on the dependent measures and for a lack of a long-term investigation phase.

By uncovering the perceptions and the attitudes of the people of Tonga to litter, further studies could be undertaken to investigate the effectiveness of using trash/waste can design to reduce litter.

3.4.3.ii Consequence Strategies

Consequences occur after a behaviour. Three types of consequence strategies available include rewards, feedback and penalties. A reward increases the likelihood that the behaviour will occur again, and a punishment (penalty) decreases the likelihood that the behaviour will occur again (Geller *et al.*, 1990). Feedback was used to reduce litter.

a) Rewards

Reward has been the most common consequence strategy used in studying litter control, although there was a series of two studies that used feedback also.

Early studies of consequence strategies indicated that these techniques were effective interventions. Burgess *et al.* (1971) paid children 10 cents for a bag full of litter collected in a theatre, and Clark *et al.* (1972) rewarded children in a campground setting with patches designed with emblems. Casey and Lloyd (1977) gave children a ticket for a free amusement park ride for a bag full of litter, and McNees *et al.* (1979) gave McDonalds cookies for bags of litter. All of these early studies found significant positive results in the amount of litter reduction by using positive reinforcements. Muth and Clark (1978) found that using a small reward for children (such as Smokey the Bear or Woodsy the Owl patches) was an effective way to encourage litter pickup in a state park area. It appeared

that tangible rewards were not needed in a wilderness litter program involving adults, who generally exhibit a common desire to keep the wilderness clean (Muth and Clark, 1978).

Use of rewards has proved successful in Tonga in reducing litter. Inter-village/town anti-litter and clean-up competitions have proved successful when rewards were given to clean villages, however, as mentioned earlier, such behaviour does not last long once the competition terminates. It is therefore important that this study on the perceptions and attitudes of the Tongan community be conducted, which may provide relevant information and become a basis for further research on how the anti-litter behaviour could be maintained.

b) Feedback

Feedback was used as a consequence strategy by Schnelle *et al.* (1980) to reduce litter on city blocks using a multiple-baseline design over 42 days. Public appeals were made by publishing in the local newspaper the amount of litter found in a particular area and comparing the amount for any day with that of the previous day. There was no noticeable difference in the amount of litter before the areas were targeted by the newspaper appeals, and, although the amount of litter was reduced when targeted, follow-up measures showed a complete return to baseline levels when the newspaper feedback was withdrawn. Gendrich *et al.* (1982) continued their research by using feedback with elementary school children. Subjects had to meet a criterion of cleanliness for their school yards to earn attendance to a Friday movie. The strategy resulted in a 75% reduction in litter, with effects continuing even at follow-up points 6 months later.

c) Penalties

It has been noted that examples of governments that had used penalty strategies (such as fines) were missing in research literature.

The literature on litter reduction focussed on studies that examined ways to reduce the litter problem in society. No study has been undertaken that examines the perceptions and attitudes of people to litter. A study of this nature should provide the very information needed for effective actions and decisions on how to address the litter problem. Without prior knowledge of the perceptions and attitudes of people, it would be very difficult to provide the most effective method for litter reduction. This study explores the attitudes and perceptions toward litter and should provide the basis for decisions on the most appropriate programs to address this ongoing problem in Tonga.

3.4.4 Knowledge and Awareness

Very few studies have been conducted on the public knowledge, attitudes, perceptions and awareness of solid waste management.

A study carried out in the city of Nairobi (Mwanthi *et al.*, 1997) assessed the factors contributing to improper solid waste management in Nairobi. Knowledge, attitudes and practices with respect to solid waste management were assessed. The researchers found that the problem of solid waste management had reached a crisis level in Nairobi. The main tool used in the data collection was a standardised questionnaire that was administered by eight trained interviewers who interviewed participants face-to-face at the participants' homes.

The study in Nairobi is similar to this study in Tonga. Both studies used a standardised questionnaire for data collection. However, the study in Nairobi administered the questionnaire by interviewing participants, whereas this study in Tonga was administered by distributing the questionnaire to the participants and asking respondents to complete the questionnaire in their own time (as discussed in chapter 4).

Chung and Poon (2001) conducted a study with the purpose of comparing the public attitudes on waste reduction practices and New Environmental Paradigm (NEP) of rural and urban Chinese citizens in three Chinese cities/towns, namely Guangzhou, Dongguan, and Yuanzhou. A comparison was made with Hong Kong, which is also a southern Chinese city, where data of a similar nature were available. NEP described the concept of treating the resources and the ecosystems on earth as things, having their own rights rather than being subordinate and subservient to humans.

The study found that the support for source separation of household waste in the rural and urban areas in mainland China was greater than that found in Hong Kong. Regarding the acceptance of the New Environmental Paradigm, it was found that the rural population scored better than the urban population and they tended to agree more frequently with the NEP. It was also found that the NEP scores of the mainland Chinese were higher, in general, than their Hong Kong counterparts as measured in early 1990s.

The study showed that there was overwhelming support for source separation of waste in mainland China, whether in rural or urban communities, and that most people were already undertaking source separation due to the redemption value of the recyclables.

The issue of waste separation and people's attitude towards waste separation are further explored in this Tonga study. This should provide useful information for decision makers on what actions need to be taken that will be beneficial economically, environmentally and health-wise to the whole of Tonga.

A public awareness survey was conducted in the town of Apia in Western Samoa (Kerslake, 1998) to assess the knowledge and level of public waste management awareness of the Apia regional area. Data was collected by interviewing the respondents and completing the questionnaires provided.

The survey revealed and highlighted the important information required to assess the knowledge and waste management awareness of the respondents. It revealed some interesting factors which would be useful in planning projects to address the waste management problems facing the people living on the Apia area. The findings also highlighted other areas which could be pertinent to decisions regarding waste management programs.

The behaviour of the respondents towards waste management issues could be generalised to reflect the behaviour and level of awareness of residents within the Apia area. The issue of public knowledge and waste management awareness are further explored in this study which could also lead to relevant and important decisions regarding waste management programs in Tonga.

3.5 Summary

This review of literature shows that behavioural studies of waste management have dealt primarily with recycling and focussed on ways that would encourage people to recycle. Studies on reducing litter took the same focus as those for recycling by investigating ways and means to reduce litter. Very few studies were conducted on attitudes and opinions to managing waste. Most studies were conducted in developed countries with very few studies in developing countries. Hardly any studies have been conducted in the Pacific Island countries and no study has been conducted to assess people's perceptions and attitudes on the complete process of solid waste management in the household, that is, from waste generation to final waste disposal. Thus although there have been no studies that could be used as a template for this study, a review of the literature provided insight into the ways the study should be facilitated.

CHAPTER FOUR: METHODOLOGY

4.1 Introduction

This chapter describes the methodology for the study. Following this introduction are five sub-sections. Section 4.2 describes the quantitative approach, that is, the study design, whereas section 4.3 explains the design and construction of the questionnaire, and the method utilized for data collection. Section 4.4 discusses the ways in which the survey was conducted, with section 4.5 describing the methods of data analysis performed using the statistical software StatView.

4.2 Study Design

> *"There is more than one gate to the kingdom of knowledge. Each gate offers a different perspective, but no one perspective exhausts the realm of 'reality' – whatever that may be"* (Burns, 1997:11).

Although there are more than one methodological approaches to research, this study employs a quantitative approach. Using a quantitative method to study human behaviour has been opposed by the advocates of the qualitative approach by taking the stand that reality cannot be subsumed within numerical classifications. They place stress on the validity of multiple meaning structures and holistic analysis, as opposed to the criteria of reliability and statistical compartmentalisation of quantitative research. However, the researcher considered the quantitative viewpoint that the epistemological underpinnings of the quantitative motif 'hold that there exist definable and quantifiable "social facts"' (Rist 1979).

One can infer perception and attitude by observing behaviour or listening to what people say. However, because observation can be unreliable and recording what people do and say may raise substantial ethical and practical problems, the researcher opted for the anonymous questionnaire survey approach. Both concepts of 'perception' and 'attitude' were operationalised as described in later sections of this chapter, and 'perception' and 'attitude' measured or inferred from the participants' responses. An anonymous survey was also considered to be the best means of obtaining information on the respondents' experiences, beliefs and attitudes to waste management. Also given the time frame for the fieldwork, the questionnaire provided an effective way of collecting the data required by the researcher to address the thesis aims and for effective data analysis and interpretation. Moreover, a questionnaire survey is a standard approach widely used in social science research and has a well-founded methodology.

4.3 Design and Construction of the Questionnaire

As stated in the previous chapter, the design and construction of the questionnaire (Appendix 1) were derived from the literature review in accordance with the study aims. The questionnaire was divided into three major parts.

4.3.1 Community Perceptions and Attitudes to Waste Management

This section was designed not only to identify the current practices of solid waste management at the household level but also to uncover the perceptions and attitudes of the people to managing the waste. Part 1 of the questionnaire consisted of 52 questions and was divided into six subdivisions, each comprising a major waste management process:

1. Waste generation (Q.1-2)
2. Waste handling (Q.3-17)
3. Waste storage (Q.18-25)
4. Final disposal (Q.26)
5. Transportation and collection (Q.27-33)
6. Waste minimisation (Q34-52)

A variety of question types were utilized. The Likert scale method of attitude measurement was employed in which the participants were asked to indicate their preferences along a scale to a set of perception and attitude questions and statements on the different processes of waste management. Examples of such questions are demonstrated by questions 9 to 12, 15, 16, 19, 29-31 and others (Appendix 1).

Checklist ranking type questions were also utilized. This involves a list of items which the participants were asked to rank according to their preferences from 1 (most preferred) to *n* where *n* is the total number of items. Question 1 is an example of this type of question.

Another question type employed was the closed question requiring a dichotomous response of yes or no. Examples are questions13, 27, 33, 43, 48 and 49. The 'open-ended items' type question was also used. These questions give a frame of reference for participants' answers, coupled with a minimum of restraint on their expression. The 'open-ended items' questions facilitate a richness and intensity of participants' responses. Such a question type was used in questions 8, 17, 24, 25, 39, 46 and 51.

In Part 1, the questions attempted to uncover, reveal and elicit the following:

i. The current practices of waste management.

The practices are elicited from responses to questions such as:

Q.3 Who handles the household waste?

Q.5 How often per week is waste cleared?

Q. 18 How is waste stored?

ii. The feelings or beliefs (affective domain) about the above practices and whether the practices are liked or disliked.

The beliefs (affective domain) were elicited using questions such as:

Q. 6 How often per week would you like waste to be cleared?

Q. 11 Do you like the way people dispose the wastes?

Q. 15 How much do you like waste to be separated before disposal?

iii. The thoughts and preferences (cognitive domain) about the above practices were sought. Questions such as the following were asked:

Q. 4 In your opinion, who should be responsible for handling the waste in the household?

Q. 9 What do you think of littering?

Q. 25 In your opinion, how can waste storage be improved in your household?

The disposition of people's actions (behavioural domain) towards the above practices was obtained.

Examples of questions used are:

Q. 7 If you are asked to do the clearing, how often would you do it?

Q. 12 How would you dispose the wastes given the above circumstances?

Q. 20 How would you store the waste if you are asked to do it?

The information from the above questions is important because by uncovering people's beliefs, preferences and behaviour, the information could become the basis for improving waste management decisions for all levels of the Tongan society.

4.3.2 Awareness Information

This section comprised eight questions (Q.53-60) which sought respondents' general knowledge and awareness of information about waste management, as well as their awareness of the problems and impacts of waste mismanagement on health, the environment and economy of the country.

Question types used are similar to those in Part I (ii). The Likert scale question type was used in questions 58 to 60 while the checklist ranking question was employed in questions 55 and 56. A yes/no question was used in question 53 and the open-ended type question was used in question 57.

The information from these questions is important because it provides information on the extent of people's knowledge and their main sources of information. Such information could be used by decision makers and other interest groups when designing future waste management programs. Furthermore, the results would inform decision-makers about the appropriate sources and medium of transmitting and communicating with the people, to ensure that whatever programs were designed are successfully conveyed to the people.

4.3.3 Personal Information

This section was designed to elicit the socio-economic and demographic characteristics of the questionnaire respondents (Q.61-69) namely gender, age, educational level, occupation, income, number of people in the household, and place of residence.

Standard classifications were used. For example, for employment, classifications according to the International Standard Classification of Occupation (ISCO-88) and used by the Tonga Statistics Department (1999) for Census 1996 for occupation, was employed in this questionnaire. Also, the Tonga Statistics Department (1999) classifications for age,

educational level, religion and the number of people in the household, were also employed in the questionnaire.

Questions eliciting personal information not only describe the characteristics of the survey sample and their representativeness, but also they provide very important information for data analysis and interpretation. The perception and attitude of the people and their waste management practices may be related to their social, economic and demographic characteristics and place of residence. The information provided by this section is indispensable for understanding and interpreting findings from the previous two parts.

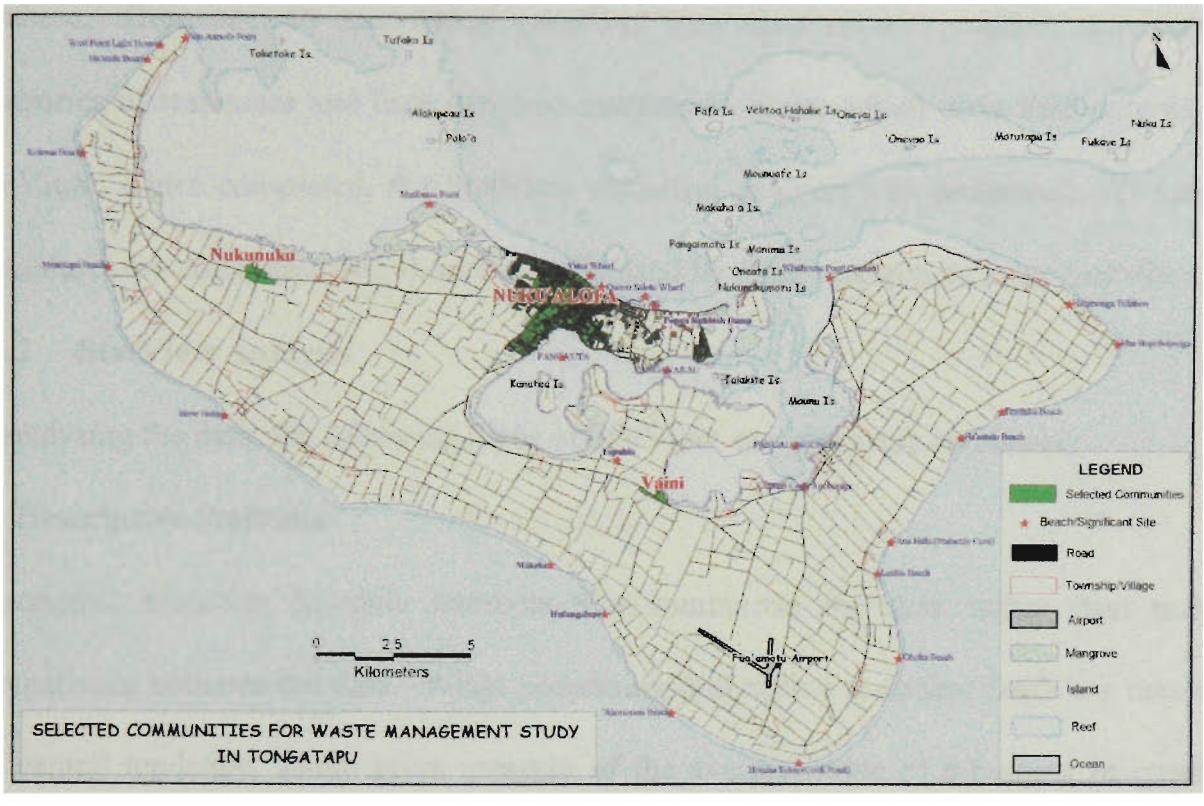
4.4 Conducting the Survey

A pilot questionnaire was developed and administered to a random sample of 15 participants, in December, 2000. Changes made as a result of this pilot survey included minor alterations to some wording and layout of questions. The revised questionnaire (Appendix 1) was administered during a three month study period (January to March 2001). There were two stages for selection of the participants. The household was first selected and a member of the household to be the respondent was then selected. A random sample population of 220 households was selected from the villages of Vaini (n=50), Nukunuku (n=20) and the capital, Nuku'alofa (n=150) (Map 4.1). For each location, the households were randomly selected from the residential census blocks used by the Tonga Statistics Department for census purposes. A stratified sampling technique based on gender and age categories was used to select individual participants to try to secure a representative sample of both males and females and also the different age groups.

The potential participant was approached, given an information sheet (Appendix 2) plus a verbal explanation of the purpose of the study, followed by a request for participation. If the potential participant agreed to participate, the consent form (viewed in Appendix 3) was then provided for signature.

The participants were then provided with the questionnaire and asked to fill in the questions directly or with the assistance of the researcher depending on the preference of the participant. If the participant agreed, the researcher remained to answer any further questions, taking care to provide clarification and explanation only and not to influence any of the participant's responses nor to direct the way in which participants responded. If the participant wanted to fill in the questionnaire at his/her leisure, the researcher returned to collect the completed questionnaire at a time specified by the participant. The questionnaire was conducted during the weekdays at non-specific times during the day. The questionnaire took about 45 minutes to 1 hour to complete and the participants were all consenting adults. Both the pilot survey and the revised questionnaire were administered by the researcher alone, to ensure the same treatment was given to each survey.

Out of the 220 questionnaires that were distributed, 172 were returned, giving an overall response rate of 78% with no discernible trends in those failing to return their questionnaire.



Map 4.1 Selected Communities for Waste Management Study in Tongatapu

4.5 Methods of Analysis

4.5.1 Data Coding and Entry

Once the questions had been set, they were organised for ease of computer coding and entry. For each question, variables represented the different responses to questions. Questions were analysed to determine whether the variables were nominal or continuous. Each participant response for closed 'yes/no' questions, Likert scaling and checklist ranking were directly assigned a numerical value and then the data were entered into a database using Microsoft Access. The open-ended questions were entered as a text field in Access. Once all the survey responses were coded and entered into the database using Access, they were then imported into the statistical software package, StatView.

The data entries in StatView were again checked for incorrect entries and errors in the database. Responses to open-ended questions were checked and recoded into common categories of responses and then assigned numerical values, which were then entered into StatView. Once completed, the StatView statistical analysis was performed. The above procedures are consistent with those normally used by other researchers using StatView.

4.5.2 StatView Analysis

In analysing the data, the following types of StatView analyses were conducted:

a) Descriptive Statistics

Descriptive statistics compute numbers that summarise the data rather than making comparisons between the data. When processing descriptive statistics, StatView measures the central tendency, which gives measure of the average value of a number or quantity, where the average can take on a variety of meanings. It also measures the variability, which conveys whether most measurements are clustered within a narrow range of values or spread over a large range. The StatView manual also states the descriptive statistics also measures the overall distribution property (Abacus Concepts, 1996)

b) Frequency Distribution

Frequency distribution tables and graphs were used to show the distribution of the responses. Frequency distribution tables and graphs also helped identify some data characteristics that influenced the descriptive statistics and other analyses to be used. (Abacus Concepts, 1996).

c) Contingency Table Analysis (Chi-square test)

The contingency table analysis in StatView was employed to determine whether a relationship exists between two nominal variables. The contingency tables were studied to

see which combinations responses or groups of responses had more or less observations than would be expected if the two variables were independent. To do this, StatView uses the chi-square test for independence. The hypothesis of independence states that the likelihood of an observation falling into one group for one variable is independent of any other group the observation falls into (Gregory, 1963). In calculating this test, StatView finds the expected value for the number of observations for every combination of groups based on the hypothesis of independence and compares the expected with the observed values in each cell. A low chi-square value and high probability (p value) indicates acceptance of the null hypothesis. However, a large chi-square value and a correspondingly low probability, suggest rejection of the null hypothesis (Abacus Concept, 1996). For the chi-square test, StatView produces a 'significance level'. In this study, a significance level of 0.05, which is the convention, was used as the cutoff. A significance level of more than 0.05 indicates the null hypothesis is not valid and therefore there is no significant relationship or correlation in the data set. A significance level of less than 0.05 indicates the null hypothesis is valid and therefore there is a significant relationship or correlation in the data set.

4.6 Summary

The quantitative approach using the questionnaire survey method was employed by this study for data collection. The questionnaire was designed to uncover, reveal and elicit the affective, cognitive and behavioural domains of how people manage the household waste. The stratified sampling technique was used to identify the respondents to whom the questionnaires were distributed. The survey responses were coded and entered into

database using Access and then imported into StatView, which was used for the analysis. The StatView analysis conducted included descriptive statistics, frequency distribution and chi-square test.

CHAPTER FIVE: RESULTS - WASTE MANAGEMENT PROCESSES

5.1 Introduction

This chapter presents the first part of the results of the survey. The first section gives a description of the socio-economic demographic characteristics of the survey respondents. The descriptive analysis of the respondents' practices, perceptions and attitudes to waste generation management (handling, storage, transportation and collection, waste minimisation, and final disposal) is presented in the second section. The third section presents the results of the associations/relationships between the respondents' socio-economic and demographic characteristics (as presented in the first section) with the practices, perceptions and attitudes of the Tongans community to waste management (as presented in the second section).

5.2 Summary Of Survey Respondent Characteristics

This section summarises the social, economic and demographic status of the respondents, who are believed to be representative of the population of Tonga. It is imperative to include the socio-economic demographic information of a survey population as this helps in understanding and explaining the perceptions, attitudes and waste management practices of the respondents and from this it may be possible to obtain a broader view of the community as a whole.

5.2.1 Demographics

The total number of survey respondents was 172, from the three study areas: Nuku'alofa, the capital city, and the villages of Vaini and Nukunuku. Table 5.1 shows the percentage

gender composition of the total sample and Tongatapu (island where the study was conducted) population. Females are slightly over represented in this study compared to their representation in the population. This is however logical, because generally females in Tonga are designated the household duty of managing waste, and therefore, it is reasonable for females to be represented as such when a questionnaire has to be completed.

Table 5.1 Gender Distribution

Gender	Total sample population	Tongatapu population (1996)
Male	45%	50.3%
Female	54%	49.6%

5.2.2 Age

Age is a standard demographic component of research on social issues. The aim of including the age distribution in this survey is to determine if there are any waste management practices, perceptions and/or attitudes that are common to any particular age groups or whether the population as a whole share the same practices and views. Such information is crucial for decision making as it may be necessary to target one or more sections of the population according to age cohorts. Table 5.2 shows the age distribution of the survey respondents and for the island of Tongatapu.

The age distribution is not representative of Tongatapu's population as the middle age cohorts (25-54) are over-represented. However, this is again can be explained easily since it is these cohorts who are likely to influence waste management in the home and are the cohorts who are well educated and likely to complete the survey.

Table 5.2 Age Distribution

Age (years)	Number of responses	Percent of responses	Tongatapu (%)
18-24	30	17	14
25-34	43	25	14
35-44	51	30	10
45-54	33	19	7
55+	15	9	10

5.2.3 Household Size

Household size distribution for the survey population is skewed towards some household sizes. More than half of the respondents were from the medium household size (5-8), with very few from larger households. The household distributions for the population of Tongatapu is not available, thus no comparison could be made to establish whether the sample population is representative of the Tongan population. Table 5.3 shows the household size distribution for the respondents population.

Table 5.3 Household Size

Household Number	Survey number	Survey percent
1-4	45	26
5-8	96	56
9-12	23	13
13+	8	5
TOTAL	172	100

5.2.4 Educational Level

The distribution of respondents' educational level is again not representative of the population as a whole. A very high proportion of the sample population had tertiary education (62%). Primary education level is under represented in keeping with Tongatapu's population. Such bias may be accounted for by the presence of the large

sample from the capital city, which consist of a highly educated portion of the population. Moreover, it may be a measure of the importance placed on academic standing or that household members feel they should be seen to be well educated and that the most appropriate person to complete the questionnaire should be the one with the highest education level in the household. Table 5.4 shows the educational level distribution of the sample population and for the population of Tongatapu.

Table 5.4 Educational Level

Educational Level	Survey number	Survey percent	Tongatapu (%)
No schooling	0	0	12
Primary school	6	4	56
Secondary school	59	34	27
Tertiary education	107	62	5
TOTAL	172	100	100

5.2.5 Occupation

The occupational distribution is also skewed towards some vocational cohorts. The professionals/technicians, clerks and service cohorts are over represented, while skilled agriculture/fisheries and elementary occupational cohorts under represented. The bias in the distribution may again be accounted for by the presence of the large sample from Nuku'alofa, the capital city which consist of a high proportion of the skilled occupational cohorts. Table 5.5 shows the sample population occupational distribution as well as for Tongatapu as a whole.

Table 5.5 Occupational Distribution

Occupation	Survey number	Survey percent	Tongatapu (%)
Legislators/Managers	5	3	2
Professionals/Technicians	67	39	14
Clerks	40	23	8
Service workers	24	14	6
Skilled agriculture/fisheries	4	2	34
Elementary occupation	32	19	36
TOTAL	172	100	100

5.2.6 Income

A very high proportion of the sample population has high incomes. As the majority of the respondents are highly educated and employed, it is expected that they also would receive high income based on Tongan standards. The income distribution for the Tongatapu population as a whole is not available and thus no definitive statement can be made on the representativeness of the sample population. Table 5.6 shows the income distribution for the sample population.

Table 5.6 Income (Tongan Pa'anga TP$)

Income (TP$)	Survey number	Survey percent
Less than 3000	17	10
3000-5000	25	15
5001-10000	51	30
More than 10000	77	45
TOTAL	170	100

5.2.7 Place of Residence

A high proportion of the sample population is from Nuku'alofa, the capital city. The village of Nukunuku is slightly under represented in keeping with Nuku'alofa's over representation compared to the population of Tongatapu as a whole. Table 5.7 shows the population distribution for the three study areas and a comparison to the study areas population within Tongatapu.

Table 5.7 Place of Residence

Place of residence	Survey number	Survey percent	Tongatapu (%)
Nuku'alofa	122	71	47
Vaini	40	23	17
Nukunuku	10	6	9
TOTAL	172	100	73

5.3 Practices, Perceptions And Attitudes To Waste Management

5.3.1 Introduction

This section presents the responses on the practices, perceptions and attitudes (affective, cognitive, behaviour) to waste management. As waste management encompasses a number of different processes (waste generation, handling, storage, collection/transportation, waste minimisation, and disposal), the responses to many questions are presented in four stages:

a) what is currently practiced,

b) what respondents would prefer, which elicit their affective attitudes,

c) what are their beliefs and thoughts, which reveal their cognitive attitudes, and

d) what and how would they act if asked to do it themselves, which uncovers their behavioural attitudes.

The failure rate of respondents to answer the questions varies from question to question. The StatView descriptive analysis plus the frequency distribution summary table were used for the analysis. In the following tables, all percentages are corrected to the nearest 1% and the percentage of no responses to a question is not included. In the following section "Table" refers to tables in the text and 'table' refers to tables in the appendices.

5.3.2 Waste Generation

This section of the survey was designed to determine what respondents saw as the major waste material and also their perceptions as to the problems regarding the amount of waste generated.

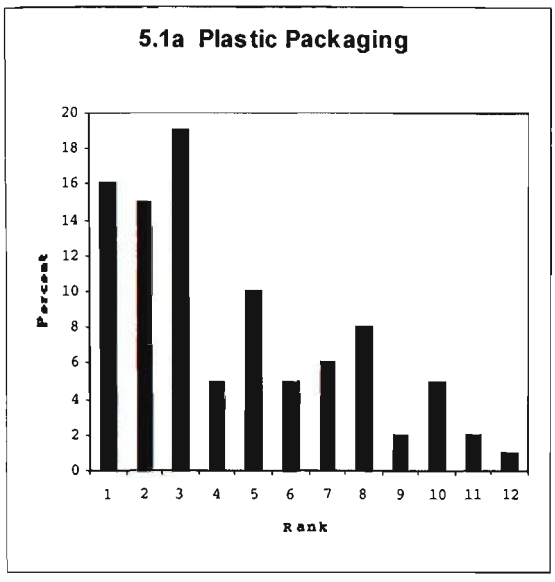
Question 1.

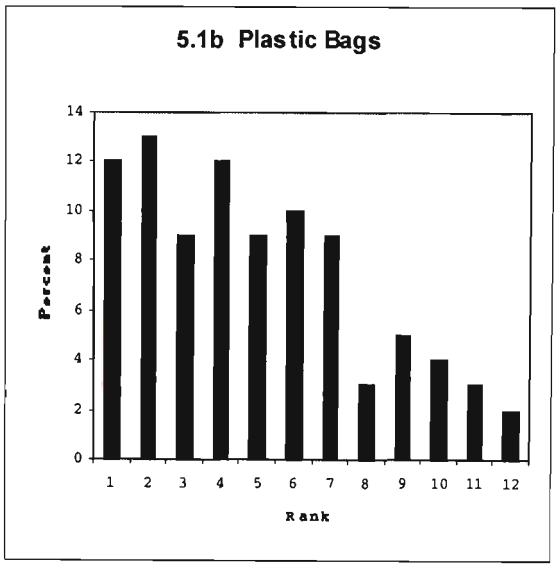
This question asked respondents to rank twelve categories of waste in order of abundance. The results are presented in Table 5.8.

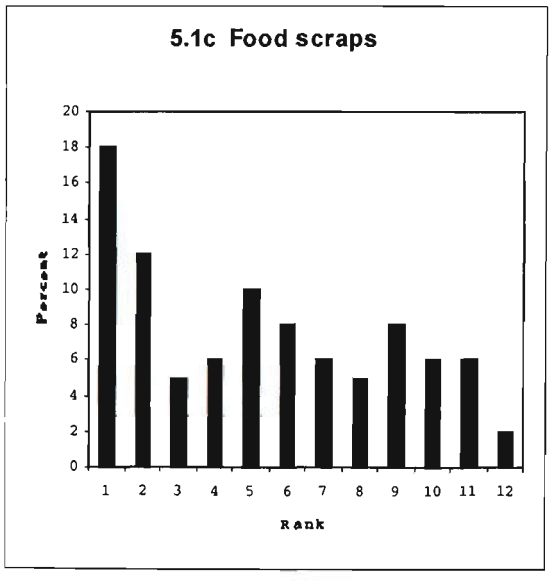
Table 5.8 Household Waste Abundance Ranking

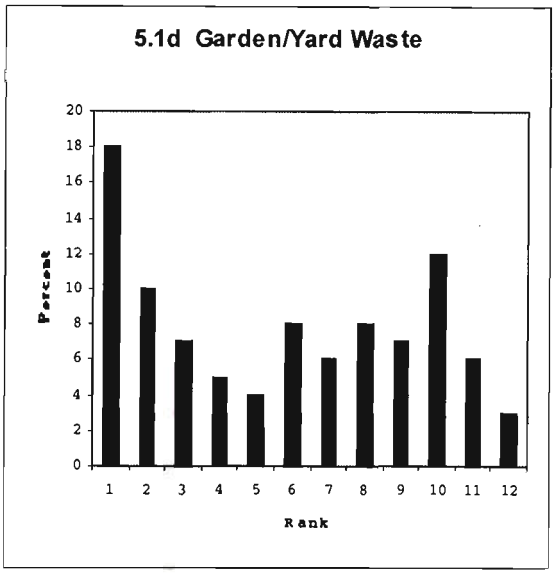
Waste Types	Mean	Standard Deviation
1. Plastic packaging	4.0	3.0
2. Plastic bags	4.6	3.1
3. Food scraps	4.9	3.5
4. Garden & yard waste	5.3	3.8
5. Tin cans	5.4	2.9
6. Waste papers	5.5	3.1
7. Paper/cardboard packaging	5.6	3.0
8. Others	5.7	5.7
9. Glass jars/containers	6.1	3.3
10. Aluminum cans	6.4	3.1
11. Cloth	7.0	3.6
12. Diapers	7.2	4.5

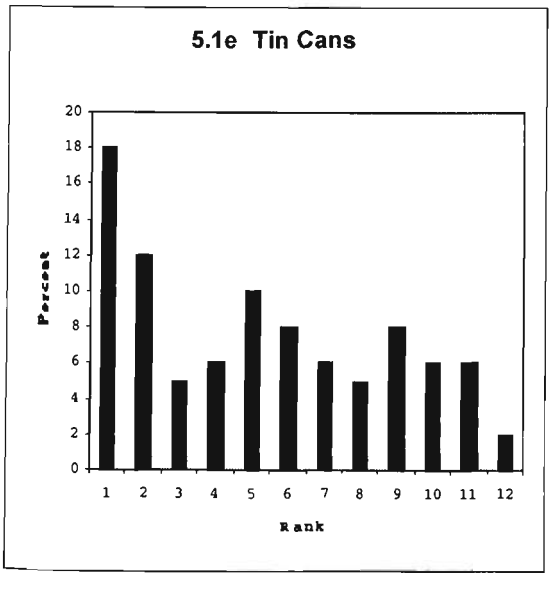
Plastic packaging is clearly seen as the most common form of waste. Cloth and diapers appear to be the least abundant and with the difference between waste types 4 to 8 (garden/yard waste to 'others'). The responses for each cohort have a large standard deviation indicating a wide spread of responses. Figure 5.1 (Ranking of Household Waste Abundance) shows the distributions of waste rankings for each waste type cohort. Some responses show a bimodal distribution such as garden/yard wastes and diapers, whereas others are multi-modal, such as waste papers, food scraps, aluminum and tin cans cohorts. Most of these distributions are skewed, some to the left showing the responses for the cohort are more abundant than average, for example, plastic bags, plastic packaging and food scraps. Some are skewed to the right indicating the responses for that cohort are less numerous than the average, for example, cloth and diapers.

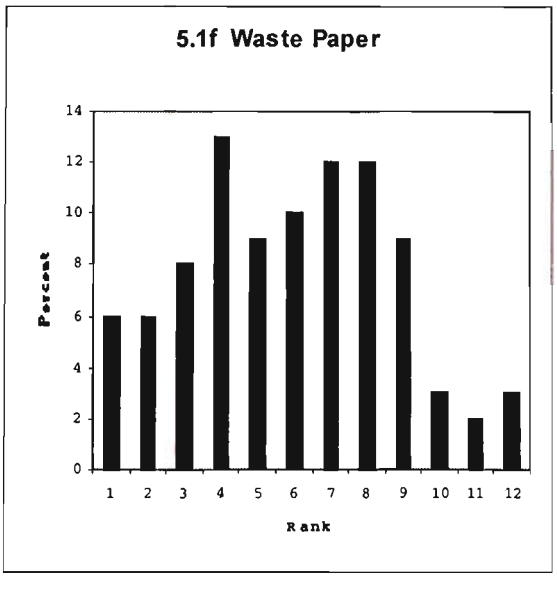

5.1a Plastic Packaging
Percent
Rank
0 2 4 6 8 10 12 14 16 18 20
1 2 3 4 5 6 7 8 9 10 11 12

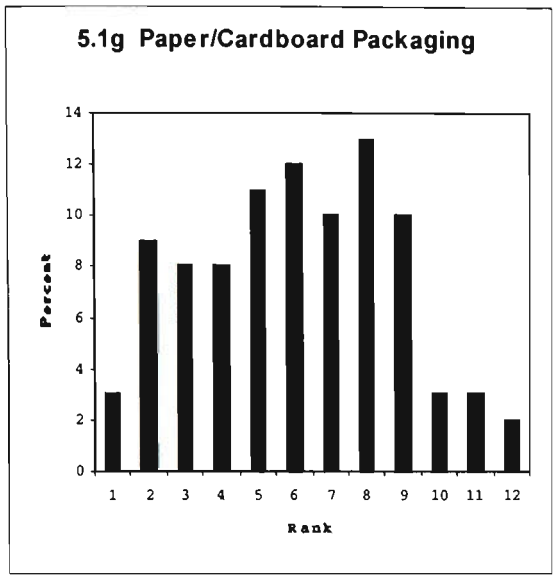

5.1b Plastic Bags
Percent
Rank
0 2 4 6 8 10 12 14
1 2 3 4 5 6 7 8 9 10 11 12

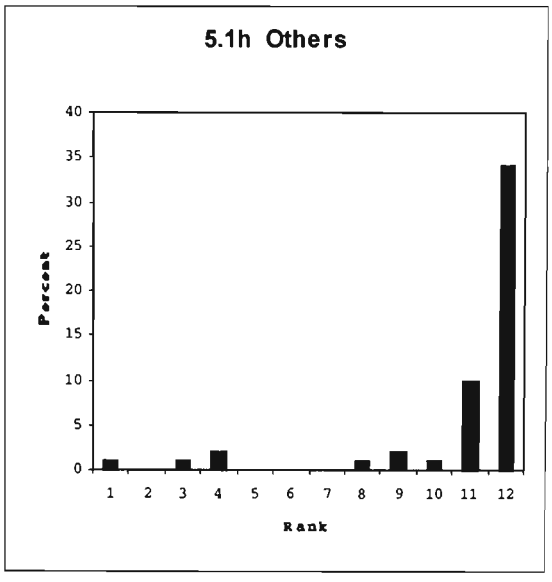

5.1c Food scraps
Percent
Rank
0 2 4 6 8 10 12 14 16 18 20
1 2 3 4 5 6 7 8 9 10 11 12

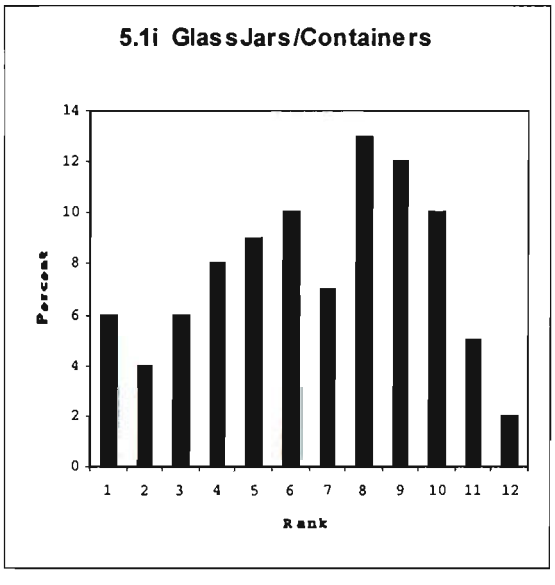

5.1d Garden/Yard Waste
Percent
Rank
0 2 4 6 8 10 12 14 16 18 20
1 2 3 4 5 6 7 8 9 10 11 12

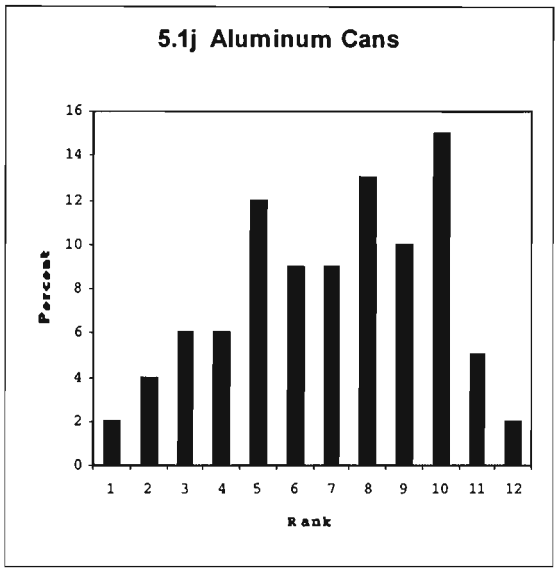

5.1e Tin Cans
Percent
Rank
0 2 4 6 8 10 12 14 16 18 20
1 2 3 4 5 6 7 8 9 10 11 12

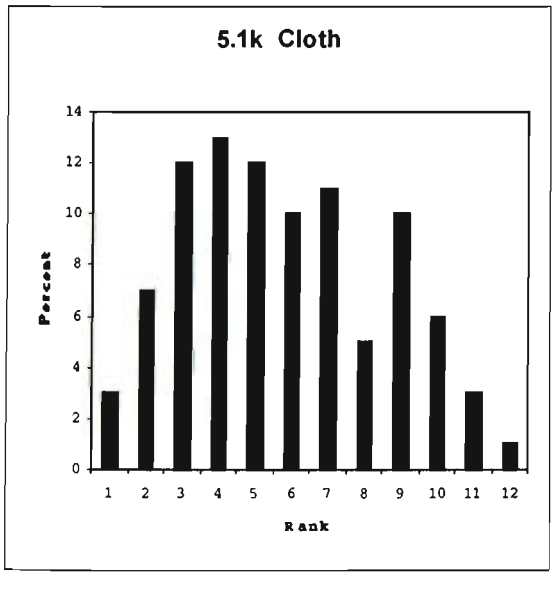

5.1f Waste Paper
Percent
Rank
0 2 4 6 8 10 12 14
1 2 3 4 5 6 7 8 9 10 11 12











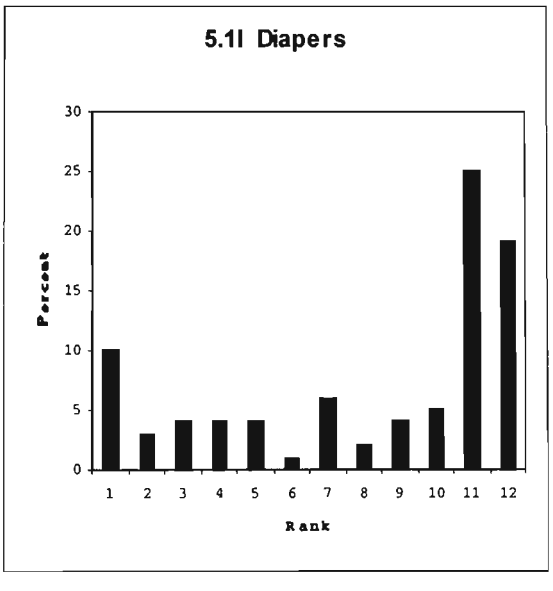


Figure 5.1 Ranking of Household Waste Abundance

Question 2.

The respondents were asked for their perceptions as to the problems regarding the amount of waste generated in the household. Their responses are presented in the Table 5.9.

Table 5.9 Perceptions of Waste Problems (%)

Waste Types	**No Problem (%)**	**Slight Problem (%)**	**Problem (%)**	**Major Problem (%)**	***Rank Abundance***
Plastic bags	38	35	10	14	*2*
Plastic packaging	27	41	17	12	*1*
Paper/cardboard packaging	43	39	12	2	*7*
Waste paper	39	35	17	5	*6*
Garden/yard waste	42	37	14	10	*4*
Glass jars/containers	24	34	23	17	*9*
Aluminum cans	21	33	26	17	*10*
Tin cans	16	32	27	22	*5*
Food scraps	47	27	16	8	*3*
Cloth	46	33	12	5	*11*
Diapers	35	20	13	24	*12*
Others	23	10	6	5	*8*

Most of the respondents perceived plastic bags, paper/cardboard packaging, waste paper, garden/yard waste, food scraps and cloth as not a problem or a slight problem. Slightly less than half of the respondents perceived glass jars/containers and aluminum cans as a problem or major problem and half perceived tin cans as a problem. Although most respondents considered diapers as not a problem, some considered it a serious problem.

In relating the responses for waste abundance ranking (Table 5.8) with the problems perceived (Table 5.9), the following observations are made:

i. Paper/cardboard packaging, waste paper and cloth are not considered to be an abundant waste type and are considered not to be a problem either.

ii. Plastic bags, plastic packaging, food scraps and garden/yard waste are considered an abundant form of waste but not considered a problem.

iii. Glass jars/containers, diapers and aluminum cans are considered not to be an abundant waste form but are considered to be problematic.

iv. Tin cans are considered to be an abundant form of waste and are considered to be problematic.

5.3.3 Waste Handling

a) Waste Handling Responsibilities

This part of the survey was designed to find out those responsible for handling the household waste, and also their opinions as to whom should be responsible for handling household waste.

Question 3.

This question asked the respondents to identify those responsible for handling (sweeping, clearing) the household waste. Their responses are presented in Table 5.10.

Table 5.10 Household Waste Handling Responsibilities (%)

Waste Types	Everybody	Parents	Paid Worker	Female only	Male only	*Rank Abundance*
Plastic bags	21	6	3	56	13	*2*
Plastic packaging	22	5	3	49	19	*1*
Paper/cbrd pckg	18	4	3	44	27	*7*
Waste papers	19	3	4	55	16	*6*
Garden/yard wst	23	4	6	21	44	*4*
Glass jar/cont	18	3	3	38	34	*9*
Aluminum cans	20	3	2	30	41	*10*
Tin cans	20	3	2	30	41	*5*
Food scraps	20	6	3	38	30	*3*
Cloth	16	5	2	61	12	*11*
Diapers	10	5	2	52	10	*12*
Others	8	3	3	14	15	*8*

The handling of most household waste types is predominantly the responsibility of females only. The exceptions are garden/yard wastes, aluminum cans and tin cans, which are predominantly the responsibility of males. Glass jars/containers and 'others' are almost equally shared between male and female which indicates no clear gender role. Not much of the household waste handling responsibilities is carried out by paid workers and parents.

Question 4.

This question asked for the respondents' opinions on who should be responsible for handling the household waste. Table 5.11 presents the responses, which elicited the cognitive attitudes to waste handling responsibilities.

Table 5.11 Opinions on Household Waste Handling Responsibilities (%)

Waste Types	Everybody	Parents	Paid worker	Female	Male
Plastic bags	27	6	2	44	17
Plastic packaging	25	7	2	40	22
Paper/cardboard packag	22	7	3	28	34
Waste paper	25	6	3	44	17
Gardens/Yard waste	23	10	4	18	42
Glass jars/containers	22	8	4	26	37
Aluminum cans	24	6	4	19	44
Tin cans	23	6	4	19	44
Food scraps	19	8	4	33	31
Cloth	20	7	3	60	6
Diapers	17	6	3	48	10
Others	8	3	5	16	15

Most of the respondents think that female should be responsible predominantly for handling plastic bags, plastic packaging, waste papers, cloth and diapers, whereas males should be predominantly responsible for paper/cardboard packaging, garden/yard waste, glass jars/containers, aluminum cans and tin cans. Handling responsibilities for food scraps

should be shared by both male and female. Parents and paid workers appeared to have less waste handling responsibilities.

Question 8.

This question required the respondents to identify whether waste handling is a problem in their household, and if so, to give reasons why they think it is a problem. This question is addressed here because it is directly related to waste handling responsibilities discussed in this particular section of the results.

The answers showed that waste handling was considered by 47% of the respondents as a problem in the household. The reasons they gave for the handling problems are: having no time and too many children (14%), no proper storage containers and not having enough storage space (13%), laziness (9%), attraction of flies and animals (6%), and environment and health problems (6%).

b) Waste Clearance

This section of the survey was designed to determine the current practice of household waste clearance, the respondents' opinions about waste clearance, and the behaviour of the respondents if asked to do the work.

Question 5

This question asked the respondents what they currently do in terms of the frequency of clearing household waste. The responses are presented in Table 5.12.

The results showed that most respondents cleared food scraps, plastic bags, diapers and waste papers daily, whereas garden/yard wastes, cloth, glass jars/containers, aluminium cans and tin cans are cleared once a week.

Table 5.12 : Household Waste Clearance Practices (%)

Waste types	Less than weekly	Once a week	Twice a week	Everyday	*Most frequent responses*
Plastic bags	1	17	12	38	*2*
Plastic packaging	1	28	24	45	*5*
Paper/cardboard packaging	1	38	23	37	*6*
Waste papers	1	24	25	48	*4*
Garden/yard wastes	2	55	26	16	*12*
Glass jars/containers	4	53	17	24	*9*
Aluminum cans	4	51	20	24	*9*
Tin cans	3	48	20	26	*8*
Food scraps	1	10	12	76	*1*
Cloth	13	41	22	22	*11*
Diapers	13	16	8	47	*2*
Others	10	17	7	16	*7*

That diapers and cloth (13% each) are cleared less than weekly may indicate that some households do not have babies or elderly who use diapers and therefore diapers are not generated in those households. Cloths may be re-used and hence there would be none to be cleared.

Question 6.

This question asked for the respondents' preferences for the frequency of waste clearance (Table 5.13). The responses elicited the affective attitude that most respondents preferred the household waste to be cleared daily.

Question 7.

The respondents were asked how often they would clear the household waste if they were asked to clear the waste themselves. The answers presented in Table 5.14 showed that most respondents would clear the waste daily.

Table 5.13 Preferences for Waste Clearance (%)

Waste Types	Less than weekly	Once a week	Twice a week	Everyday	Most frequent
Plastic bags	1	13	19	66	*3*
Plastic packaging	1	15	25	59	*5*
Paper/cardboard packaging	2	19	25	52	*7*
Waste paper	1	16	17	65	*4*
Garden/yard waste	0	27	30	40	*10*
Glass jars/containers	1	31	19	47	*8*
Aluminum cans	2	25	19	53	*6*
Tin cans	1	24	21	53	*11*
Food scraps	0	8	12	79	*1*
Cloth	3	30	26	39	*12*
Diapers	3	9	9	68	*2*
Others	5	10	9	27	*9*

Table 5.14 Waste Clearance Act/Performance (%)

Waste Types	Less than weekly	Once a week	Twice a week	Everyday	*Most frequent*
Plastic bags	1	18	24	57	*3*
Plastic packaging	1	19	27	52	*5*
Paper/cardboard packaging	1	26	27	45	*6*
Waste papers	1	18	23	58	*3*
Garden/yard wastes	1	35	30	33	*12*
Glass jars/containers	2	38	25	35	*11*
Aluminum cans	2	33	27	38	*9*
Tin cans	1	32	27	38	*8*
Food scraps	1	12	12	75	*1*
Cloth	3	38	20	35	*10*
Diapers	3	10	11	63	*2*
Others	5	15	9	24	*6*

c) Littering

This section of the survey addressed the respondents' perceptions of litter, their own litter disposal practices and attitudes towards litter disposal given different circumstances.

Question 9.

This question asked for the respondents' perceptions of litter in Tonga nationally, their own village/town and their individual household. The responses are presented in Table 5.15.

Table 5.15 Perceptions of Litter Problems (%)

	No problem	Slight problem	Problem	Serious problem
Tonga	0	2	17	81
Village/town	1	15	40	42
Household	14	49	14	19

The responses for the three locations are very different. Litter is perceived as a serious problem for Tonga (nationally), not so serious for the village/town and only a slight problem in the household.

Question 10.

This question asked for the respondents' litter disposal practices given four different circumstances. The first circumstance is at a festival at Pangai (a place where festivals are usually held) where many people normally attend. The second is the road and for street where pedestrians commute daily. The third is picnicking at the beach, which is very common, and lastly in the household. The responses are presented in Table 5.16.

Table 5.16 Litter Disposal Practices for Four Different Circumstances (%)

Circumstances	Rubbish container	Throw-away	Throw into the sea	Take home	Others
Pangai festival	27	58	6	3	2
Road	13	69	2	8	4
Beach	15	31	44	6	3
Household	62	16	1	6	10

Most of the spectators who attend a festival at Pangai disposed of their rubbish by throwing it away, and similarly with people travelling on the road. Those picnicking at the beaches disposed of their rubbish by throwing it into the sea or by throwing it away (Plate 5.1). However, in the households, only a very few respondents throw their litter away and most dispose of the litter in rubbish containers.

Question 11.

Given the disposal practices for the different circumstances above, respondents were asked whether they liked these litter disposal practices (Table 5.17).

Table 5.17 Affective Attitudes to Litter Disposal (%)

	Don't like it at all	Don't really like it	Like it	Like it very much
Pangai festival	58	17	6	15
Road	60	20	7	6
Beach	63	16	7	8
Household	23	13	19	40

The majority did not like the way rubbish/litter was disposed of during the festival at Pangai or along the roadside and at the beach. However, most respondents liked the way rubbish/litter was disposed of in the household.

A

B

Plate 5.1 Litter Disposal at the Beach and into the Sea

Question 12.

The respondents were asked how they would dispose of their rubbish/litter given the same four circumstances as in question 11. The responses are shown in Table 5.18 which uncover the respondents behavioural attitudes to litter.

Table 5.18 Respondents Behaviour to Litter Disposal (%)

	Rubbish container	Throw away	Throw into the sea	Take home	Others
Pangai festival	80	3	1	8	3
Road	46	3	1	36	5
Beach	49	4	4	30	5
Household	75	3	1	5	8

For all the four circumstances, most said they would dispose of their rubbish/litter in containers. Some responded that they would take their rubbish/litter home instead of leaving it along the roadside or at the beach. Very few would throw away their rubbish or throw into the sea.

d) Waste Separation

This part of the survey was designed to find the practices of waste separation, what respondents thought of waste separation, what the respondents would do if they had to separate waste themselves, and the reasons for not separating waste.

Question 13.

This question asked respondents whether they separate waste prior to disposal.

Fifty eight percent of the respondents said they practiced waste separation whereas 42% did not.

Question 17.

Those who did not separate waste were asked to give reasons for not doing so.

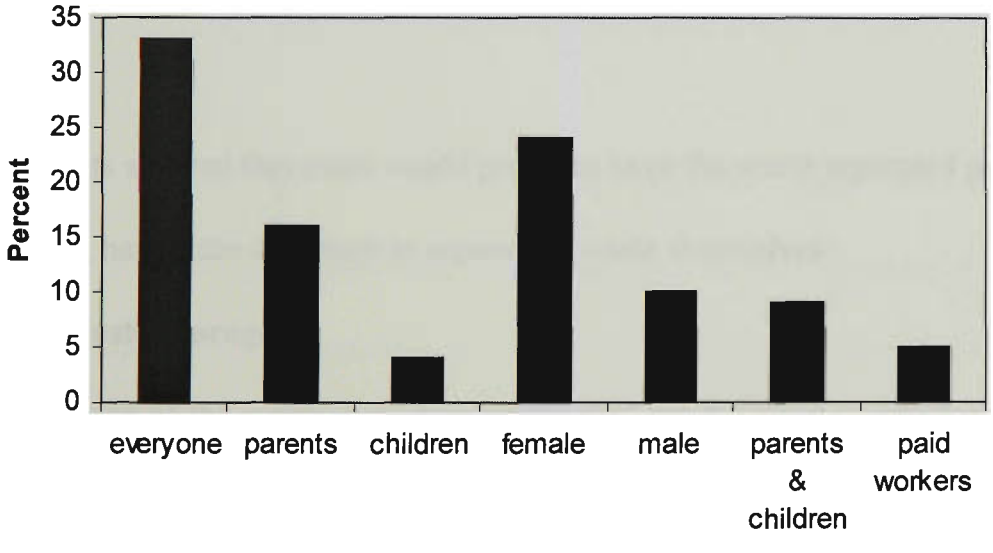
The reasons they gave were laziness (10%), no time (10%), no practical purpose for doing so (9%), dirty and unhealthy (5%), lack storage containers/space (4%) and lack of awareness (4%).

Question 14a.

Respondents were asked who in the household is responsible for waste separation.

Figure 5.2 shows the responses. Some said 'everyone' (33%) did separation of waste and 25% said that females only were responsible. Children and paid workers did little separation of waste.

Figure 5.2 Waste Separation Responsibilities



Question 15.

The respondents were asked how much they would like waste to be separated before disposal in order to elicit the respondents' affective attitudes to waste separation. The responses are presented in Table 5.19.

Question 16.

The respondents were further asked how much they would like separating waste themselves. This question was designed to uncover their behavioural attitudes to waste separation. Their responses are also presented in Table 5.19.

Table 5.19 Respondents' Affective and Behavioural Attitudes to Waste Separation (%)

	Don't like it at all	Do not really like it	Like it	Like it very much	No response
1) Affective attitude	4	2	13	47	34
2)Behavioural attitude	2	8	19	35	36

The results showed that most would prefer to have the waste separated prior to disposal and similarly, have little objection to separating waste themselves.

5.3.4 Waste Storage

This section of the survey was designed to find out the ways in which the household waste is stored, how long it is stored, problems associated with waste storage and how these problems could be overcome.

Question 18.

The respondents were asked about the methods they utilise for storing waste in their households. Their responses reveal the practices of household waste storage. The respondents' answers are presented in Table 5.20

Table 5.20 Household Waste Storage Practices (%)

Waste types	Plastic bags	C/board box	Open container	Closed container	Open pile	Basket	Others
Plastic bags	54	11	9	11	3	1	3
Plastic pcking	35	15	19	12	5	1	3
Paper/cdb pck	15	27	18	7	16	3	3
Waste paper	23	27	26	9	10	1	3
Garden/yard	6	4	6	5	38	20	11
Glass/jar cont	12	12	22	19	13	5	6
Aluminum cans	18	12	22	14	14	6	5
Tin cans	17	10	22	14	14	8	6
Food	14	2	17	38	7	7	8
Cloth	21	28	13	8	13	2	6
Diapers	34	3	6	28	3	1	3
Others	3	1	4	3	5	2	5

The results showed the variations in storage practice. Some storage methods are more common for storing of particular waste types than others. Storing in plastic bags is very common for waste types such as plastic bags, plastic packaging and diapers. Wastes such as cloth, paper/cardboard packaging and waste papers are commonly stored in cardboard boxes. Open containers are quite common for storing glass jars/containers and aluminum cans and tin cans while food scraps and diapers are commonly stored in closed containers. Direct storage in open piles outside and in baskets is a common practice for garden and yard waste.

Question 19.

The respondents were asked whether they liked the way waste is stored in their household. The answers solicited the respondents' affective attitudes to waste storage. The responses are presented on Table 5.21.

Table 5.21 Respondents' Affective Attitudes to Waste Storage (%)

Waste types	Don't like it at all	Don't really like it	Like it	Like it very much
Plastic bags	9	12	40	35
Plastic pck.	12	10	42	30
Paper/cdb pck	11	13	42	27
Waste paper	11	15	41	28
Garden/yard	14	15	39	28
Glass jars/con	18	20	33	26
Al. Cans	17	20	31	27
Tin cans	18	21	30	27
Food scraps	15	18	28	34
Cloth	12	16	40	26
Diapers	23	15	21	22
Others	10	3	11	10

The results showed that most generally liked the way waste is stored in the household. A fair distribution of the respondents either liked or disliked the way glass jars/containers, aluminum cans and tin cans are stored prior to disposal. However, in comparison with the other waste types, a much higher proportion disliked the way diapers are stored.

Question 20.

This question asked respondents how they would store the waste if they themselves had to undertake this in order to determine their behavioural attitude to waste storage.

Table 5.22 Respondents' Behavioural Attitudes to Waste Storage (%)

Waste type	Plastic bag	Cardboard box	Open container	Closed container	Open pile	Basket	Others
Plastic bags	56	6	5	23	3	1	3
Plastic packg	32	12	13	30	4	1	3
Paper/cb pck	19	27	13	22	26	1	4
Waste paper	31	17	10	24	7	1	4
Garden yard	7	3	10	16	31	19	9
Glass jars	11	9	24	39	5	3	3
Alumin cans	16	9	24	34	5	6	3
Tin cans	15	7	25	36	5	5	3
Food	9	2	13	59	4	4	4
Cloth	20	24	13	22	8	3	3
Diapers	23	3	4	47	0	1	3
Others	1	0	2	12	3	2	6

The responses showed that containers with secured lids stood out as the most popular method in which household waste should be stored. Plastic bags are the preferred container to be used for wastes such as plastic bags and plastic packaging whereas cardboard box storage should be used to store paper/cardboard packaging and cloth. The most popular storage option for garden/yard waste is an open pile or in a basket.

Question 21.

This question asked respondents the length of time waste is stored in the household prior to disposal. The responses (Table 5.23) showed that most of the waste is stored between 1 to 3 days before being removed. However, food scraps and diapers are stored by most for only a single day before disposal, whereas cloth is stored by most for more than 7 days. Wastes such as glass jars/containers, aluminium cans and tin cans range in the period of storage from 1 day to more than 7 days.

Table 5.23 Length of Household Waste Storage Time (%)

Waste types	1 day	2-3 days	4-5 days	6-7 days	> 7 days
Plastic bags	22	37	14	13	12
Plastic packaging	23	35	14	17	8
Paper/cardboard pck	22	28	23	14	12
Waste paper	30	28	16	13	9
Garden/yard waste	28	26	14	20	11
Glass jars/containers	21	19	16	19	21
Aluminum cans	19	19	20	20	20
Tin cans	22	23	16	19	18
Food scraps	71	16	3	4	4
Cloth	16	18	16	18	27
Diapers	43	16	6	10	6
Others	12	5	3	3	8

Question 22.

The respondents were asked how they perceive problems of waste storage.

The responses showed that most (42%) perceived waste storage as a slight problem, 23% perceived it as a problem, 18% perceived waste storage as not a problem and only 7% perceived it as a major problem.

Question 23a.

The respondents were asked to identify the waste types that are a problem when stored in their household. They responded that tin cans (22%), diapers (20%), aluminum cans (19%) glass jars/containers (16%), and food scraps (15%) are a problem when stored.

Question 23b.

The respondents were asked to identify storage problems within their household. The following were identified as problems: the lack of proper containers and space for waste storage, waste scattered by animals especially dogs, and attraction of flies and insects.

Question 25.

Respondents were asked for their opinions on ways to improve waste storage in the household. They suggested that waste storage could be improved by making available containers with secured lids (45%), disposing of waste regularly (25%), training household members to store waste properly (9%), and for household members to share the responsibility (5%) of ensuring that waste is stored properly and disposed of regularly.

5.3.5 Final Waste Disposal

This section of the survey was designed to find out the methods used for disposing the household waste, the respondents' opinions on the methods used, and the reasons for not using the disposal methods they think are the best.

Question 26a.

This question asked respondents for the methods they used for disposing of household waste. The responses are presented in Table 5.24.

Table 5.24 Household Waste Disposal Practices (%)

Waste types	Others	Bury	Burn	Waste dump	Unoccupied land
Plastic bags	4	11	53	25	3
Plastic packaging	4	9	48	30	2
Paper/cardboard pck.	2	5	72	13	1
Waste paper	1	5	77	10	2
Garden/yard waste	9	9	48	18	10
Glass jars/containers	6	32	3	45	8
Aluminum cans	5	27	8	49	7
Tin cans	4	31	5	48	7
Food scraps	69	6	4	10	5
Cloth	2	7	53	22	9
Diapers	3	24	14	35	5
Others	8	3	6	12	3

The results showed that most combustible/burnable household wastes such as plastic bags, plastic packaging, paper/cardboard packaging, waste paper, garden/yard waste and cloth are disposed of by burning (Plate 5.2). Non-combustible wastes, such as glass jars/containers, aluminum cans, tin cans and diapers are disposed of at the rubbish dump with quite a number burying them instead. Dumping of wastes on unoccupied land (Plate 5.3) is also practiced but only to a minor extent. Food scraps are disposed of predominantly by 'other' method, which was identified as being fed to animals.

Question 26b.

This question asked respondents for their opinions on whether the disposal methods practiced were the best in order to elicit their cognitive attitude. Their responses are presented in Table 5.25 .

Table 5.25 Household Waste Disposal Methods (%)

Waste Types	Is this the best disposal method?	
	Yes (%)	No (%)
Plastic bags	55	17
Plastic packaging	53	19
Paper/cardboard packaging	59	13
Waste paper	61	12
Garden/Yard waste	56	16
Glass jars/containers	51	22
Aluminum cans	51	22
Tin cans	53	19
Food scraps	69	3
Cloth	60	12
Diapers	51	9
Others	22	8

Most of the respondents considered the present disposal methods for each waste type as the best method.

Plate 5.2 Combustible Waste Disposal by Burning

Question 26c.

This question was directed to those who answered 'no' to the above question 26b. The respondents were asked to identify the disposal methods they considered the best. The results are presented in Table 5.26.

Disposal at the waste dump and burying are generally considered to be the best methods for disposing of household waste.

Plate 5.3 Dumping Waste on Unoccupied Land

Table 5.26 Household Disposal Methods Considered Best (%)

Waste types	Others	Bury	Burn	Waste dump	Unoccupied Land
Plastic bag	5	5	2	5	0
Plastic packaging	5	7	1	5	0
Paper/cardboard packaging	3	3	2	3	0
Waste paper	3	3	2	3	0
Garden/Yard waste	3	7	3	1	1
Glass jars/containers	4	11	1	5	0
Aluminum cans	8	10	1	3	0
Tin cans	5	9	1	3	0
Food scraps	2	1	0	1	1
Cloth	2	5	2	2	0
Diapers	0	4	0	3	1
Others	1	2	0	2	1

Question 26d.

This question asked the respondents to give reasons for not using the methods they considered the best. The reasons given were laziness, no time, costly and also the fact that recycling (the best method for disposing recyclable materials) is not available.

5.3.6 Waste Collection Services and Transportation

This section of the survey was designed to examine the availability, frequency and efficiency of the Ministry of Health's (MOH) waste collection services.

Question 27a.

This question asked respondents how aware they were of the MOH rubbish collection service. The responses revealed that majority of the respondents (86%) was aware of the MOH rubbish collection service. Only 11% of the respondents were not aware of the service.

Question 27b.

This question asked the respondents whether the MOH rubbish collection service was available in their area. The answers revealed that the collection service is available to 57% of the respondents and not available to 39%.

Question 27c.

The respondents were asked whether they used the MOH waste collection service. The answers showed that out of the 57% to whom the service is made available, most of these (53%) used the service.

Question 27d.

This question asked respondents whether they think the number of MOH garbage collection services was enough. The responses uncovered their cognitive attitudes which

showed that most (45%) of the respondents thought the number of collections is not enough. Only 6% of the respondents thought it was enough.

Question 28.

Respondents were asked for their preferences for the number of waste collections. The answers presented in Table 5.26 show that most preferred two collections per week for all waste types except food scraps and diapers for which a daily collection was preferred.

Table 5.26 Household Waste Collection Preferences (%)

Waste types	Once in two week weeks	Once a week	Twice a week	Everyday
Plastic bag	4	11	18	10
Plastic packaging	3	10	21	9
Paper/cardboard packaging	5	10	20	8
Waste paper	4	9	19	10
Garden/Yard waste	3	14	17	7
Glass jars/containers	4	10	22	8
Aluminum cans	5	10	19	9
Tin cans	3	11	19	12
Food scraps	1	3	18	22
Cloth	8	14	16	6
Diapers	1	3	12	24
Others	2	2	7	4

Weekly collection for all the household waste types is the current practice with no separate collection for specific waste types, nor of recycled materials. However, a question on the respondents' preferences uncovers their affective attitude to waste collection, which is worth considering for further action if needs be.

Question 29.

The respondents were asked their opinions as to how regular the MOH collection service should be in order to determine their cognitive attitudes. Twenty two percent of the

respondents think the MOH garbage collection service is regular, whereas 23% think it is not regular.

Question 30.

The respondents' opinions on the amount paid for the collection service (currently TP$5.00 per month but previously 50 cents per month up until mid-year 2000) was requested to elicit their cognitive attitude towards payment for waste disposal. The responses showed that 15% thought it is not enough, 23% said it is enough and 10% thought the amount paid is more than enough.

Question 31.

This question asked respondents whether they would be willing to pay extra if the MOH service improved. The answers showed that majority (45%) would be willing to pay more if the collection service improves, and only 5% said they were not willing to pay more.

Question 32.

Reasons were sought as to why households did not use the collection service. The responses showed that most of the respondents (33%) did not use it because it was not available in their area. Some (12%) disposed of their own rubbish, 8% said the service is unreliable, 5% could not afford the service, 4% was not aware of the service and 1% said they just have not arranged for the service.

Question 33.

This question was directed to those to whom the MOH collection service was not available. They were asked whether they wished to be provided with this service. The answers showed that most (74%) wished that this waste collection service be provided for them. Only 11% did not wish for it.

5.3.7 Waste Minimisation

This section of the survey was designed to examine the 4Rs (reduction, re-use, recycle, and recovery) of waste management and their application to Tongan waste disposal.

Reduction/Avoidance

Question 34.

This question asked respondents on how often household members take a shopping bag when shopping. A shopping bag is used here to mean any substantial bag other than one made out of plastic. The answers (Table 5.27) showed that most of the households sometimes used a shopping bag for shopping with only 10% never using such a bag.

Table 5.27 : Practices and Behavioural Attitudes to Using a Shopping Bag (%)

	Never	Rarely	Sometimes	Most times	Always
Practice	10	19	40	16	14
Behavioural attitude	12	12	38	19	18

Question 36.

The respondents were asked how often they themselves take a shopping bag for shopping to determine if there was any difference between practices and behavioural attitudes. The answers, presented in Table 5.27 show most would sometimes take a shopping bag and their behavioural attitude is similar to the household practice revealed by the answers to question 34.

Question 35.

This question asked respondents for their opinions on the use of shopping bags so as to elicit their cognitive attitude towards shopping bags. Most of the respondents (65%) thought it was a very good idea to take a shopping bag for shopping, 30% thought it was good and only 4% thought it was not so good. None of the respondents thought it was a bad or very bad idea.

b) Re-use

Question 37.

The respondents were asked whether they re-use household waste. The responses are presented in Table 5.28.

Table 5.28 Waste Re-use (%)

Waste Types	Yes	No
Plastic bags	89	10
Plastic bottles/containers	87	12
Cardboard boxes	76	23
Glass jars/bottles	74	24
Cloth	60	38
Papers	51	48
Food scraps	26	73
Aluminum cans	19	80
Tin cans	16	83
Others	6	29

Their answers showed that the majority of the respondents re-use most of the waste. However, a few of the respondents re-use aluminum cans and tin cans.

Question 38.

This question asked respondents how they considered the appropriateness of re-using waste to waste management, again to determine their cognitive attitude to waste re-use. Most of the respondents (50%) considered waste re-use as very appropriate to waste management; 30% considered it appropriate; 13% said it is not so appropriate, 2% said it is inappropriate and 3% considered waste re-use as very inappropriate.

c) Recycling

Question 40.

The respondents were asked about their knowledge of recycling. The results showed that only 13% identified themselves as knowing much about recycling. Most (57%) thought they only knew a little and 14% admitted to knowing nothing at all.

Question 41.

This question asked respondents about their knowledge of the available recycling services. The answers showed that 33% knew that recycling services were available. However, most (63%) admitted not to knowing about the available recycling services.

Question 43.

The respondents were asked whether they used the recycling services. The responses showed that 70% did not use the available recycling services and only 24% use it.

Question 46.

This question asked respondents their reasons for not recycling. The results showed that most of the respondents (41%) did not recycle due to their lack of awareness of the available services. Other reasons given were laziness and having no time (10%), not taking

an interest in recycling (9%) and a further 8% said their household did not have enough recyclable materials to warrant using recycling services.

Question 47.

The respondents were asked how eager they would be to recycle if the recycling services were available and operated efficiently. Their responses showed that most (60%) of the respondents would be very eager to recycle waste.

d) Recovery

Question 48.

As composting is one way of recovering energy from waste materials, respondents were asked about their knowledge of composting. Their responses showed that 49% knew nothing about composting and 43% had some knowledge about composting.

Question 49.

This question was directed to those respondents who did know about composting. They were asked whether they composted materials themselves. The responses showed that 30% of those who knew about composting carried out composting.

Question 50.

The respondents were asked to identify the waste types they composted. The waste types they identified were garden/yard wastes (22%) and food scraps (9%).

Question 51.

This question was directed to those respondents who did not carry out composting. They were asked to give reasons for not composting. The reasons they gave were lack of composting knowledge (13%), laziness and no time (8%) and having no need to as the soil is 'beautiful and fertile' (4%).

Question 52.

The respondents were asked how eager they would be to compost waste if taught the proper way to do it. Most of the respondents said they would be very eager (49%), some would be eager (26%), 10% slightly eager, 4% not eager and 1% were not eager at all.

5.4 Associations and Relationships with Socio-Demographic Characteristics

5.4.1 Introduction

This section presents the results of tests, applied by StatView, to determine any relationships or associations between the socio-economic demographic characteristics and the practices, perceptions and attitudes of the respondents to waste management. The test applied was the chi-square test. This test gives a chi-square value and a p-value. For the discussion that follows in this and later chapters, the p-value is taken as a measure of the significance of any relationship. A p-value of less than 0.05 indicates a relationship of significance.

To meet the assumptions of the chi-square test and later analysis, the following socio-demographic classes have been grouped together based on similarity or occupational prestige and social status in Tonga. For the socio-demographic questions, four groups were used for the number of people in the household: 1-4, 5-8, 9-12 and 12+. For the chi-square tests, groups 9-12 and 12+ have been grouped together and thus the new groups are: 1-4, 5-8 and 9+.

For the chi-square test, the educational qualifications groups were reduced to two groups with the original groups: no schooling, primary school and secondary groups grouped together and given a new label 'pre-tertiary'. The other group remained as 'tertiary'.

Some occupational groups were combined (legislators, managers and professionals, technicians; skilled agriculture, fisheries workers and elementary occupations) and thus the new groups are:

i. elementary, agriculture and fisheries workers,

ii. managers, professionals and technicians,

iii. clerks and

iv. service workers.

As for place of residence, Nukunuku and Vaini were combined as both villages and Nuku'alofa, the capital city remained the other group.

5.4.2 Waste Generation

The respondents' perceptions of the household waste generation problems (Q.2) were tested against each of gender (table 5.1.1), age (table 5.1.2), household size (table 5.1.3), educational level (table 5.1.4), occupation (table 5.1.5) and residence (table 5.1.6) to determine if they significantly influenced the responses (perceptions). All tables of results applicable to this section are given in Appendix 4.

The test results showed no relationship for all tests except for the test with occupation for the clerical jobs cohort with aluminum cans (p-value = .02) and tin cans (p-value = .04) being seen as a major problem in the household.

5.4.3 Waste Handling

a) Waste Handling Responsibilities

The practices of household waste handling responsibilities were tested against gender (table 5.2.1), age (table 5.2.2), household number (table 5.2.3), educational level (table 5.2.4), occupation (table 5.2.5), and residence (table 5.2.6).

The tests results showed no relationships for all tests except that for gender. Males seemed to believe that garden/yard waste (p-value = .01), glass jars/containers (*p*-value = .01), food scraps (*p*-value = .04) and cloth waste (*p*-value = .02) should be handled by male alone, rather than females.

The respondents' cognitive attitude to waste handling responsibilities was tested against the socio-demographic variables gender (table 5.3.1), age (table 5.3.2), household numbers (table 5.3.3), educational level (table 5.3.4), occupation (table 5.3.5) and residence (table 5.3.6).

The tests showed no relationship with age, occupation or place of residence. However, there was a relationships with gender, household size, and education level. Males' cognitive attitude appeared to be that plastic bags (*p*-value = .005), plastic packaging (p-value = .03) and waste papers (p-value = .006) should be handled by males only, and paper/cardboard packaging (p-value = .01) and food scraps (p-value = .01) should be handled by female only.

Another relationship was found for the large household (9+) cohort, who seemed to think that paper/cardboard packaging (p-value = .01) should not be handled by males only.

Relationships were found for the pre-tertiary educational group who think garden/yard waste (p-value = .005) should be handled by parents only and food scraps (p-value = .04) by female only.

b) Waste Clearance

The respondents' practices of household waste clearance frequency was tested for relationships with gender (table 5.4.1), age (table 5.4.2), household size (table 5.4.3), educational level (table 5.4.4), occupation (table 5.4.5) and residence (table 5.4.6). The results showed no relationships with gender and place of residence. However, there were relationships with age, household size, education and occupation cohorts. The youngest age group (18-24) was more likely to clear aluminum cans (p-value = .007) and tin cans (p-value = .01) twice a week and everyday respectively.

For the large household group (9+), another relationship suggests that to clear cloth (p-value = .01) should be disposed of everyday whereas other age cohorts did not.

The tests showed the pre-tertiary educational cohort wanted to dispose of paper/cardboard packaging (p-value = .007), waste papers (p-value = .03) and diapers (p-value = .03) twice a week.

Clerical workers were more likely to clear waste cloth (p-value = .04) twice a week.

The respondents' affective attitude to waste clearance (how often they would like the household waste to be cleared every week) was tested for a relationship with gender (table 5.5.1), age (table 5.5.2), household numbers (table 5.5.3), educational level (table 5.5.4), occupation (table 5.5.5) and residence (table 5.5.6).

The results showed no relationship with gender, age or occupation. However, the small household (1-4) cohort seemed to prefer clearing paper/cardboard packaging (p-value = .03) waste twice a week.

The village cohort showed preference for clearing glass jars and containers (p-value = .04) twice a week, whereas the pre-tertiary educational cohort seemed to prefer clearing glass/jars containers (p-value = .04) everyday.

The respondents' behavioural attitude to waste clearance frequency (how would they be disposed to clear the household waste if asked to do the clearing themselves), was also tested to find out if there was any relationships with gender, age, household numbers, educational level, occupation and residence (tables 5.6.1 to 5.6.6). No category showed any relationship with gender, age, household size, educational status and residence. The only relationship was with the 'elementary' occupational cohort with the behavioural attitude for clearing diapers (p-value = .02) once a week.

c) Littering

The respondents' perceptions of litter in Tonga, their own town/village and their household was tested for any relationship with gender (table 5.7.1), age (table 5.7.2), household size (table 5.7.3), educational level (table 5.7.4), occupation (table 5.7.5) and residence (tables 5.7.6). The results showed no relationship between any two variables.

Another chi-square test was performed to find out if there were any relationships for the respondents litter disposal practices between four different localities (a festival at Pangai, roads, beaches and the household) and gender, age, household numbers, educational level, occupation and residence (tables 5.8.1 to 5.8.6). The results showed no relationship except

for the clerks' litter disposal practices on the road (p-value = .001). The clerks preferred to dispose of litter in rubbish containers more than the other groups.

The respondents' affective attitude to litter practices (whether they like the way people dispose waste) was tested between the above four different localities) and gender, age, household size, educational level, occupation and residence (tables 5.9.1 to 5.9.6).

The results showed no relationship except for females who were less inclined to like the litter practices in the household (p-value = .01).

The respondents' behavioural attitudes to litter disposal for the four different localities above were tested for any relationships against the same six socio-demographic variables (table 5.10.1 to 5.10.6). The results showed no relationships except for the pre-tertiary educational cohort, which was less inclined to take home rubbish generated on the road (p-value = .01). This cohort (pre-tertiary education) appeared to dispose of beach litter into the sea (p-value = .009).

d) Waste Separation

The respondents' waste separation practices (whether the household waste was separated before final disposal) was tested for any relationships with gender, age, household size, educational level, occupation and residence (table 5.11). The test results showed no significant relationships.

The relationships between the respondents affective attitude to waste separation (how much they like waste to be separated before disposal) was also tested against gender, age, household numbers, educational level, occupation and residence (tables 5.12).

The results showed no p-values less than 0.05 in all tests except for the middle age 45-54 years (p-value = .002) and village cohorts (p-value = .02), who appeared not to like waste separation at all.

The respondents' behavioural attitude to waste separation (how much they would like to separate waste themselves) was tested to find out their relationships with gender, age, household numbers, educational level, occupation, residence (table 5.13).

The results showed no relationships except for residence with the village cohort not liking to perform waste separation at all (p-value = .006).

5.4.4 Waste Storage

Household waste storage practices prior to disposal were tested for any relationship with gender (table 5.14.1), age (table 5.14.2), educational level (table 5.14.3), occupation (table 5.14.4), income (table 5.14.5) and residence (table 5.14.6).

The results showed no relationship with gender, education and residence cohorts. However, a relationship was found with the age group 18-24 years. This group seemed to store waste cloth (p-value = .02) in containers with secured lids more than the other groups.

Another relationship was between the service workers and storage prior to disposal; the service workers appeared to store glass jars/containers (p-value = .03) in containers with secured lids, and elementary workers stored aluminum cans (p-value = .03) and tin cans (p-value = .02) by 'other' method. The respondents did not specify what these 'other' storage methods they utilised.

Another relationship was found between by the income cohort (<TP$3000) and practice prior to disposal. This income cohort store tin cans (p-value = .02) in cardboard boxes.

The respondents' affective attitudes to waste storage (how they liked household waste storage) was tested for any relationship with gender (table 5.15.1), age (table 5.15.2), educational level (table 5.15.3), occupation (table 5.15.4), income (table 5.15.5) and residence (table 5.15.6).

The results showed relationships with age, education and income cohorts, but not with gender, household size and occupation. The (55+) age cohort preferred household waste storage practices for the glass jars/containers (p-value = .04). Similarly, the pre-tertiary educational cohort preferred the waste paper (p-value = .03) storage practices in the household.

The lowest income group cohort (<TP$3000) appeared not to like the way plastic bags (p-value = .003), paper/cardboard packaging (p-value = .03) and waste paper (p-value = .03) were stored in the household. The village cohort also did not like the way in which plastic packaging (p-value = .02) was stored.

The respondents' behavioural attitude to waste storage (how they would be disposed to store waste) was tested for relationships with the gender (table 5.16.1), age (table 5.16.2), educational level (table 5.16.3), occupation (table 5.16.4), income (table 5.16.5) and residence (table 5.16.6). The test results showed no relationship for gender, age, occupation and residence. However, for educational level a p-value of 0.02 was obtained. Analysis of the data showed the pre-tertiary educational cohort was the cohort with the different response. This cohort is less likely to store plastic packaging in cardboard boxes

The income responses also gave a significant p-value (0.002) and this is attributable to the highest income group (TP$10000+) being different in their behavioural attitude, in that they would store garden/yard waste in containers with secured lids when asked to do so.

The length of household waste storage was also tested for any relationship with gender (table 5.17.1), age (table 5.17.2), educational level (table 5.17.3), occupation (table 5.17.4), residence (table 5.17.5) and household size (table 5.17.6).

The test results showed no relationships with gender, occupation and residence. However, the youngest age group (18-24) would store aluminum cans (p-value = .03) for a period of 4 to 5 days before disposal, in contrast to the other cohorts. Similarly, the smallest household cohort (1-4) would store waste papers (p-value = .04) for the same period of time (4-5 days) before disposal.

The different educational groups also showed some significant differences in the length of storage of plastic bags (p-value = .01), waste paper (p-value = .02) and cloth (p-value = .01) before disposal. The pre-tertiary cohort is less likely to store plastic bags more than 7 days, but more likely to store waste papers for 1 day; cloth is likely to be stored for 4 to 5 days before disposal.

The respondents' perceptions of waste storage problems were tested for relationships with gender, age, household size, educational level, occupation and residence (table 5.18). The test showed no relationships.

The respondents' perceptions of waste types that have storage problems were also tested for relationship with gender (table 5.19.1), age (table 5.19.2), educational level (table 5.19.3), occupation (table 5.19.4) and residence (table 5.19.5).

The test results showed no significant differences except for the village cohort's perceptions of storage. This cohort believes that waste paper is less likely to be a problem with regard to storage (p-value = .04).

5.4.5 Final Waste Disposal

The respondents' waste disposal practices were tested for any relationship with gender (table 5.20.1), age (table 5.20.2), educational level (table 5.20.3), occupation (table 5.20.4), income (table 5.20.5) and residence (table 5.20.6).

No relationship was found with gender, age and household cohorts. However, relationships with education, income and residential cohorts were found. The pre-tertiary educational cohort was less likely to dispose of plastic bags (p-value = .009), aluminum cans (p-value = .03), tin cans (p-value = .04) and cloth (p-value = .02) in the waste dump, than any other group. This cohort also was more likely to bury tin cans more than any other cohort.

The elementary occupational cohort appeared more likely to dispose glass jars/containers using 'other' disposal method (p-value = .03) (include disposal on unoccupied land and in the sea) more than any other cohort.

The lowest income group (<TP$3000) was more likely to bury tin cans (p-value = .02) than any other cohort.

The village cohort was less likely to dispose of plastic bags (p-value = .01), plastic packaging (p-value = <.0001), aluminum cans (p-value = .003), tin cans (p-value = .006) and diapers (p-value = .001) at the waste dump.

The respondents' cognitive attitude to waste disposal (opinion on whether the disposal practice was the best) was also tested for relationships with gender (table 5.21.1), age (table 5.21.2), educational level (table 5.21.3), occupation (table 5.21.4) and residence (table 5.21.5).

The test results showed no relationship except for the village cohort. This group had more responses indicating they believe the disposal methods for waste paper (p-value = .01), glass jars/containers (p-value = .01) and tin cans (p-value = .009) were not the best.

5.4.6 Waste Collection and Transportation

Respondents' awareness of the Ministry of Health's waste/garbage collection service was tested against gender, age, educational level, occupation and residence (table 5.22).

The test results showed no relationship with gender, age and education. However, relationships with the 'elementary' occupational groups (p-value = .004) and the 'village' cohort (p-value = .007) were found. Both these cohorts were less aware of the MOH garbage collection service.

Tests were performed to find out if there was relationships between gender, age, educational level, occupation and residence (table 5.23) and the usage of the MOH waste collection service. The tests found no relationship except for the 'village' group (p-value = <.0001), which was less likely to use the Ministry of Health's garbage collection service. This observation is reasonable as the MOH waste collection service is unavailable in the villages.

The respondents' cognitive attitude with regards to the number of waste collections by the Ministry of Health's (MOH) garbage collection service was tested for any relationships with gender, age, educational level, occupation and residence (table 5.24.1 to 5.24.5).

The results showed no relationships with gender, age, household and occupation. However, a p-value of 0.01 for the educational level was attributable to the pre-tertiary cohort who thinks that the MOH garbage collection service is adequate. All other cohorts think the service in inadequate.

The respondents' behavioural attitude to the MOH's waste collection services (willingness to pay more if the MOH waste collection service improves) was tested for relationships with gender, age, educational level, occupation , income and residence (table 5.25). The test showed no relationships.

A further test was performed to find out if there was a relationship in the affective attitude (whether they would like to be provided the MOH's waste collection service and gender, age, educational level, occupation and residence (table 5.26). The test results also showed no significant difference for all the relationships.

5.4.7 Waste Minimisation

a) Reduction/Avoidance

The respondents' practices of waste reduction (by taking a shopping bag for shopping), was tested against gender, age, educational level, occupation and residence (table 5.27).

The medium age group (35-44 years) take a shopping bag most of the time (p-value = .009).

The respondents' cognitive attitude for taking a shopping bag (whether it is good or not) was tested for any relationships with gender, age, educational level, occupation and residence (table 5.28). No relationships were found.

The respondents' behavioural attitude (using a shopping bag if disposed to act in such manner) was tested against gender, age, educational level, occupation and residence (table 5.29). The gender, educational level and occupational cohorts gave relationships; males sometimes take a shopping bag for shopping (p-value = .008) more than females. The pre-tertiary educational cohort always take a shopping bag for shopping (p-value = .01) and managers/professionals/technicians are least likely to always take a shopping bag (p-value = .003).

a) Re-use

The respondents' practice of re-using waste was tested for relationships with gender (table 5.30.1), age (table 5.30.2), educational level (table 5.30.3), occupation (table 5.30.4) and residence (table 5.30.5). The tests showed no relationship with age, household size, occupation and residence. However, a relationship was found with the gender and educational cohorts. The males were less likely to reuse cloth (p-value = .007), and the pre-tertiary educational cohort was less likely to reuse plastic bottles/containers (p-value = .01).

The respondents' cognitive attitude with regard to the appropriateness of waste re-use in managing waste, was tested for relationships with gender, age, educational level, occupation and residence (table 5.31). No relationships were found for gender, age, household size, occupation and residence. The only relationship was with educational groups (p-value = .004). The pre-tertiary cohort appeared to think that waste re-use is very appropriate for managing waste.

Gender, age, educational level, occupation and residence (table 5.32) were test against factors that stop respondents from re-using waste.

The test showed no relationship with gender, age, household size, occupation and residence. The only relationship was the pre-tertiary cohort (p-value = .008) who appeared not to reuse waste because it is unhealthy and dirty.

c) Recycle

The respondents' knowledge of recycling was tested for against gender, age, educational level, occupation and residence (table 5.33).

The only relationships were with education, occupation and residential cohorts. The pre-tertiary (p-value = <.001) and village cohorts (p-value = .001) were more likely to know

nothing about recycling, than any other cohorts and the service workers (p-value = .005) were more likely to know a lot about recycling.

The respondents' knowledge of available recycling services was tested for relationships with gender, age, educational level, occupation and residence (table 5.34). No relationships were found.

The respondents' using of the recycling services was tested against gender, age, educational level, occupation and residence (table 5.35). No relationships were found.

The respondents' affective attitude to recycling (their eagerness to recycle if the services run efficiently) was tested for relationships with gender, age, educational level, occupation and residence (table 5.36). Again, the tests showed no relationships with any variable.

d) Recovery

The respondents' composting knowledge was tested for relationships with gender, age, educational level, occupation and residence (table 5.37). The only relationship was with educational cohorts. The pre-tertiary cohort (p-value = .003) was less likely to know anything about composting.

The respondents' composting practices was tested against gender, age, educational level, occupation and residence (table 5.38). The youngest age cohort (18-24 years) is less likely to compost (p-value = .01) than any other cohorts.

The respondents' reasons for not composting was tested for relationships with gender, age, educational level, occupation and residence (table 5.39). No relationship was found except for the age cohort 45-54 years (p-value = .04) who did not see any need for composting.

The respondents' affective attitude to composting (their eagerness to compost if taught the proper way to do it was tested for relationships with gender, age, educational level, occupation and residence (table 5.40). No relationship was found.

5.5 Conclusions

The chi-square tests indicated a uniformity or concordance in the responses in most cases. Thus waste management practices, perceptions and attitudes appear not to be affected and influenced to any large degree by the socio-demographic variables such as, gender, age, household size, educational level, occupation, income and place of residence. It needs to be noted that where the chi-square tests showed p-values that indicate relationships, some of the relationships may not be significant according to Zar's (1984) description of the differences between the comparison-wise and experiment-wise significance levels. This is discussed in Chapter Seven.

CHAPTER SIX: RESULTS - AWARENESS ISSUES

6.1 Introduction

This chapter presents a second part of the results of the survey. The presentation is in three parts with the first part consisting of the descriptive analysis of the respondents general awareness of waste management information, legislation/regulations and the health, environment and economic impacts of improper waste management. Part two presents the results of the chi-square tests for relationships between the respondents' socio-economic demographic characteristics with their general awareness and knowledge of waste management. The third part presents the results of the relationships between the communities' awareness and knowledge with the practices, perceptions and attitudes to waste management.

6.2 Awareness And Knowledge Of Waste Management

6.2.1 Waste Management Information Awareness

This section of the survey examines the respondents' awareness of waste management information, sources of information and the media used for transmitting such information.

Question 53.

The respondents were asked whether they have heard or seen information about waste management or any problems associated with waste management. The responses showed that most of the respondents (78%) are aware of some information about waste management.

Question 54.

This question asked respondents about the types of information they saw or heard. The answers they gave included clean-up campaigns (47%), anti-litter campaigns (16%) and recycling (14%).

Question 55.

The waste management information in Tonga can be received through a variety of media. The respondents were asked to rank the eight media from which they received waste management information from 1 as most frequent to 8 as least frequent. The responses are presented on Table 6.1.

Table 6.1 Medium of Information Transmission

	Current source		Preferred source	
Medium	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
Radio	2.3	1.5	2.5	1.5
Television	2.4	1.7	1.9	1.5
Newspaper	3.8	1.9	3.5	1.8
Family/friends	4.4	1.7	4.7	2.2
Women's group	4.8	1.9	4.8	1.8
Govt village w/shop	5.1	2.0	4.1	1.9
Church group	5.4	1.9	5.0	1.8
Others	6.7	2.3	6.9	2.2

The results showed that radio, television and newspaper (in that order) were the most common ways of receiving information regarding waste management.

Question 56.

This question asked respondents' preferences for the type of media for receiving waste management information. They were again asked to rank from 1 as most frequent to 8 as least frequent.

The results (Table 6.1) showed that television is the respondents' prime preference for receiving waste management information, followed by radio and newspaper.

Question 57.

The respondents were asked to identify the source from which the waste management information comes from. The responses showed that the source from which most respondents get their information were government departments such as the Ministry of Health, Environment Department, Tonga Visitors Bureau (information on cleaning up 31%, anti litter 23% and recycling 7%). Other sources include the church, youth, women's group, family and friends from whom 9% of the respondents received cleaning up information, anti-litter information 12% and recycling information 4%.

6.2.2 Health, Environment and Economic Impact Awareness

This section of the survey was designed to examine how aware the respondents are of the health, environment and economic impacts of improper waste management.

Question 58.

This question asked respondents how aware they were of the health, environment and economic impacts of improper waste management. The responses are presented in Table 6.2.

Table 6.2 Impacts of Improper Waste Management (%)

Impacts	Unaware	Slightly aware	Aware	Very aware
Health	0	6	17	74
Environment	1	5	27	64
Economic	5	13	30	48

The results showed that most of the respondents are very aware of the health and environmental impacts of mismanaging wastes, but only about half of the respondents are very aware of the economic impacts.

6.2.3 Legislation/Regulations Awareness

This section of the survey was designed to find out the respondents' awareness of the waste management legislation and regulations.

Question 59.

The respondents were asked about their knowledge of legislation and regulations concerning waste management. The answers they gave showed that most (41%) of the respondents knew some of the legislation/regulations, 34% said they only know a little, 15% admitted not to know any of the legislation/regulation and only 6% said they know a lot.

Question 60.

This question asked respondents whether they were willing to prosecute those who dump waste on unoccupied land. The answers showed that most (44%) were most willing to prosecute, 31% were willing, 12% were not so willing, 3% were unwilling and 6% were absolutely unwilling to prosecute.

6.3: Relationships With Socio-Demographic Characteristics

6.3.1 Waste Management Information

The respondents' awareness and knowledge of information about waste management and the associated problems was tested for any relationships with gender, age, household size, education, occupation and residence (Table 6.1) using the chi-square test.

The tests showed no relationships with gender, age, household size and residence. However, a significant difference was shown in the relationships with education level and occupation. The pre-tertiary (p-value = <.001) and the clerical cohorts (p-value = .007) were less likely to hear or see information about waste management and the associated problems, than any other cohorts.

A further test was performed to find out if there were any relationships between the type of information that respondents see and hear about waste management with gender, age, household size, education, occupation and residence (Table 6.2). The test results showed no relationship with gender, age, household size, education level and occupational cohorts. The only significant difference was for residence groups where the village cohort (p-value = .006) was less likely to see or hear information about recycling.

6.3.2 Health, Environment and Economic Impacts

The respondents' awareness of the health impacts (table 6.3.1), economic (table 6.3.2) and environmental impacts (table 6.3.3) of improper waste management were tested against gender, age, household size, education, occupation and residence.

The tests showed no relationships with gender, household size and education. However, the tests showed the following:

i. oldest age cohort 55+ (p-value = .02) were being aware of the environmental impacts of improper waste management, more than any other age groups.

ii. the 'elementary' occupational cohort appeared to be less aware than any other cohorts of the health (p-value = .008) and economic impacts (p-value = .02) of improper waste management.

iii. the village cohort were unaware or only slightly aware of the environmental impacts of improper waste management (p-value = .02).

6.3.3 Legislation/Regulations Awareness

The respondents' knowledge of waste management legislation/regulations was tested for any significant difference in the relationships with gender, age, household size, education, occupation and residence (table 6.4). The tests showed no relationships with gender, age, household size, education and residence. However, the 'elementary' occupational cohort (p-value = .03) seemed to be less likely to know the waste management legislation and/or regulations than the other cohorts.

A further test was performed to find out any relationships between the respondents' willingness to prosecute anybody that dumps waste on their (the respondents) unoccupied land with gender, age, household size, education, occupation and residence (table 6.5).

The tests showed no relationship with gender, age, household size, occupation and residence. However, the pre-tertiary cohort (p-value = .04). appeared to be more unwilling to prosecute those dumping waste on their unoccupied land.

6.4 Relationships with Awareness and Knowledge

The chi-square test was performed to find out if there was any relationships between awareness of the health and environment impacts of improper waste management and the frequency with which waste is cleared. The responses are presented in tables 6.6.1 and 6.6.2. All the results tables are in Appendix 4. The tests showed no relationships except for the test with the clearing of waste paper (p-value = .02). Those who are 'aware' of the environmental impacts appear to clear waste paper twice a week.

The chi-square test was also performed to find out if there was any relationship between the awareness of health and environment impacts of improper waste management and the community's perceptions of littering in Tonga, the respondents own town/village, and their

household. The tests are presented in tables 6.7.1 to 6.7.2, and show no relationship in most cases. However, the test showed a relationship between environmental impact awareness and the perception of littering in Tonga (p-values = .003) and in the village/town cohort (p-value = .03). Those who are 'aware' of the environmental impacts of litter perceived litter as a 'problem' for Tonga, and a 'slight problem' for their village/town.

Another test was performed to find out if there was any relationships between the awareness of health and environment impacts of improper waste management and litter disposal practices at different localities - a festival at Pangai; along the road; at the beach having a picnic; and in the household (tables 6.8.1 and 6.8.2). No relationships were found.

The chi-square test was also used to test for any relationships between the awareness of the health and environment impacts of improper waste management and whether the respondents like the way waste is disposed given the above situations (tables 6.9.1 and 6.9.2). The tests showed no relationships.

A further test was performed to find out if there was any relationships between the awareness of the health and environment impacts of improper waste management and the behavioural attitude to the disposal for the above circumstances (tables 6.10.1 and 6.10.2). The tests showed that those who are unaware or only slightly aware of the health impacts (p-value = .03) or environmental impacts of mismanaging waste (p-value = .01), appeared to be more inclined to dispose of litter during a festival at Pangai by throwing it into the sea than those who were more aware of the impacts.

A further test was performed to find out if there was any relationships between awareness of the health, environmental and economic impact of improper waste management and household waste disposal practices (tables 6.11.1 to 6.11.3). The test showed that those who are unaware or only slightly aware of the health impacts of mismanaging waste,

appeared to dispose of tin cans (p-value = .006) using 'other methods'. The respondents, however did not specify these 'other' methods used for tin can disposal.

Similarly, those who are unaware or only slightly aware of the impacts on the environment of mismanaging waste appeared to dispose of glass jars/containers (p-value = .02), tin cans (p-value = .005) and diapers (p-value = .002) using 'other methods'. Again, the respondents did not specify these 'other methods'. This was a weakness with survey because it did not ask respondents to nominate the 'other methods'.

Likewise, those who are unaware or only slightly aware of the economic impacts of improper waste management disposed of glass jars/containers (p-value = .02), tin cans (p-value = .03) and diapers (p-value = .002) using 'other methods'.

Health, environmental and economic impact awareness of improper waste management and eagerness to recycle waste were tested (table 6.12). The test showed no relationships.

A further test was conducted to find out if there was any relationships between awareness of the health, environmental and economic impact of improper waste management and eagerness to compost (table 6.13). The test again showed no relationships.

6.5 Conclusions

The results showed no relationships or associations for majority of the chi-square tests and this suggests strong uniformity in the responses. The waste management practices, perceptions and attitudes seemed not to be influenced by any of gender, age, household size, educational level, occupation, income and place of residence.

CHAPTER SEVEN : DISCUSSIONS

7.1 Introduction

This chapter provides a critical and analytical appraisal of the results given in Chapters Five and Six. The presentation follows the order of the results and questionnaire.

i. Examination of the validity, integrity and how representative the sample population is of the typical Tongan population.

ii. Consideration of waste generation with regard to abundance of waste and peoples perceptions of this.

iii. Evaluation of waste handling practices, perceptions and attitudes concerning handling responsibilities, waste clearance, littering and waste separation.

iv. Analyses of waste storage practices, perceptions and attitudes.

v. Assessment of waste collection and transportation with reference to their availability, reliability, sufficiency and effectiveness.

vi. Examination of respondents' waste disposal practices perceptions and attitudes.

vii. Evaluation of the respondents' waste minimisation practices, perceptions and attitudes.

viii. Analyses of the awareness of the respondents to waste management information, health/environment/economic impacts of improper waste management, and waste management legislation/regulations.

The chi-square test was used to determine relationships or associations between sets of variables. All analyses reported were based on a comparison-wise significance level, arbitrarily set at 5% or 0.05 which is the 95% confidence level. Zar (1984) stated that when

multiple tests (the test used for most of the results in this study) are carried out, an experiment-wise significance level is sometimes chosen in preference to comparison-wise significance level. According to Zar, if 5% significance level is used for many separate hypothesis tests, then about 1 in 20 will yield a statistically significant result even when the null hypothesis is always true. This therefore has the effect of discounting p-values which are not of an order of magnitude less than 0.05. On the basis of the above, the discussion will exclude the relationships that are not of that order of magnitude, even though they are reported as part of the results and findings.

The critical appraisal of the Tongan community's waste management awareness, practices, perceptions and attitudes has implications for waste management in Tonga. Being the first detailed study of its nature, this study should provide some baseline data for further research. The information provided may enlighten and empower environmental and educational programmers, government and non-government organisations, interest groups and individuals on the most appropriate and suitable approaches when managing waste in an attempt to alleviate the far reaching, negative waste and litter problems that Tonga currently encounters.

Moreover, the decision makers may be influenced to reprioritise their agenda and place more and serious attention on waste management issues, and to consider the importance and immediate or instantaneous actions that should be taken to ensure the return to a near pristine environment and thus reduce the vulnerability of Tonga to the detrimental effects of mismanaging waste practices now in place.

Since Tonga does not have a waste management policy, this study should provide a good and strong basis for policy makers from which to develop a waste management policy for

the Kingdom. In the conclusions chapter, some recommendations and suggestions are given for policy formulation and implementation.

7.2 Survey Population - Socio-Demographic Characteristics

The respondents were typically middle-aged adults, well educated, employed with middle to high incomes. The middle age groups (25-34, 35-44, 45-54 years) were over represented compared to their representation in the Tongan community. However, these age groups are by in large responsible for managing waste in the household. Thus, it is fair and justifiable that they are represented in such a proportion, as it is probably they who evolved and determined the waste management attitudes and practices.

The survey group was highly educated, that is, having some kind of tertiary education as defined in the results chapters, and as such, as a group, possibly is more educated than the average Tongan. This is expected because 71% of the survey group lives in Nuku'alofa, the capital city, and census data suggests most of the residents of Nuku'alofa are in the high education category.

Though highly educated, the respondents, they being mothers, wives, fathers or husbands, also play their roles in the family which include managing household waste or ensuring that such tasks are taken care of or are allocated to other family members.

The survey group is also biased in regards to employment as most are employed as service workers, clerks, and professionals/technicians. Again this follows because most of the survey group are highly educated and live in Nuku'alofa; highly educated individuals are more likely to be employed in Tonga. The employed section of the population is also presumably the sector that handles or at least is responsible for overseeing, supervising and

ensuring the household waste is managed. As such, the views of the employed portion of the population are acceptable and representative of typical Tongans based on the author's knowledge and as a participant of Tongan society.

To have a good education and be employed, one is expected to generate some kind of income, in this case, middle to high income in accordance with the income level of Tonga. A family without employment may still obtain middle to high income from remittances from relatives who reside overseas, and this is a very common source of income for Tongans. Whilst it is likely the above reasoning is correct, there is no readily available data on income levels for Tongans and hence comparison between the survey group and the Tongan population as a whole are not possible.

Despite the limitation on the respondents 'fit' into the total population, it is believed that the group selected for the survey is representative of the Tongan population especially their attitudes and participation in waste management. The worst case scenario provides a platform from which to develop additional surveys.

7.3 Waste Generation

Plastic packaging and plastic bags are a major component of household waste. The abundance of such waste types and the presence of the many different other waste types (Table 5.8) suggest a lifestyle with reliance or dependence on packaged imported goods, at least a substantial growth in the use of these items in the last few years Such reliance on heavily packaged imported goods has implications on waste management. There is a likelihood that such waste types will continue to increase as standards of living increases, and this implies intensification and escalating the disposal problems that has already been

confronting and becoming a challenge to Tonga. The disposal problems also have implications on the environment and health of the Tongans, and this is discussed later in this chapter. However, the argument taken here is that, actions should be taken to minimise or diminish the influx of packaged imported goods that generate wastes, which may worsen or intensify the disposal problems.

7.4 Waste Handling

7.4.1 Waste Handling Responsibilities

The current practice of handling household waste is mainly the responsibility of women, and this is not surprising for a country like Tonga in which the division of labour is distinctive, and where handling is considered and designated as women's responsibility. However, as described in chapter one, the anecdotal evidence that suggests men may have an increasing share of the waste management responsibility for some waste types in the household is substantiated by this study. Men are predominantly responsible for handling garden and yard waste, aluminum cans and tin cans. Moreover, men showed significant differences from women in their attitude that men alone should handled garden and yard waste, glass/jars containers, food scraps and cloth. This implies that men are increasingly or gradually accepting the responsibilities of handling waste despite the explicit gender division of the Tongan society. Such deviation from the norm may not be surprising, given the study was on the main island of Tonga, where societal expected norms may be weakened and enfeebled by the far reaching and increasingly numerous contacts and exposures to outside influences. An alternative explanation is that garden job is a male oriented job and modern society dictates a more even distribution of waste management

jobs. Accordingly men are more likely to take waste management jobs associated with their activities. Alcohol and other beverages are the common contents of cans and again it is possible drinking is a male dominant past time for which they are obliged to shoulder the responsibilities for waste management.

Further research on the outer islands where a more rural based population resides is worth pursuing and this may provide a different perspective or outlook from this study.

Evidence of men increasingly accepting the household waste handling responsibilities has implications for waste management. Programs, campaigns and promotions of 'village clean-up', 'keep Tonga beautiful' and other such programs should incorporate men also, instead of focussing on women's groups only. If men are willingly embracing and taking up handling of household waste, their incorporation, as well as acknowledging the values of their involvement, may contribute to making 'clean-up' programs successful. It is worth mentioning at this stage, that some antecedent and consequence strategies used by behavioural scientists in manipulating specific conditions for promoting recycling (Chapter Three), could be tried out in Tonga to explore their application in promoting clean-up and anti-litter programs in the Kingdom.

The general cognitive attitude to waste handling which was revealed by the respondents' opinions as to who should handle household waste, is very similar to the current household waste handling practices described above. Very few significant differences were identified. The large household cohort (9+) is less keen for paper and cardboard packaging to be handled by men alone. Because there are many members in the household that that can share the waste handling responsibilities, which include handling of paper and cardboard

packaging, it is reasonable that such cognitive attitude (not to be handled by men only) emerged from the large household cohort.

The 'pre-tertiary' education cohort was significantly different in their responses to the group as a whole, especially in their thinking (cognitive attitude) that garden and yard waste should be handled by parents only and food scraps by males alone. The pre-tertiary group is most likely to conform to the traditional norms that women and parents handle the household waste. This is because this group is most likely to be more conservative because they are less exposed to changes in comparison to the tertiary education cohort and therefore slower to accept changes to the traditional norms and mores. It is therefore not bizarre nor unusual they adopt or embrace such cognitive attitudes. The uncertainty is why this cohort held such attitudes for the handling of food scraps and garden/yard wastes only and not for the other waste types.

Several reasons were identified for waste handling problems in the household. These reasons have implications on waste management. Responses such as 'having no time' and 'too many children' may imply that waste handling is of a low priority and hence it is the last activity to be done, and in many cases it is not done because of lack of time. It could also be suggested that children are responsible for an over-proportion of the waste and those responsible for waste management give up tidying waste sourced by children. Such information should be useful for village groups when designing clean-up programs, giving special considerations and care for those who face these problems.

There is also an implication here that the role and importance of the extended family, where relatives may take care of children, is diminishing. This is reasonable considering the survey respondents were mostly from the capital city, Nuku'alofa where the most

progressive section of the population live. An alternative, is to discipline and train the children and assign to them easy tasks of handling waste, which should be beneficial to everybody in the long run. Programs for training children and waste management practices should be incorporated into the primary school curriculum where they could be trained to handle waste wisely from early ages. Also training parents to train their children may be considered at the village level, in consultation with government and/or non-government organisations as they see fit. Organisations such as the Ministries of Education and Health should be requested for resources and people to conduct and assist such programs.

Laziness was also identified as a key problem to handling household wastes, and this may reveal some common or collective behaviour for Tongans. On an individual basis, Tongans may seem lazy with respect to handling waste. But Tongans may not be lazy on a communal basis whenever they are required to work together to achieve a particular purpose or goal. Several community and village clean-up competitions have proved successful but the apparent 'good attitudes' ceased once the competition terminates. Studies by Hamad *et al.* (1980-1981) and McCaul and Kopp (1982) also showed that encouraging recycling behaviour using goal setting technique, proved successful but once the goals were discontinued, the recycling immediately declined. Further research should be conducted to find means by which such favourable behaviours, such as getting involved in clean-up campaigns even after community based competitions ceased.

Having no proper storage containers was also identified as a major problem. The remaining two problems, attracting flies/animals and environment and health problems are closely related to storage containers and emphasises the problem of not having proper storage containers. If there were proper storage containers, the other problems may not arise.

There is a message here for government, non-government organisations and any interest groups that are engaged in health and the environmental matters/issues. The needs can be identified and actions have to be taken on endeavours to minimise the impacts on health and the environment of the effects of waste mishandling due to a lack of proper storage facilities.

7.4.2 Waste Clearance

Clearing food scraps and diapers from the household is practiced on a daily basis whereas garden/yard wastes, cloth, glass jars/containers, aluminum cans and tin cans are mostly cleared once a week. Such practices are not unusual considering the nature of the different waste types. However, the respondents' attitudes (both affective and behaviour) to waste clearance showed a divergence from the normal practice. Most would like to clear all waste types on a daily basis. If Tongans possess these attitudes, it is vital that such attitudes are transformed into actions and practices, and if this could be done, it will have implications on waste management. Households will be much cleaner and tidier which again has further implications on health and environment, that is, a much cleaner environment and healthier people. As such, further research is essential to discover strategies that would be most effective in transforming the attitudes of Tongan people's into actions.

7.4.3 Littering

The responses suggest a spatial concept or pattern of Tongan's perceptions and practices of litter disposal. Tongans are inclined to take care of their immediate surroundings and have the tendency to disregard and have little respect for public places and the larger community. This is apparent by the high response of placing litter in containers/bins in the household, but 'throwing it away' or 'throwing it into the sea' in public places. Tongan's propensity to

litter is common to all regardless of the different socio-demographic characteristics. This is revealed by the chi-square tests, which showed no significant differences in the relationships between litter disposal practices, and attitudes, with gender, age, household size, education level, occupation and place of residence. This enduring enigma needs to be addressed from individual to national level because litter has economic, social, aesthetic and safety costs. The Ministry of Health is responsible for cleaning the streets and other public places. There is only one street sweeper for the main road; to get more involves money. In addition to clean up costs, there are indirect costs associated with litter ugliness. Aesthetic damage caused by litter affects a community's quality of life and economic well-being because businesses and individuals are less likely to settle in dirty and unattractive areas. Litter reduction also tends to boost tourism and recreation.

Litter also poses health and safety risks. Debris on streets and sidewalks may be linked to numerous traffic accidents and injuries to pedestrians. Discarded bottles and cans can collect stagnant water and become a breeding ground for disease-carrying insects.

A large body of research conducted elsewhere, as reviewed and discussed in Chapter Three, suggests several 'antecedents' and 'consequence' strategies to eliminate litter behaviour. Such strategies include written and verbal prompts, community involvement, effects of prior litter, trash can design, rewards and penalties. These studies however, may not be applicable in the Tongan situation for they were strategies proposed and intended to be effective for targeted populations. Although trash bins, can design (Plate 7.1) and community involvement with rewards, have not been used in Tonga to reduce litter, it is not clear how effective these strategies might be in their application to Tonga considering the Kingdom's social, economic and other difference circumstances. Further research is

therefore required to find out how effective these strategies would be, how applicable other strategies might be, and whether new strategies would be most effective in addressing the litter problem in Tongan situations.

Plate 7.1 Trash Can Design

In Tonga the Town Regulation Act states it is illegal to litter in gazetted area such as Nuku'alofa but there is very little if any enforcement of these regulations. Hence, it is crucial to enforce such existing legislation and regulations by appropriate authorities if Tonga is to improve or prosper in any aspects of life whether it be economic, health or environment that could be tarnished by litter problems. Forming policies and anti-litter legislation and regulations should also be seriously considered.

The respondents' attitudes both affective and behavioural, towards litter disposal were so different from their practices. Most did not like the way people dispose of litter in public places. Also most would themselves dispose of litter in containers/bins. If these findings are correct, these attitudes are very important and should be cultivated and put to good use. To be able to do this effectively, research should be encouraged to find ways and means by which these attitudes could be successfully utilised.

7.4.4 Waste Separation

Slightly more than half of the population practiced waste separation. However, both their affective and behavioural attitudes revealed they would very much like to separate waste prior to disposal. The only exception was the village cohort, who did not like waste separation. These findings of the study are different to findings in the study of Chung and Poon (2001) in Mainland China which showed overwhelming support for waste separation in both rural and urban communities. The people undertook waste separation due to the redemptive value of the recyclables. This appears to be the drive behind the Chinese waste separation practices.

A question arises. Is there any reason then for Tongans to separate their household waste? Besides the many reasons given for not separating wastes, one that is directly relevant to this question is that, there is no practical purpose or reason for separating waste. If this is true, then there is no drive or impetus for people to separate the waste. Further research should be conducted on waste separation as a mean of waste reduction.

7.5 Waste Storage

Household waste is stored in numerous ways as reported in chapter five. There is no common or standard secure storage vessel such as containers with secured lid as utilised in

developed countries. Although most were satisfied with the household waste storage practices, the problems identified, such as animals, especially dogs scattering the stored waste (Plate 7.2) and attracting insects and vermin, imply that the present storage practices are insecure and unsafe. Such problems have further health and economic implications. As described in chapter one, the predominant illnesses encountered in Tonga are those related to poor sanitation and hygiene. Hence unsafe waste storage is unhygienic and leads to poor sanitation. Scattering of wastes by scavenging dogs is unsightly and aesthetically unpleasant. As tourism is a growing industry and a major component of the economy of Tonga, such aesthetically unpleasant scenes may jeopardize the tourist industry and consequently the economy of Tonga.

Plate 7.2 Stored Waste Scattered by Dogs

The prime suggestion for improving household waste storage was to make available containers with secured lids. Likewise, most of the survey group held the behavioural attitude for storing the household waste in containers/bins with secured lids. The need for such rubbish containers had been raised earlier and as such, provision of containers with secured lid to each household should be considered seriously by the Ministry of Health, Tonga Visitors Bureau and related organisations, if the general health of the population is to improve and tourist industry to flourish.

Other reasons suggested for improving household waste storage is to dispose of waste regularly, train household members to store waste properly, and for household members to share the responsibility of ensuring that waste is stored properly and disposed regularly. Given these reasons, further research is needed to explore the best means and ways in which these suggestions could best be implemented to improve the household waste storage.

A significant difference was shown by the highest income cohort with the behavioural attitude of storing garden and yard waste in containers with secured lid. Apart from this, the general population seemed to be common in their practices and attitudes to waste storage. As such, any targeted programs to address waste storage in the household should be applicable to the general population.

7.6 Waste Collection Services and Transportation

Waste collection in Nuku'alofa used to be twice per week, however it has been reduced to once per week due to the lack of funds and equipment. There is only one collection truck in operation although there were two initially. The truck (a Garwood, 160T Perkins) is about 16 years old and was given by Australia. The second truck has been out of use for some

time due to a broken hydraulic system and the lack of funds to buy parts for repair of the vehicle. For collection, domestic rubbish is put out, loose, in piles, in plastic bags, on stands but rarely on bins (Plate 7.3)

Although the majority of the respondents was aware of MOH collection service, the responses of the 'elementary occupational' and the 'village' cohorts were significantly different to the responses of others in that they professed to not being aware of this collection service. The village cohort may not be aware of the MOH collection service because this service is not available to villages.

The waste collection service is not available to everybody, and most of the respondents wish that this collection service be provided for them. Those, to whom the service is available, think the number of collection per week is not enough. The preference is for two collections per week. Having only one garbage collection truck available for all of the main island, probably is the prime reason for the limited garbage collection practice.

At present there are no private waste collection contractors in Nuku'alofa. It is therefore worth conducting research to see if communal or private collection service/s could be made available to assist in the garbage collection task to meet the needs of the entire country. The MOH has been considering privatisation of the waste collection service in Nuku'alofa for some time. An action plan drafted by the MOH shows a survey of private homes in January 1999, a submission of draft legislation in March 1999, and the start of a private collection system in January 2000. It is believed that this process has not yet been undertaken (Sinclair Knight Merz, 2000). Having private and/or communal service/s available should lead to better health due to cleaner households with fewer breeding places for insects and vermin.

A

B

Plate 7.3 Household Waste Awaiting Collection

C

D

Plate 7.3 Household Waste Awaiting Collection (continued)

The current collection service is optional and this is understandable considering the equipment availability, but it is worth considering making such a service compulsory to all, for health, environment and economic benefits. Changes are only possible, if the necessary equipment for collection is available, and also regulations and policy are in place.

Most respondents think that the current garbage collection is irregular, however they are willing to pay more, if the service improves. It is common knowledge that the garbage truck sometimes breaks down, and there is difficulty in its maintenance. Human resources that 'manned' the garbage truck may not be adequate and ample for the task. Further study is necessary as to why the service is irregular and to find means by which they could be improved. It is perhaps not unreasonable to suggest that it is a lack of adequate funding to service waste disposal mechanisms and the solution is easy in theory but more difficult in practice.

7.7 Final Stages of Waste Disposal

Household waste is disposed of through various methods as described in Chapter Five. Burning, burial and dumping which have been used since antiquity for disposing solid waste, are still practiced in Tonga. Most of the combustible waste is burned, while non-combustible is buried. Dumping waste on unoccupied land is practiced by some.

Disposal at a landfill site, which is the common practice today for disposal in most countries, is also practiced in Tonga. Unfortunately, the standard of the landfill at the Tonga Tukutonga/Popua Dump (Map 7.1) is appalling as waste is dumped haphazardly and rarely covered (Plate 7.4). This dump is located in an area that was previously a tidal mangrove swamp, 4 kilometres from the centre of Nuku'alofa. An alternative site for

landfill was identified at Sopu in 1995 but this was then designated for a golf course by the government and as a result the MOH has been forced to identify another site. Despite this, people still dump their rubbish at Sopu (Plate 7.5). Makeke (refer Map 7.1) is also a dump-site where meat and the like are discarded straight into the sea (Plate 7.6). However, other waste types such as discarded vehicles, white waste and other waste are dumped haphazardly in the Makeke area (Plate 7.7).

The Tukutonga/Popua waste dump is used mostly by those in the Nuku'alofa area and rarely used by the villages, unless they transport their own waste to the dump. The chi-square test supported this hypothesis in showing that there were few respondents from the village cohort who disposed of waste in the rubbish dump.

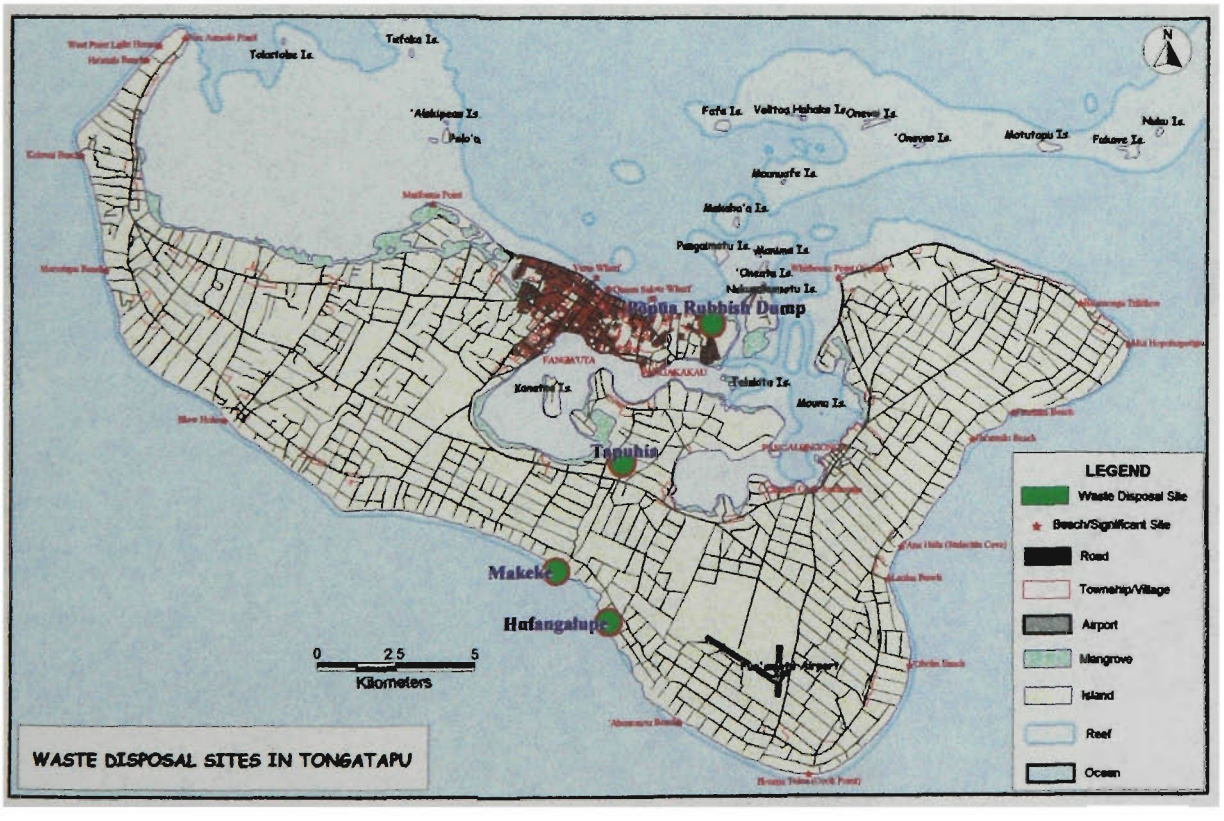
Most respondents held the attitude (cognitive) that the disposal methods used were the best. However, the few who did not think they were the best, suggested and proposed recycling as the best method for disposing of most of the recyclable waste.

Safe disposal of waste is crucial for a small island like Tonga. The current disposal methods have implications on the health and the environment of the country. The condition of the current waste dump has become a favourable breeding place for flies and vermin. Those who live in the vicinity of the Tukutonga waste disposal site are in danger of being exposed to this uncontrolled and unhealthy waste dump where waste is exposed most of the time.

If waste is not properly disposed of, the environment is in danger. Burning of some waste releases gases to the atmosphere, which may contribute to the problem of global warming and also could be detrimental to the health of people. As there is no such thing as 'away'

with regards to the law of matter, what one thinks has been removed or destroyed, is being deposited elsewhere, maybe in the same form or a different form.

Disposal of waste on unoccupied land, especially land that is highly vulnerable, such as the mangroves (Plate 7.8), may jeopardise the ecosystem. The current waste dump is located in an area that was previously a tidal mangrove swamp and one cannot underestimate the impact it may have on the environment. In addition, the dump is aesthetically unpleasant and the odour is a problem. As the current dump is nearing the end of its life, the government has identified Tapuhia (Map 7.1 and Plate 7.9), an old quarry which is more centrally located, as the next rubbish dump.



Map 7.1 Waste Disposal Sites in Tongatapu

A

B

Plate 7.4 Tukutonga/Popua Waste Dump

C

D

Plate 7.4 Tukutonga/Popua Waste Dump (continued)

A

B

Plate 7.5 Dumping at Sopu

A

B

Plate 7.6 Dumping Meat at Makeke Dump-Site

A

B

Plate 7.7 Other Waste Types at Makeke Dump Site (car bodies, white goods, diapers)

C

D

Plate 7.7 Other Waste Types at Makeke Dump Site (fish heads, old drums)

Considering the burning of waste and the impact on health and the environment, further research is needed to find out the types and quantities of household waste that is burned. Awareness programs should therefore be considered so as to inform the public of waste types that are unsafe for burning on health and environment grounds. It is worth firstly exploring the best methods and means through which the public could be informed and educated before embarking on any awareness program.

The Garbage Act of 1949 stated that garbage from premises must be deposited in garbage cans and not on roadways, vacant land, foreshore, streams or creeks. This law has defined the methods of disposal that are not acceptable and should not be practiced, yet waste is still deposited on vacant land and on roadways (Plate 7.10). Since this law lacks enforcement, it is worth investigating why the relevant authorities are not taking the necessary actions and how best could they assume this responsibility again and ensure it is carried out.

Currently there are no regulations to govern what should or should not be deposited at the dumpsite. With the upcoming new disposal site, regulations should be put in place to determine the waste types acceptable at the dump with due consideration for the health and environmental impacts.

Recycling has been considered as the best disposal alternative for waste that is recyclable. As there are very few recycling initiatives in Tonga at present, further research is needed to explore the possibility of running economically viable recycling programs, not only because of the economic benefits but as a means to better manage waste.

A

B

Plate 7.8 Dumping Waste in Mangrove Areas

Plate 7.9 Tapuhia Old Quarry as Next Rubbish Dump

A

B

Plate 7.10 Waste Disposed on Vacant Land and Roadways

7.8 Waste Minimisation

7.8.1 Reduction/Avoidance

Waste reduction activities are important to halt or slow down the increasing rate of waste generation. Waste reduction aspects such as volume reduction and encouraging products that can be recycled more easily, should be addressed.

In Tonga, almost all goods to sustain people's daily needs are imported. This generates an excessive amount of package waste, which, because of the limited market, has very little possibility of recycling. Waste minimisation measures such as recycling of package waste practiced in other parts of the world are not easily applicable in Tonga (Sinclair Knight Merz, 2000).

Using a re-usable shopping bag for shopping is a means of reducing waste. Plastic bags are perceived by respondents, as the second most abundant waste generated in the household, and this is because the current practice has been to use plastic bags almost everywhere for carrying shopping and goods. The use of shopping bags instead of plastic bags may help minimise such waste in the household. The people's behavioural attitude is similar to the current practice, that is, they may sometimes take a shopping bag for shopping. The only observed relationship was the 35-44 years age cohort whose practice appears to be to take a shopping bag most of the time. This group's cognitive attitude also reveals their thinking that using a shopping bag is a very good idea. There was no relationship on all relationships regarding their cognitive attitude to using a shopping bag with gender, age, household size, education level, occupation and place of residence. This implies that such attitudes are common to all. As such, this good attitude should be encouraged and

transformed into action. To successfully do this, research should be carried out to explore the means for encouraging people to practice using re-usable shopping bag.

The study did not explore other means of reducing waste, such as the preference for purchasing non-packaged goods and non-canned food versus packaged goods and canned foodstuff and drinks. The study also did not investigate the use of disposable diapers versus re-usable diapers. Further research is needed to explore these practices and the perceptions and attitudes for these practices with regard to these aspects, and to identify and propose means of reducing these waste types in the household.

Perhaps government action is necessary to firstly consider the reduction of importing heavily packaged goods, or make necessary arrangements with importers for means of exporting the recyclable packages, cans and other recyclables. Such actions may assist in the reduction of waste disposed, which should in turn be beneficial to both health and the environment. Enabling recyclables to be exported would be economically beneficial to individuals and the country.

7.8.2 Re-use

Re-using waste is considered as very appropriate to waste management by most respondents. The only significant difference was the pre-tertiary cohort, which was less likely to consider waste re-use as such. Also the male responses were significantly different with fewer responses for re-using cloth. The pre-tertiary cohort also has fewer responses for re-using plastic bottles and containers. A suggestion maybe as to why the males respondents have fewer responses for re-using waste is that, cloth re-use is a gender-related phenomenon and is associated with females in Tongan society. However, there is no reasonable explanation as to why the pre-tertiary group had fewer responses for re-using

plastic bottles/containers only and not other waste types. The re-use practices and attitudes of the study group are generally similar and therefore any program organised to encourage and motivate waste re-use should be applicable to the entire population.

Further research is needed to investigate how waste that is minimally re-used could be maximised in future. A common saying is "one man's trash can be another man's treasure". Thus what one throws away may be re-used by another and as such less waste will need to be disposed of, which may have health and environmental implications. Ways and means of putting words into practice are needed.

7.8.3 Recycle

Currently, Tonga has very few recycling initiatives. There is neither a scrap metal recycler operating nor a paper recycling. Aluminum cans are collected and sold to a small recycling business at Sopu, run by Sione Faupula, who pays approximately TP$5/1000 cans. Scrap copper is collected and recycled at 'Atenisi University, which pays 20 cents/kilo. Used bottles are collected by Coca-Cola and returned to Coca-Cola Amatil in Sydney for recycling (Sinclair Knoght Merz, 2000).

Most of the people have very little knowledge of recycling and with the pre-tertiary cohort being significantly different, appearing to 'know nothing' about recycling. In addition, most respondents are not aware of the recycling services available in the country. Recycling is concerned primarily with salvaging reusable wastes, and as such, it is vital that people know what recycling is and what could be recycled. Since such knowledge is lacking, educational programs should be provided for the public to learn about recycling. Similarly, the population should be made aware of the recycling services currently available. Research is needed to find out how best knowledge about recycling could be

taught to people. The literature search did not provide a solution. Present publications dwell primarily on manipulating specific conditions to promote recycling for people who already have knowledge of recycling. Since barely any significant differences were shown between the various groups of respondents in this study, future educational programs can target the whole population.

It is known that Tonga has very few recycling initiatives. As such there would be no point in running any recycling knowledge-based educational program if there are no efficient recycling services available. Recycling initiatives should therefore be encouraged by government for this would assist in reducing waste that is already a serious problem in the country. Having in place efficient recycling services, and people with good knowledge of recycling, may have implications on health, environment and the economy of the country.

7.8.4 Recovery

As with recycling, most respondents have no knowledge of composting, and the pre-tertiary education cohort was significantly different with fewer responses for knowing anything about composting. This is logical as the least educated people are the most unlikely to be knowledgeable generally. Considering the importance of recovering energy from composting, people should be educated on these practices. Research should be conducted to investigate how best composting knowledge can be taught to Tongan people and considered together with the suggested research on recycling.

Most would be very eager to compost if taught the proper ways of composting. Such affective attitude should be encouraged and put to good use, by ensuring some educational programs are conducted.

7.9 Awareness Issues

7.9.1 Waste Management Information Awareness

Most of the survey group is aware of some information regarding cleaning up, anti-litter and recycling. A significant difference appeared to be the pre-tertiary educational group and the clerks who both seemed not to have seen or heard information about waste management and associated problems. It is important that people are aware of information regarding waste management such as clean-up and anti-litter campaigns, if any such programs are to proceed successfully. The pre-tertiary group and the clerks have to be targeted to ensure that medium utilised for transmitting the information is readily accessible. The most favourable media are radio, television and newspaper, in that order. However television is the most preferred medium, followed by radio. Considering this information, organisations (both government and non-government) that convey information should consider the means by which most of the population would receive information. Further research is suggested to explore how best information is conveyed by each different medium. Information from such research is vital to ensure that the information conveyed reaches those targeted.

7.9.2 Health, Environment and Economic Impact Awareness

Awareness of health, environment and economic impacts of improper waste management is generally high and this is not surprising from a generally more-educated population. Several questions beg answers however. For example, why is a population highly aware of the impacts of waste and poor waste disposal practices, still mismanaging its waste whilst knowing the consequences of their actions? What is hindering the proper management of waste? How could an unaware population be convinced to act appropriately?

7.9.3 Legislation/Regulations Awareness

There is no waste management legislation or waste management policy in Tonga. Legal provisions for environmental issues are scattered throughout a range of legislation and administered by a number of Ministries and Departments.

Most of the respondents know some of the legislation and regulations pertaining to waste management. The exception was the elementary occupation cohort who appeared to not know any legislation. This is reasonable as this group are mostly less educated.

From the survey, most respondents appear willing to prosecute persons who dump waste on their vacant land. However, the pre-tertiary education cohort appeared to be unwilling to prosecute. The pre-tertiary group attitude can be understood from a cultural point of view. Cultural ties may still be very strong and one would not prosecute relatives, neighbours, friends or someone from the same village.

Despite knowing the legislation, people still litter and dispose of waste haphazardly which breaches and violates the Garbage Act (1949).

7.10 Conclusion

Having evaluated and examined the results of the study, the researcher finds that for the majority of the questions, responses were consistent for all categories of respondents and did not vary according to respondents' background, that is, the responses were not influenced by gender, age, location, education, household size, income or occupation. Therefore, the key finding is Tongans tend to think similarly about waste management, that is, they generally have the same practices, perceptions and attitudes. As such, programs

that may be designed to facilitate and improve waste management could effectively target the whole population of Tonga.

CHAPTER EIGHT: CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

The continued persistence of littering and the mismanagement of waste, resulted in the researcher adopting the assumption that littering and waste management problems are related to the perceptions and attitudes of the Tongan people.

In order to investigate this assumption and its effect on waste disposal practices in Tonga, the researcher investigated if there are links or relationships between the perceptions and attitudes of the people of Tonga and the way solid wastes in the households are managed. To do this, the entire household waste management operations were examined.

The specific objectives of the study were:

i. To identify the current household practices of waste management.

ii. To examine the perceptions and attitudes (affective, cognitive and behavioural) towards current waste practices adopted by Tongan households.

iii. To identify the community's general awareness of different aspects of waste management and the impacts of mismanaging wastes.

iv. To identify changes people would like to implement in relation to waste disposal.

The major findings of the survey were:

i. Waste types generated in the households varies in abundance, and people's perceptions of waste abundance also vary according to waste types. Non-combustible waste is regarded by most of the respondents as problematic (with regards to handling, storing and disposal) even if it is not abundant, whereas combustible waste is considered by most as not problematic, whether abundant or not.

ii. The current practices for household waste handling responsibilities are predominantly those of women, with men increasingly sharing the responsibilities for some waste types. People's beliefs (cognitive attitude) about waste handling responsibilities are very similar to the current practices. Majority of the responses did not vary irrespective of respondent background.

iii. Clearing of household waste is conducted on a daily basis for some waste types such as food scraps and diapers, while most non-combustible waste is cleared once a week. People's preferences (affective attitude) and behaviour (behavioural attitude) towards waste management are similar to their practices, with most preferring daily clearance for all waste types. This attitude is common to all, as responses were consistent for all respondents irrespective of background.

iv. Most households practiced waste separation prior to disposal. This corresponds well to their preferences and behaviour with respect to waste separation. Most prefer to separate waste prior to disposal although respondents in the age group 45-54 years do not prefer waste separation.

v. Household waste is stored in various ways (plastic bags, cardboard boxes, containers, open baskets and open piles) prior to disposal, depending on the type and nature of the waste. People's preferences (affective attitudes) for waste storage are generally similar to the current practice. However, their behavioural attitude is to generally store waste in containers with secure lids. This attitude is similar to what people would like to change about the current storage. They would like to improve waste storage by using containers with secure lids. They also suggest household members need to be trained to store waste properly, to share the responsibility of waste management, and also to dispose of waste

regularly. These are the kinds of changes Tongans would like to see implemented, in order to improve waste storage in the household.

vi. Perceptions of litter vary according to space. Litter is perceived as only a 'slight problem' in the household, a 'problem' in the town/village, but for Tonga nationally, it is perceived as a 'major problem'. Litter disposal practices vary from the household level to the wider community. In the household, litter is predominantly disposed of in garbage containers, however at beaches, roads and festival areas, litter is 'thrown away' or 'into the sea'. People generally like the litter disposal practices in the households, but not the practices at beaches, roads and festival areas. Their behavioural attitude is to dispose litter in containers for all situations. Responses were consistent for all respondent characteristics.

vii. Waste disposal practices still include the long-practiced methods of dumping, burning and burial. Combustible waste is predominantly burned, while non-combustible waste is mostly buried or ends up at the rubbish dump where it becomes the concern of someone other than the householders. Respondents' preferences (affective attitude) support the current disposal practices by generally thinking that the methods currently utilised are the best. Generally, the responses did not vary according to respondent background.

viii. The MOH garbage collection service (the only collection service) is available only in the main town Nuku'alofa and is utilised by some households only. Most of the respondents think that the number of garbage collection service is not enough and would prefer two collections per week. They also think the collection service is not regular, and that the amount paid for the service (recently increased from 50 cents to TP$5.00 per month) is enough. However, they are willing to pay more if the service improves. For those to whom the service is not available, both in Nuku'alofa and the villages, it is their

wish that the service be provided for them as well. Responses were consistent for all respondents irrespective of background.

ix. In an attempt to minimise waste, the majority of the respondents take their own shopping bag for shopping. This avoids generating waste (plastic bags, packaging) that normally accompanies shopping without a shopping bag. People's behavioural attitude towards shopping and waste is similar to their practice, that is, they sometimes use a shopping bag for shopping. Most respondents think it is a very good idea to use their own shopping bag.

Recycling is not practiced by most of the respondents, generally because they have very little knowledge of it or the recycling services available. Other reasons given for not recycling include laziness, lack of interest and not having enough recyclable materials. However, most respondents would be very eager to recycle if services were made available and operated efficiently.

Those who know how to compost, do practice composting of food scraps, garden and yard waste. However, composting is not practiced by most of the respondents simply because they do not have the knowledge. Reasons for not composting include laziness, having no time, and some think there is no need to compost as the soil is already 'beautiful and fertile'. However, most of the respondents are very eager to compost if taught the proper way to do composting.

x. The Tongan community's general awareness of different aspects of waste management and the impacts of mismanaging wastes have also been identified. Most of the respondents are aware of some information about waste management, such as cleaning-up and anti-litter campaigns. The main sources of information are from government departments such as the Ministry of Health, Environment Department, Tonga Visitors Bureau, and some non-

government organisations such as churches, youth and women's groups. The information is received mostly via the radio, television and newspaper, in that order. Other media from which information is gained were identified as family/friends, women's groups, government village workshops and church groups. People's preferences (affective attitude) of a medium of information transmission are much similar to the current practice, except that television becomes their first priority and prime medium preference, followed by radio and newspapers.

Generally, most of the respondents are very aware of the health and environmental impacts of mismanaging waste. This is not so with the economic impacts as only about half of the respondents are aware of the impact that improper waste management has on the economy of the country.

Awareness of legislation/regulations on waste management is generally low. Although many know some of the legislation/regulations, a lot of the respondents know very little and some admitted to knowing nothing. Most were willing to prosecute those that dump waste on vacant lands.

Having identified the current practices of waste management, and uncovered the perceptions and attitudes of the Tongan community to waste management, one can conclude the Tonga people's perceptions and attitudes influenced the way solid waste is managed in the households.

The majority of the responses was consistent and did not vary according to respondents' background. This implies that the groups with which the people identify in Tongan society regarding attitudes, feelings, and behaviours, are strongly influenced by Tongan society's prototypical and normative behaviour at large. As such, Tongans tend to think similarly and therefore have the same perceptions and attitudes. The ambivalence identified in the

relationships between the practices and attitudes to litter disposal and waste storage is understood from a behavioural approach because of the ambiguity that generally takes place between the overt and the covert behaviour. In addition, the collective theory helps to explain the similarity in the perceptions, attitudes and behaviour of the Tongan community. That is, the perceptions and attitudes of an individual can be explained and understood from the perspective of the wider Tongan society. Perceptions and attitudes of an individual are influenced by the transcending power of the broader Tongan social, economic, political and cultural behaviour.

8.2 Limitations of the Study

Having conducted the study, limitations were noted, although these did not significantly impact on the results of the survey. The questionnaire was in English and there was no translation to the Tongan language due to the difficulty of finding Tongan words to describe some of the concepts investigated. That the survey was in English could be the reason for a large majority of the respondents being 'highly educated'. However this may also have been a positive in that the researcher did not influence the respondents. The questionnaire was long and only minimal time could be allotted for each respondent and the researcher to go through the questions in detail. Because of the location, time constraints and scope of the survey (the survey was carried out in Tonga whereas the design and evaluation of the survey was done in Wollongong, Australia), the researcher was unable to follow up any unanswered questions although there were not a large number, with an average, between five and ten no responses to any question.

Top decision and policy makers were not targeted to determine their perceptions and attitudes. Such findings are vital for facilitating any necessary actions and decisions to improve waste management in Tonga.

During the analysis and compilation of the results of the survey, it became clear that one of the possible responses to some of the questions, that of 'other' was a limitation of the questionnaire. In several questions, this alternative attracted a small but significant number of responses. The reason for respondents selecting the 'other' response in these questions is not clear but two possible explanations are:

- firstly, it could be that respondents found that all other alternatives responses were not applicable and the 'other' was the only possible answer; inherent in this is the probability that there was no other response that was suitable.
- secondly, there was a significantly different response that was meaningful and respondents did not elaborate; where this was the probability there should have been a suitable space for respondents to give the meaningful alternative.

Clearly any future surveys should address the above limitation.

8.3 Suggested Research for the Future

This study provides a substantial and informative baseline data bank from which to launch further studies. The following are suggested.

1. A similar study on the outer islands, which are predominantly rural and more traditional in their way of life, be conducted to find out their waste management practices, perceptions and attitudes.

2. A study of the top decision and policy makers be conducted to find out their perceptions and attitudes to waste management, and how best can they be influenced to take appropriate actions and decisions for better waste management.
3. The potential effectiveness of clean-up and anti-litter programs be explored to find strategies that would encourage proactive improvement in waste management practices.
4. Strategies that would be most effective in transforming attitudes such as daily clearance of household waste, disposing litter in rubbish cans rather than 'throwing away', be investigated.
5. The entire MOH garbage collection service be investigated to determine problems it faces and to find means by which the service could be improved.
6. The possibilities of running some economically viable recycling programs be researched and explored.
7. A survey be conducted to investigate how best waste minimisation knowledge, such as composting and recycling, can be taught to Tongans.
8. A survey be conducted to explore how effective and successful the various media are in conveying waste management information to those sections of the Tongan population that need to be targeted in order to improve waste management practices.

8.4 Recommendations

The Tongan people's patterns of perceptions and attitudes (beliefs, preferences and behaviour) which have been identified and uncovered, are potential contributions to improving waste management decisions for Tonga. Therefore, to improve waste management, the following recommendations are made:

a) Legislation, Policy and Enforcement

1. The Tongan Government should consider formulating a waste management policy to guide the waste management practices and activities in the Kingdom.
2. Law makers need to:
   i. consider implementing a new/single Waste Management Act instead of its current multi-sectoral laws.
   ii. review and update legislation regularly to meet the changes in the Tongan society.
   iii. clearly identify the authority responsible for implementing any legislation relating to waste management.
   iv. enforce the existing legislation, such as the Garbage Act.
3. The Government should consider using legislation or tariffs to reduce or at least effectively control imports of products and materials which require management and disposal in Tonga, particularly non-recyclable materials and wastes difficult to manage.
4. The Government could influence the adoption of waste minimisation schemes through tax structures. Consideration should be given for tax exemptions for the export of recyclable materials from Tonga or devise other incentives.

b) Improving Services and Facilities

1. The Government should consider buying more garbage-collection trucks, and to implement a fully communal and/or privatised garbage collection system that covers the needs of all the Kingdom. For example, the Government (Ministry of Health) to consider making waste collection compulsory for all the households in the Nuku'alofa

area, and to extend the garbage collection service to the areas that are not served both at Nuku'alofa and the villages.

2. The Ministry of Health should improve existing services and facilities by ensuring the waste workers are competent and trained to maintain a regular and efficient service collection.
3. The Government should provide garbage bins with secure lid to every household for storing household waste.
4. The Ministry of Health should implement a fair fee structure by either lump sum per month or payment by weight or volume of waste collected.
5. The Government should take steps to improve the present rubbish dump by covering the waste regularly to prevent health and environmental impacts.

c) Waste Minimisation Initiatives

1. The Government and businesses need to consider financial incentives and levies to encourage re-use and recycling.
2. The government should support recycling in Nuku'alofa and ship recyclable materials to overseas destinations if necessary.
3. The Government and businesses should negotiate with overseas recycling companies for the purchased recycled materials.
4 The government should consider the economic value of compost. Compost is now being sold in some countries and a similar scheme could be introduced in Tonga. A major part of the waste management strategy could be to reduce the quantities of compostable material produced and the availability of valuable product could minimise the need to import expensive fertilisers. As a start, composting by community groups

in villages could be organised using local biodegradable materials such as green waste and food scraps.

d) Awareness, Education and Training

1. People should be made fully aware that waste is a resource and very little of it should be dumped. This could be done by running workshops at the village level to inform the community.

2. The Government (Ministry of Health, Environment Department, Tonga Visitors Bureau) and interested non-Government organisations should:

i. run awareness and educational programs using multi-media and face-to-face contact through community groups to promote, inform and educate the public about the following:

- clean-up and anti-litter programs best
- practice waste disposal, that is, ways that would be least harmful to the environment and health of the people
- knowledge about composting, recycling and other waste minimisation issues
- impacts of improper waste management on health, environment and the economy of the country
- knowledge of legislation and regulations regarding managing waste.

ii. incorporate waste management issues into the primary and secondary school curriculum so that children are made aware and be influential in their practices and attitudes to waste management from the early stages of their lives.

iii. to consider training persons to supervise and train others at the community level to promote wise waste management.

To take the above recommendations on board by decision and policy makers, many of which only require minimal cost, and implement others at lower levels, would improve waste management practice in Tonga, thus contributing to a better and cleaner environment, healthier people and benefit the economy of the Kingdom as a whole.

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APPENDICIES

APPENDIX 1

Survey Questionnaire

Research Topic:
COMMUNITY PERCEPTION AND ATTITUDE TO WASTE MANAGEMENT IN TONGA

Instruction:
1. Please tick the bracket(s) that correspond(s) to the correct answer, unless special instructions are given.

Part 1: Questions on perceptions and attitudes to waste management

Waste Source and Generation

1. Please rank the following waste types in your household in the order of their abundance. Rank from 1 to 12 where 1 is most abundant and 12 is least abundant.
   - [ ] plastic bags
   - [ ] plastic packaging (include drink bottles and other plastic containers)
   - [ ] paper and cardboard packaging
   - [ ] waste paper
   - [ ] garden/yard waste
   - [ ] glass jars and containers
   - [ ] aluminium cans
   - [ ] tin canned
   - [ ] food scraps
   - [ ] cloth
   - [ ] diaper
   - [ ] others: specify _____

2. Considering the amount of waste types in your household, are they a problem?

Waste type	major problem	problem	slight problem	no problem
Plastic bags	[ ]	[ ]	[ ]	[ ]
Plastic packaging	[ ]	[ ]	[ ]	[ ]
Paper & c/board pkg	[ ]	[ ]	[ ]	[ ]
Waste paper	[ ]	[ ]	[ ]	[ ]
Garden/yard	[ ]	[ ]	[ ]	[ ]
Glass jars/containers	[ ]	[ ]	[ ]	[ ]
Aluminium cans	[ ]	[ ]	[ ]	[ ]
Tin canned	[ ]	[ ]	[ ]	[ ]
Food scraps	[ ]	[ ]	[ ]	[ ]
Cloth	[ ]	[ ]	[ ]	[ ]
Diapers	[ ]	[ ]	[ ]	[ ]
Others: specify	[ ]	[ ]	[ ]	[ ]

Waste Handling

3. Who handles (sweeps, collects) the waste in your household?

a) father/husband b) mother/wife c) male relatives d) female relatives
e) son f) daughter g) paid worker

Waste types	a)	b)	c)	d)	e)	f)	g)
Plastic bags	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Plastic packaging	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Paper & c/board pkg	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Waste paper	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Garden/yard waste	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Glass jars/containers	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Aluminium & tinned cans	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Foodscraps	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Cloth	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Diapers	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Others: specify	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

4. In your opinion, who should be responsible for handling the waste in your household?

Waste types	a)	b)	c)	d)	e)	f)	g)
Plastic bags	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Plastic packaging	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Paper & c/board pkg	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Waste paper	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Garden/yard waste	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Glass jars/containers	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Aluminium & tinned cans	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Foodscraps	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Cloth	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Diapers	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Others: specify	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

5. How often per week is waste cleared (collected and disposed) by household members?

	everyday	twice	Once	None
Plastic bags				
Plastic packaging	[ ]	[ ]	[ ]	[ ]
Paper & c/board pkg	[ ]	[ ]	[ ]	[ ]
Waste paper	[ ]	[ ]	[ ]	[ ]
Garden/yard	[ ]	[ ]	[ ]	[ ]
Glass jars/containers	[ ]	[ ]	[ ]	[ ]
Aluminium cans	[ ]	[ ]	[ ]	[ ]
Tin canned	[ ]	[ ]	[ ]	[ ]
Food scraps	[ ]	[ ]	[ ]	[ ]

Cloth	[ ]	[ ]	[ ]	[ ]
Diapers	[ ]	[ ]	[ ]	[ ]
Others: specify	[ ]	[ ]	[ ]	[ ]

6. How often per week would you like waste to be cleared?

	everyday	twice	Once	None
Plastic bags	[ ]	[ ]	[ ]	[ ]
Plastic packaging	[ ]	[ ]	[ ]	[ ]
Paper & c/board pkg	[ ]	[ ]	[ ]	[ ]
Waste paper	[ ]	[ ]	[ ]	[ ]
Garden/yard	[ ]	[ ]	[ ]	[ ]
Glass jars/containers	[ ]	[ ]	[ ]	[ ]
Aluminium cans	[ ]	[ ]	[ ]	[ ]
Tin canned	[ ]	[ ]	[ ]	[ ]
Food scraps	[ ]	[ ]	[ ]	[ ]
Cloth	[ ]	[ ]	[ ]	[ ]
Diapers	[ ]	[ ]	[ ]	[ ]
Others: specify	[ ]	[ ]	[ ]	[ ]

7. If you are asked to do the clearing, how often would you do it?

	everyday	twice	Once	None
Plastic bags	[ ]	[ ]	[ ]	[ ]
Plastic packaging	[ ]	[ ]	[ ]	[ ]
Paper & c/board pkg	[ ]	[ ]	[ ]	[ ]
Waste paper	[ ]	[ ]	[ ]	[ ]
Garden/yard	[ ]	[ ]	[ ]	[ ]
Glass jars/containers	[ ]	[ ]	[ ]	[ ]
Aluminium cans	[ ]	[ ]	[ ]	[ ]
Tin canned	[ ]	[ ]	[ ]	[ ]
Food scraps	[ ]	[ ]	[ ]	[ ]
Cloth	[ ]	[ ]	[ ]	[ ]
Diapers	[ ]	[ ]	[ ]	[ ]
Others: specify	[ ]	[ ]	[ ]	[ ]

8. If waste handling is a problem in your household, why do you think it is a problem?

9. What do you think of littering in:
   a) Tonga
   b) Your town/village
   c) Household

	a)	b)	c)
Serious problem	[ ]	[ ]	[ ]
Problem	[ ]	[ ]	[ ]
Slight problem	[ ]	[ ]	[ ]
No problem	[ ]	[ ]	[ ]

10. Considering the circumstances below, how do people dispose the rubbish they generate?
    a) A festival night at Pangai - spectators wastes from snacks packaging, coconut and soft drinks cans etc)
    b) At the road closest to your house - people with empty cans & bottles of drinks and snacks packages.
    c) At the beach having a picnic
    d) At the household – snacks packages, drinks (empty cans, bottles, coconuts)

	a)	b)	c)	d)
Rubbish containers/tins	[ ]	[ ]	[ ]	[ ]
Throw-away	[ ]	[ ]	[ ]	[ ]
Throw into the sea	[ ]	[ ]	[ ]	[ ]
Take home	[ ]	[ ]	[ ]	[ ]
Others (specify)	[ ]	[ ]	[ ]	[ ]
	[ ]	[ ]	[ ]	[ ]
	[ ]	[ ]	[ ]	[ ]

11. Given the above circumstances, do you like the way people dispose the wastes?

	a)	b)	c)	d)
Like it very much	[ ]	[ ]	[ ]	[ ]
Like it	[ ]	[ ]	[ ]	[ ]
Don't really like it	[ ]	[ ]	[ ]	[ ]
Do not like it at all	[ ]	[ ]	[ ]	[ ]

12. How would you dispose the wastes given the above circumstances?

	a)	b)	c)	d)
Rubbish containers/tins	[ ]	[ ]	[ ]	[ ]
Throw-away	[ ]	[ ]	[ ]	[ ]
Throw into the sea	[ ]	[ ]	[ ]	[ ]
Take home	[ ]	[ ]	[ ]	[ ]
Others (specify)	[ ]	[ ]	[ ]	[ ]
	[ ]	[ ]	[ ]	[ ]
	[ ]	[ ]	[ ]	[ ]

13. Is waste separated before disposal? If you answer yes go to Q.14, if no go to Q.17.
[ ] yes [ ] no

14. Please answer a-c by writing your answers on the spaces provided below.
a) Who does the waste separation?
b) What waste is separated?
c) How is it done?

a)	b)	c)
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

15. How much do you like the waste to be separated before disposal?

[ ] like it very much [ ] like it
[ ] do not really like it [ ] do not like it at all

16. If you are to separate the foodscraps, waste papers and tinned cans for disposal, how much do you like doing it?

[ ] like it very much [ ] like it [ ] do not really like it
[ ] do not like it at all

17. Please give reason(s) for not separating the waste.

Waste Storage

18. How is waste stored in your household before disposal?
    1) plastic bag
    2) cardboard box
    3) open container
    4) container with secured lid
    5) open pile outside
    6) baskets (coconut leaves)
    7) others: specify

Waste Types	1)	2)	3)	4)	5)	6)	7)
Plastic bags	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Plastic packaging	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Paper & c/board pkg	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Waste paper	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Garden/yard	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Glass jars/containers	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Aluminium cans	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Tin canned	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Food scraps	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Cloth	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Diapers	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Others: specify	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

19. How do you like the way waste is stored in your household?
    a) like it very much
    b) like it
    c) do not really like it
    d) do not like it at all

Waste Types	a)	b)	c)	d)
Plastic bags	[ ]	[ ]	[ ]	[ ]
Plastic packaging	[ ]	[ ]	[ ]	[ ]
Paper & c/board pkg	[ ]	[ ]	[ ]	[ ]
Waste paper	[ ]	[ ]	[ ]	[ ]
Garden/yard	[ ]	[ ]	[ ]	[ ]
Glass jars/containers	[ ]	[ ]	[ ]	[ ]
Aluminium cans	[ ]	[ ]	[ ]	[ ]
Tin canned	[ ]	[ ]	[ ]	[ ]
Food scraps	[ ]	[ ]	[ ]	[ ]
Cloth	[ ]	[ ]	[ ]	[ ]
Diapers	[ ]	[ ]	[ ]	[ ]
Others: specify	[ ]	[ ]	[ ]	[ ]

20. How would you store the waste if you are asked to do it?

1) plastic bag
2) cardboard box
3) open container
4) container with secured lid
5) open pile outside
6) basket (coconut leaves)
7) others: specify

Waste Types	1)	2)	3)	4)	5)	6)	7)
Plastic bags	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Plastic packaging	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Paper & c/board pkg	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Waste paper	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Garden/yard	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Glass jars/containers	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Aluminium cans	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Tin canned	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Food scraps	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Cloth	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Diapers	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Others: specify	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

21. How long is waste stored in your household before disposal?

Waste Types	1 day	2-3 days	4-5 days	6-7 days	>7 days
Plastic bags	[ ]	[ ]	[ ]	[ ]	[ ]
Plastic packaging	[ ]	[ ]	[ ]	[ ]	[ ]
Paper & c/board pkg	[ ]	[ ]	[ ]	[ ]	[ ]
Waste paper	[ ]	[ ]	[ ]	[ ]	[ ]
Garden/yard	[ ]	[ ]	[ ]	[ ]	[ ]
Glass jars/containers	[ ]	[ ]	[ ]	[ ]	[ ]
Aluminium cans	[ ]	[ ]	[ ]	[ ]	[ ]
Tin canned	[ ]	[ ]	[ ]	[ ]	[ ]
Food scraps	[ ]	[ ]	[ ]	[ ]	[ ]
Cloth	[ ]	[ ]	[ ]	[ ]	[ ]
Diapers	[ ]	[ ]	[ ]	[ ]	[ ]
Others: specify	[ ]	[ ]	[ ]	[ ]	[ ]

22. Is waste storage a problem in your household? If your answer is 1 or 11 go to Q.23, if your answer is 111 or 1V go Q.24

[ ] 1. major problem [ ] 11. problem [ ] 111. little problem
[ ] 1V. not a problem

23. a) Which waste has storage problems in your household?
    b) What is the problem?

Answer question a) by placing a tick in the bracket, then answer question b) on the spaces provided.

Waste Types	a)	b)
Plastic bags	[ ]	.....
Plastic packaging	[ ]	.....
Paper & c/board pkg	[ ]	.....
waste paper	[ ]	.....
Garden/yard	[ ]	.....
Glass jars/containers	[ ]	.....
Aluminium cans	[ ]	.....
Tin cans	[ ]	.....
Food scraps	[ ]	.....
Cloth	[ ]	.....
diapers	[ ]	.....
Others: specify	[ ]	.....

24. Why is waste storage not a problem in your household?

25. In your opinion, how can waste storage be improved in your household?

Waste Final Disposal

26. Use the brackets provided below to answer questions a - d

a) How are wastes disposed in your household?

b) In your opinion, is this the best disposal method? Answer 'yes' or 'no' .

c) If not, what disposal method you consider the best? Choose from disposal methods below and insert the number that represents the method, in the bracket.

d) Why isn't that method practiced? (reason)

Disposal Methods:

1. feed to animals
2. Bury
3. Burn
4. Waste dump
5. Unoccopied land
6. Sea
7. Others

Waste types

1 plastic bags *2 plastic packaging* *3 paper & cardboard pkg* *4 waste papers*
5 garden/yard *6 glass jars/containers* *7 aluminium cans* *8 tin cans*
9 foodscraps *10 cloth* *11 diapers* *12 Others (specify)*

W/Types	a) Disposal Methods							b)	c)	d)
	1	2	3	4	5	6	7			
1	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	.....
2	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	.....
3	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	.....
4	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	.....
5	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	.....
6	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	.....
7	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	.....
8	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	.....
9	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	.....
10	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	.....
11	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	.....
12	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	.....

Waste Collection Service and Transportation

27. Please answer questions a-d by placing a tick in the corresponding brackets.
    a) Are you aware of the Ministry of Health's (MOH) waste collection service?
    b) Is this (MOH) waste collection service available in your area?
    c) Are you using the service? If you answer yes go to d), if no go to Q.32
    d) Do you think the current service provided (number of collection) is enough? If you answer yes go to Q.29, if no go to Q.28.

	a)	b)	c)	d)
Yes	[ ]	[ ]	[ ]	[ ]
No	[ ]	[ ]	[ ]	[ ]

28. If the current collection service is not enough, how often do you want your waste collected?
a) everyday b) twice a week c) once a week d) once in two weeks

	a)	b)	c)	d)
Plastic bags	[ ]	[ ]	[ ]	[
Plastic packaging	[ ]	[ ]	[ ]	[ ]
Paper & c/board pkg	[ ]	[ ]	[ ]	[ ]
Waste paper	[ ]	[ ]	[ ]	[ ]
Garden/yard	[ ]	[ ]	[ ]	[ ]
Glass jars/containers	[ ]	[ ]	[ ]	[ ]
Aluminium cans	[ ]	[ ]	[ ]	[ ]
Tin canned	[ ]	[ ]	[ ]	[ ]
Food scraps	[ ]	[ ]	[ ]	[ ]
Cloth	[ ]	[ ]	[ ]	[ ]
Diapers	[ ]	[ ]	[ ]	[ ]
Others: specify	[ ]	[ ]	[ ]	[ ]

29. How regular is the MOH's garbage collection service?
    [ ] very regular [ ] regular [ ] Not so regular
    [ ] irregular [ ] very irregular

30. In your opinion, do you think the amount paid is enough?
    [ ] more than enough [ ] enough [ ] not enough

31. Are you willing to pay more if the service improves?
    [ ] strongly willing [ ] willing [ ] not so willing
    [ ] unwilling [ ] strongly unwilling

32. If you are not using the MOH's collection service, why aren't you using it?

33. If the MOH waste collection service is not available to you. Do you wish to be provided with this waste collection service?

[ ] yes [ ] no

Waste Minimisation - 4Rs (Reduce, Reuse, Recycle, Recovery)

Reduce/Avoidance

34. How often does a person in your household take a shopping bag when go shopping?
[ ] always [ ] most of the time [ ] sometimes [ ] rarely [ ] never

35. What do you think of the idea of taking a shopping bag when go shopping?
[ ] very good [ ] good [ ] not so good [ ] bad [ ] very bad

36. How often do you take a shopping basket/bag/container when go shopping/market?
[ ] always [ ] most of the time [ ]sometimes [ ] rarely [ ] never

Reuse

37. Do you reuse any of the following?

	Yes	No
plastic bags	[ ]	[ ]
plastic bottles/containers	[ ]	[ ]
glass bottles/jars	[ ]	[ ]
cardboard boxes	[ ]	[ ]
papers	[ ]	[ ]
cloth	[ ]	[ ]
aluminium cans	[ ]	[ ]
tin cans	[ ]	[ ]
papers	[ ]	[ ]
foodscraps	[ ]	[ ]
others: specify	[ ]	[ ]

38. Do you think waste reuse is appropriate to managing waste?
[ ] very appropriate [ ] appropriate [ ] not so appropriate
[ ] inappropriate [ ] very inappropriate

39. What factors stop you from reusing waste?

Recycle

40. Do you know anything about recycling?
[ ] know much [ ] know little [ ] know nothing

41. Do you know of any recycling services available?
[ ] yes [ ] no

42. If yes, name them?

43. Do you use the recycling service(s)?
[ ] yes [ ] no
If you answer yes go the Q.44, if no go to Q.46.

44. What do you recycle?
[ ] bottles [ ] aluminium cans [ ] scrap metals
[ ] others: specify_____

45. Do you think the recycling service(s) is/are working efficiently?
a) very efficient b) efficient c) slightly efficient d) inefficient

Name of recycling services	Efficiency of services			
	a)	b)	3)	d)
Moana Recycling	[ ]	[ ]	[ ]	[ ]
Royal Beer Recycling	[ ]	[ ]	[ ]	[ ]
Others	[ ]	[ ]	[ ]	[ ]
	[ ]	[ ]	[ ]	[ ]
	[ ]	[ ]	[ ]	[ ]

46. Why aren't you recycling?

47. If the recycling services are available and run efficiently, how eager are you to recycle?
[ ] very eager [ ] eager [ ] slightly eager [ ] uneager
[ ] very uneager

Recovery

48. Do you know anything about composting? If yes go to Q. 49, if no go to Q.52.
[ ] yes [ ] no

49. Do you do compost? If yes go to Q.50, if no go to Q.51.
[ ] yes [ ] no

50. What do you compost?
[ ] foodscraps [ ] garden/yard waste
[ ] others: specify_____

51. Why don't you compost?

52. If taught the proper way to do composting, how eager you would be to compost?
[ ] very eager [ ] eager [ ] slightly eager [ ] uneager
[ ] very uneager

Part 2: Questions on the community general awareness of waste management

General Awareness Information

53. Have you heard or seen any information about waste management or any associated problems?
[ ] yes [ ] no

54. If yes, what type/s of information did you see/hear?
[ ] clean up campaign [ ] anti litter campaign
[ ] recycling [ ] others: specify

55. What was the medium of information transmission? Rank from 1 to 8 where 1 is most frequent and 8 is least frequent
[ ] television [ ] radio [ ] newspaper
[ ] government village workshops [ ] women's group [ ] family/friends
[ ] church group [ ]others: specify _____

56. If you want to learn more about waste management, how would you like the information to come from? Rank from 1 to 8 where 1 is like most and 8 is like least.

[ ] television [ ] radio [ ] newspaper
[ ] government village workshops [ ] women's group [ ] family/friends
[ ] church group [ ] others: specify _____

57. From whom did the information come? (Source). Please answer by filling the table below.

Information	Source
[ ] clean up campaign	
[ ] anti litter campaign	
[ ] recycling	
[ ] others: specify	
[ ]	
[ ]	
[ ]	
[ ]	

58. How aware are you of the impacts of improper waste management on:
a) health b) environment c) economy

	Very aware	Aware	Slightly aware	Unaware
Health impact	[ ]	[ ]	[ ]	[ ]
Environmental impact	[ ]	[ ]	[ ]	[ ]
Economic impact	[ ]	[ ]	[ ]	[ ]

59. How much do you know about the legislation/regulations regarding waste management?

[ ] know a lot [ ] know some [ ] know a little
[ ] don't know any

60. Suppose somebody dumps a load of waste in your piece of land that is unoccupied. How willing are you to carry out prosecution of that person?

[ ] most willing [ ] willing [ ] not so willing
[ ] unwilling [ ] absolutely unwilling

Part 3: Questions on Sociodemograhy

Personal Information

61. Gender
[ ] male [ ] female

62. Age
[ ] 18-24 [ ] 25-34 [ ] 35-44 [ ] 45-54 [ ] 55+

63. Number of people in the household
[ ] 1-4 [ ] 5-8 [ ] 9-12 [ ] over 12

64. Educational qualification
[ ] no schooling [ ] primary school [ ] secondary
[ ] tertiary

65. Occupation
[ ] legislators/managers [ ] professionals
[ ] technicians [ ] clerks
[ ] service workers [ ] skilled agriculture & fisheries workers
[ ] craft & related trade workers [ ] plant & machine operators
[ ] elementary occupations

66. Religion
[ ] Free Weslyan Church [ ] Roman Catholic [ ] Latter Day Saints
[ ] Free Church of Tonga [ ] Church of Tonga [ ] Tokaikolo Church
[ ] Seventh Day Adventists [ ] Assembly of God [ ] Anglican Church
[ ] Others

67. Family's average annual income (Tongan $)
[ ] less than 3000 [ ] 3000-5000
[ ] 5001-10000 [ ] 10000+

68. Have you been to a foreign country?
[ ] yes [ ] no

69. Place of residence (name of town/village)

APPENDIX 2

Human Research Ethics Committee

Information Sheet

Project Title: Community perception and attitude to waste management in Tonga

Researcher: Vika Lutui

This research project is being conducted as part of a Master of Science (Hons) Degree, supervised by Assoc. Prof. Adrian Hutton and Dr. Laurie Brown in the School of Geosciences at the University of Wollongong.

The purpose of the research project is to study the peoples' perception and attitude and whether they are related to the way in which solid waste is being managed in the household. The waste management behaviour will be studied with regards to how waste is generated, handled, collected, transported, minimised and disposed.

The survey involves filling in a questionnaire, which consist of three main parts. Part 1 includes questions related to your perception and attitude and the current practice of how waste is generated, handled, stored, collected, transported, minimised and disposed in your household. Part 2 includes questions on the general awareness of the community of waste management and Part 3 consists of sociodemographic questions for statistical purposes.

Your participation in this research is voluntary, and you are free to refuse to participate and/or withdraw from the research at any time.

If you have any inquiries about the research, you can contact Vika Lutui (phone 29513), Assoc. Prof. Adrain Hutton (61 2 42213832) and/or Dr. Laurie Brown (61 2 42214441) and if you have any concerns or complaints regarding the way the research is or has been conducted, you can contact the Complaints Office, Human Research Ethics Committee, University of Wollongong on 61 2 4221 4457.

APPENDIX 3

Human Research Ethics Committee

Consent Form

Research Title
Community Perception and Attitude to Waste Management in Tonga

Researcher
Vika Lutui

I have been given information about the research topic "Community Perception and Attitude to Waste Management in Tonga" and discussed the research project with Vika Lutui who is conducting this research as part of a Master of Science (Hons) Degree, supervised by Assoc. Prof. Adrian Hutton and Dr. Laurie Brown, in the School of Geosciences at the University of Wollongong.

I understand that, if I consent to participate in this project I will be asked to fill in a survey questionnaire related to my perception and attitude and the current practice of how waste is generated, handled, stored, collected, transported, minimised and disposed in my household.
I also understand that I will be asked some personal sociodemographic questions for statistical purposes.
I understand that my participation in this research is voluntary, and I am free to refuse to participate and/or withdraw from the research at any time without penalty.

If I have any inquiries about the research, I can contact Vika Lutui (phone 29513), Assoc. Prof. Adrain Hutton (61 2 42213832) and Dr. Laurie Brown (61 2 42214441) or if I have any concerns or complaints regarding the way the research is or has been conducted, I can contact the Complaints Office, Human Research Ethics Committee, University of Wollongong on 61 2 4221 4457.

By signing below I am indicating my consent to participate in the research entitled "Community Perception and Attitude to Waste Management in Tonga", conducted by Vika Lutui as it has been described to me in the information sheet. I understand that the data collected from my participation will be used for purposes of MSc thesis and Journal Article and I consent for it to be used in that manner.

Signed ..... Date ...../...../.....

Name (please print)
.....

APPENDIX 4

Table 5.1.1 Relationships between Gender and Perceptions of Household Waste Generation Problems.

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	3	3.479	.3235
Plastic packaging	3	1.509	.6801
Paper/cardbd packg	3	2.464	.4818
Waste paper	3	3.541	.3155
Garden yard waste	3	2.029	.5664
Glass jars containers	3	2.693	.4415
Aluminum cans	3	1.223	.7474
Tin cans	3	1.423	.7001
Food scraps	3	7.497	.0576
Cloth	3	1.911	.5911
Diapers	3	.338	.9528
Others	3	3.788	.2853

Table 5.1.2 Relationships between Age and Perceptions of Household Waste Generation Problems

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	12	13.765	.3160
Plastic packaging	12	10.375	.5831
Paper/cardbd packg	12	15.784	.2013
Waste paper	12	10.271	.5922
Garden yard waste	12	6.946	.8611
Glass jars containers	12	9.417	.6669
Aluminum cans	12	10.643	.5597
Tin cans	12	7.694	.8085
Food scraps	12	19.951	.0680
Cloth	12	9.093	.6950
Diapers	12	16.883	.1541
Others	12	6.973	.8594

Table 5.1.3 Relationships between Household Size and Perceptions of Household Waste Generation Problems

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	6	5.220	.5159
Plastic packaging	6	3.008	.8078
Paper/cardbd packg	6	3.009	.8087
Waste paper	6	6.095	.4126
Garden yard waste	6	3.619	.7281
Glass jars containers	6	3.777	.7069
Aluminum cans	6	6.379	.3821
Tin cans	6	6.387	.3813
Food scraps	6	9.045	.1711
Cloth	6	10.072	.1217
Diapers	6	7.602	.2687
Others	6	4.606	.5952

Table 5.1.4 Relationships between Educational Level and Perceptions of Household Waste Generation Problems

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	3	2.338	.5053
Plastic packaging	3	1.087	.7802
Paper/cardbd packg	3	3.058	.3827
Waste paper	3	.994	.8026
Garden yard waste	3	4.541	.2086
Glass jars containers	3	3.818	.2818
Aluminum cans	3	.426	.9369
Tin cans	3	2.608	.4561
Food scraps	3	2.200	.5320
Cloth	3	4.830	.1847
Diapers	3	1.427	.6993
Others	3	5.120	.1632

Table 5.1.5 Relationships between Occupation and Perceptions of Household Waste Generation Problems

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	9	4.156	.9008
Plastic packaging	9	6.789	.6591
Paper/cardbd packg	9	12.672	.1780
Waste paper	9	7.577	.5773
Garden yard waste	9	13.383	.1460
Glass jars containers	9	6.308	.7088
Aluminum cans	9	19.109	.0243
Tin cans	9	17.002	.0487
Food scraps	9	14.889	.0940
Cloth	9	11.086	.2699
Diapers	9	12.702	.1766
Others	9	5.946	.7453

Table 5.1.6 Relationships between Residence and Perceptions of Household Waste Generation Problems

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	3	6.037	.1098
Plastic packaging	3	6.717	.0815
Paper/cardbd packg	3	.225	.9735
Waste paper	3	.732	.8656
Garden yard waste	3	4.028	.2584
Glass jars containers	3	3.580	.3105
Aluminum cans	3	.421	.9358
Tin cans	3	1.073	.7836
Food scraps	3	4.940	.1763
Cloth	3	6.819	.0779
Diapers	3	1.292	.7310
Others	3	5.950	.1141

Table 5.2.1 Relationships between Gender and Household Waste Handling Responsibilities

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	4	8.392	.0782
Plastic packaging	4	8.064	.0893
Paper/cardbd packg	4	7.415	.1155
Waste paper	4	1.216	.8755
Garden yard waste	4	12.283	.0154
Glass jars containers	4	12.370	.0148
Aluminum/tincans	4	3.302	.5086
Food scraps	4	9.805	.0438
Cloth	4	10.785	.0291
Diapers	4	7.795	.0994

Table 5.2.2 Relationships between Age and Household Waste Handling Responsibilities

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	16	16.622	.4104
Plastic packaging	16	13.353	.6468
Paper/cardbd packg	16	12.436	.7134
Waste paper	16	17.936	.3277
Garden yard waste	16	16.228	.4372
Glass jars containers	16	13.651	.6247
Aluminum/tin cans	16	9.589	.8872
Food scraps	16	12.884	.6813
Cloth	16	20.897	.1825
Diapers	16	23.096	.1112
Others	16	18.603	.2898

Table 5.2.3 Relationships between Household Size and Household Waste Handling Responsibilities

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	8	6.470	.5947
Plastic packaging	8	6.723	.5668
Paper/cardbd packg	8	6.886	.5489
Waste paper	8	6.663	.5734
Garden yard waste	8	12.229	.1413
Glass jars containers	8	10.466	.2338
Aluminum cans	8	4.709	.7881
Food scraps	8	6.488	.5928
Cloth	8	7.855	.4478
Diapers	8	2.714	9510
Others	8	3.737	.8800

Table 5.2.4 Relationships between Educational Level and Household Waste Handling Responsibilities

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	4	8.425	.0772
Plastic packaging	4	7.463	.1134
Paper/cardbd packg	4	4.655	.3246
Waste paper	4	5.232	.2643
Garden yard waste	4	7.507	.1114
Glass jars containers	4	5.692	.2233
Aluminum cans	4	5.477	.2417
Food scraps	4	4.045	.3999
Cloth	4	4.190	.3808
Diapers	4	5.442	.2449
Others	4	5.104	.2768

Table 5.2.5 Relationships between Occupation and Household Waste Handling Responsibilities

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	12	6.638	.8806
Plastic packaging	12	6.522	.8875
Paper/cardbd packg	12	12.762	.3866
Waste paper	12	3.898	.9852
Garden yard waste	12	7.733	.8056
Glass jars containers	12	10.609	.5627
Aluminum cans	12	11.654	.4738
Food scraps	12	12.218	.4283
Cloth	12	8.406	.7527
Diapers	12	7.850	.7968
Others	12	16.043	.1893

Table 5.2.6 Relationships between Residence and Household Waste Handling Responsibilities

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	4	2.200	.0990
Plastic packaging	4	4.047	.3997
Paper/cardbd packg	4	1.827	.7676
Waste paper	4	4.809	.3075
Garden yard waste	4	.679	.9538
Glass jars containers	4	2.236	.6925
Aluminum cans	4	1.865	.7606
Food scraps	4	3.886	.4217
Cloth	4	4.780	.3106
Diapers	4	3.052	.5491
Others	4	4.768	.3120

Table 5.3.1 Relationships between Gender and Opinions on Household Waste Handling Responsibilities

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	4	14.855	.0050
Plastic packaging	4	10.548	.0308
Paper/cardbd packg	4	12.373	.0148
Waste paper	4	14.245	.0066
Garden yard waste	4	7.950	.0934
Glass jars containers	4	8.589	.0722
Aluminum cans	4	8.241	.0831
Tin cans	4	7.233	.1241
Food scraps	4	11.885	.0182
Cloth	4	5.016	.2827
Diapers	4	1.468	.8324
Others	4	8.025	.0907

Table 5.3.2 Relationships between Age and Opinions on Household Waste Handling Responsibilities

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	16	20.278	.2079
Plastic packaging	16	17.112	.3784
Paper/cardbd packg	16	15.608	.4806
Waste paper	16	22.022	.1425
Garden yard waste	16	22.514	.1273
Glass jars containers	16	14.188	.5847
Aluminum cans	16	18.263	.3087
Tin cans	16	20.056	.2177
Food scraps	16	22.776	.1199
Cloth	16	15.478	.4899
Diapers	16	17.199	.3728
Others	16	16.025	.4512

Table 5.3.3 Relationships between Household Size and Opinions on Household Waste Handling Responsibilities

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	8	10.215	.2503
Plastic packaging	8	80413	.3942
Paper/cardbd packg	8	20.016	.0103
Waste paper	8	14.372	.0726
Garden yard waste	8	14.384	.0723
Glass jars containers	8	12.214	.1419
Aluminum cans	8	6.294	.6143
Tin cans	8	5.280	.7273
Food scraps	8	9.169	.3282
Cloth	8	10.991	.2022
Diapers	8	6.987	.5381
Others	8	9.751	.2829

Table 5.3.4 Relationships between Educational Level and Opinions on Household Waste Handling Responsibilities

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	4	8.766	.0672
Plastic packaging	4	10.168	.0377
Paper/cardbd packg	4	6.350	.1745
Waste paper	4	8.276	.0820
Garden yard waste	4	14.585	.0056
Glass jars containers	4	3.787	.4356
Aluminum cans	4	5.676	.2248
Tin cans	4	5.974	.2011
Food scraps	4	9.728	.0453
Cloth	4	5.338	.2544
Diapers	4	7.300	.1208
Others	4	4.337	.3624

Table 5.3.5 Relationships between Occupation and Opinions on Household Waste Handling Responsibilities

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	12	10.798	.5463
Plastic packaging	12	12.753	.3872
Paper/cardbd packg	12	14.615	.2632
Waste paper	12	11.702	.4699
Garden yard waste	12	11.445	.4913
Glass jars containers	12	10.422	.5790
Aluminum cans	12	13.281	.3490
Tin cans	12	12.569	.4012
Food scraps	12	13.049	.3655
Cloth	12	9.735	.6392
Diapers	12	10.059	.6108
Others	12	14.166	.2902

Table 5.3.6 Relationships between Residence and Opinions on Household Waste Handling Responsibilities

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	4	4.998	.2875
Plastic packaging	4	4.993	.2880
Paper/cardbd packg	4	4.484	.3445
Waste paper	4	4.664	.3258
Garden yard waste	4	11.944	.0178
Glass jars containers	4	2.564	.6332
Aluminum cans	4	2.219	.6956
Tin cans	4	1.760	.7797
Food scraps	4	.330	.9878
Cloth	4	1.705	.7898
Diapers	4	2.468	.6471
Others	4	.140	.9976

Table 5.4.1 Relationships between Gender and Opinions on Household Waste Clearance Practices

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	2	3.396	.1831
Plastic packaging	2	.435	.8043
Paper/cardbd packg	2	.320	.8523
Waste paper	2	.396	.8204
Garden yard waste	2	1.379	.5019
Glass jars containers	2	.180	.9137
Aluminum cans	2	4.397	.1110
Tin cans	2	4.231	.1206
Food scraps	2	.760	.6840
Cloth	2	.077	.9624
Diapers	2	2.037	.3611
Others	2	.152	.9269

Table 5.4.2 Relationships between Age and Opinions on Household Waste Clearance Practices

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	8	9.352	.3135
Plastic packaging	8	9.371	.3120
Paper/cardbd packg	8	11.656	.1672
Waste paper	8	4.888	.7695
Garden yard waste	8	14.203	.0766
Glass jars containers	8	8.930	.3482
Aluminum cans	8	20.758	.0078
Tin cans	8	19.371	.0130
Food scraps	8	7.865	.4468
Cloth	8	9.648	.2906
Diapers	8	4.497	.8097
Others	8	12.647	.1246

Table 5.4.3 Relationships between Household Size and Opinions on Household Waste Clearance Practices

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	4	3.118	.5383
Plastic packaging	4	2.841	.5847
Paper/cardbd packg	4	4.698	.3197
Waste paper	4	5.052	.2820
Garden yard waste	4	3.009	.5563
Glass jars containers	4	3.337	.5031
Aluminum cans	4	1.637	.8022
Tin cans	4	5.380	.2505
Food scraps	4	2.033	.7296
Cloth	4	11.860	.0184
Diapers	4	7.358	.1181
Others	4	10.608	.0313

Table 5.4.4 Relationships between Educational Level and Opinions on Household Waste Clearance Practices

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	2	.378	.8278
Plastic packaging	2	.555	.7577
Paper/cardbd packg	2	9.888	.0071
Waste paper	2	6.536	.0381
Garden yard waste	2	1.871	.3925
Glass jars containers	2	3.139	.2081
Aluminum cans	2	.909	.6349
Tin cans	2	.311	.8560
Food scraps	2	.596	.7425
Cloth	2	1.298	.5225
Diapers	2	6.766	.0339
Others	2	1.960	.3754

Table 5.4.5 Relationships between Occupation and Opinions on Household Waste Clearance Practices

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	6	12.020	.0615
Plastic packaging	6	4.771	.5736
Paper/cardbd packg	6	5.116	.5290
Waste paper	6	7.173	.3051
Garden yard waste	6	4.883	.5589
Glass jars containers	6	4.874	.5600
Aluminum cans	6	4.324	.6329
Tin cans	6	6.037	.4190
Food scraps	6	5.501	.4813
Cloth	6	12.671	.0486
Diapers	6	10.456	.1067
Others	6	7.131	.3089

Table 5.4.6 Relationships between Residence and Opinions on Household Waste Clearance Practices

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	2	2.015	.3651
Plastic packaging	2	.116	.9437
Paper/cardbd packg	2	.294	.8632
Waste paper	2	.162	.9221
Garden yard waste	2	3.090	.2134
Glass jars containers	2	1.112	.5735
Aluminum cans	2	.622	.7329
Tin cans	2	.438	.8033
Food scraps	2	2.105	.3490
Cloth	2	3.553	.1693
Diapers	2	.465	.7924
Others	2	2.968	.2267

Table 5.5.1 Relationships between Gender and Household Waste Clearance Preference per week

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	2	.290	.8651
Plastic packaging	2	.302	.8597
Paper/cardbd packg	2	1.231	.5405
Waste paper	2	.428	.8073
Garden yard waste	2	2.474	.2903
Glass jars containers	2	.001	.9996
Aluminum cans	2	.642	.7253
Tin cans	2	.353	.8380
Food scraps	2	1.727	3.353
Cloth	2	3.353	.1870
Diapers	2	.273	.8723
Others	2	2.438	.2955

Table 5.5.2 Relationships between Age and Household Waste Clearance Preference per week

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	8	5.362	.7183
Plastic packaging	8	8.905	.3504
Paper/cardbd packg	8	8.373	.3979
Waste paper	8	3.070	.9299
Garden yard waste	8	6.344	.6087
Glass jars containers	8	9.951	.2685
Aluminum cans	8	13.040	.1105
Tin cans	8	11.666	.1667
Food scraps	8	6.519	.5893
Cloth	8	9.655	.2901
Diapers	8	6.869	.5509
Others	8	5.552	.6973

Table 5.5.3 Relationships between Household Size and Household Waste Clearance Preference per week

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	4	1.793	.7738
Plastic packaging	4	3.161	.5312
Paper/cardbd packg	4	10.705	.0301
Waste paper	4	4.733	.3158
Garden yard waste	4	7.670	.1044
Glass jars containers	4	5.489	.2407
Aluminum cans	4	5.208	.2667
Tin cans	4	4.392	.3555
Food scraps	4	5.589	.2320
Cloth	4	5.938	.2038
Diapers	4	7.146	.1284
Others	4	5.265	.2611

Table 5.5.4 Relationships between Educational Level and Household Waste Clearance Preference per week

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	2	2.119	.3465
Plastic packaging	2	1.253	.5345
Paper/cardbd packg	2	.325	.8499
Waste paper	2	1.322	.5164
Garden yard waste	2	3.014	.2215
Glass jars containers	2	6.282	.0432
Aluminum cans	2	2.782	.2488
Tin cans	2	1.134	.5673
Food scraps	2	1.825	.4014
Cloth	2	1.762	.4143
Diapers	2	1.160	.5599
Others	2	2.017	.3647

Table 5.5.5 Relationships between Occupation and Household Waste Clearance Preference per week

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	6	2.671	.8488
Plastic packaging	6	3.615	.7286
Paper/cardbd packg	6	2.700	.8454
Waste paper	6	6.406	.3793
Garden yard waste	6	1.920	.9269
Glass jars containers	6	3.852	.6967
Aluminum cans	6	3.268	.7745
Tin cans	6	4.135	.6584
Food scraps	6	5.788	.4474
Cloth	6	2.952	.8148
Diapers	6	10.177	.1174
Others	6	7.346	.2901

Table 5.5.6 Relationships between Residence and Household Waste Clearance Preference per week

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	2	.528	.7680
Plastic packaging	2	.058	.9713
Paper/cardbd packg	2	.300	.8605
Waste paper	2	2.029	.3626
Garden yard waste	2	3.335	.1887
Glass jars containers	2	6.359	.0416
Aluminum cans	2	1.565	.4572
Tin cans	2	.747	.6882
Food scraps	2	1.796	.4074
Cloth	2	2.475	.2902
Diapers	2	2.890	.2357
Others	2	.023	.9888

Table 5.6.1 Relationships between Gender and Behavioural Attitude to Household Waste Clearance per week

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	2	.305	.8584
Plastic packaging	2	.388	.8239
Paper/cardbd packg	2	.442	.8016
Waste paper	2	.192	.9084
Garden yard waste	2	3.587	.1664
Glass jars containers	2	.434	.8049
Aluminum cans	2	.938	.6257
Tin cans	2	.119	.9420
Food scraps	2	.528	.7681
Cloth	2	.326	.8496
Diapers	2	.946	.6232
Others	2	1.300	.5200

Table 5.6.2 Relationships between Age and Behavioural Attitude to Household Waste Clearance per week

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	8	10.016	.2639
Plastic packaging	8	3.408	.9062
Paper/cardbd packg	8	6.129	.6328
Waste paper	8	4.631	.7962
Garden yard waste	8	4.043	.8532
Glass jars containers	8	5.306	.7244
Aluminum cans	8	4.076	.8502
Tin cans	8	4.966	.7612
Food scraps	8	7.859	.4473
Cloth	8	7.057	.5305
Diapers	8	4.285	.8305
Others	8	.157	.3292

Table 5.6.3 Relationships between Household Size and Behavioural Attitude to Household Waste Clearance per week

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	4	1.127	.8900
Plastic packaging	4	2.875	.5789
Paper/cardbd packg	4	2.852	.5829
Waste paper	4	2.949	.5664
Garden yard waste	4	5.101	.2771
Glass jars containers	4	5.182	.2691
Aluminum cans	4	2.158	.7068
Tin cans	4	.828	.9347
Food scraps	4	2.615	.6242
Cloth	4	5.880	.2083
Diapers	4	2.805	.5911
Others	4	1.544	.8189

Table 5.6.4 Relationships between Educational Level and Behavioural Attitude to Household Waste Clearance per week

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	2	.767	.6816
Plastic packaging	2	1.981	.3714
Paper/cardbd packg	2	.417	.8117
Waste paper	2	.154	.9260
Garden yard waste	2	.344	.8420
Glass jars containers	2	.889	.6412
Aluminum cans	2	.047	.9767
Tin cans	2	.418	.8113
Food scraps	2	3.722	.1555
Cloth	2	.137	.9339
Diapers	2	2.008	.3664
Others	2	1.135	.5670

Table 5.6.5 Relationships between Occupation and Behavioural Attitude to Household Waste Clearance per week

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	6	8.641	.1948
Plastic packaging	6	5.991	.4242
Paper/cardbd packg	6	1.152	.9792
Waste paper	6	8.483	.2048
Garden yard waste	6	2.423	.8770
Glass jars containers	6	5.084	.5331
Aluminum cans	6	5.742	.4527
Tin cans	6	7.063	.3150
Food scraps	6	4.985	.5458
Cloth	6	7.055	.3158
Diapers	6	14.235	.0271
Others	6	4.795	.5704

Table 5.6.6 Relationships between Residence and Behavioural Attitude to Household Waste Clearance per week

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	2	.205	.9028
Plastic packaging	2	4.411	.6212
Paper/cardbd packg	2	1.113	.5731
Waste paper	2	.457	.7956
Garden yard waste	2	.603	.7396
Glass jars containers	2	.188	.9104
Aluminum cans	2	.442	.8016
Tin cans	2	.495	.7809
Food scraps	2	.479	.7872
Cloth	2	2.398	.3016
Diapers	2	4.121	.1274
Others	2	2.339	.3105

Table 5.7.1 Relationships between Gender and Litter Perceptions

	Degree of Freedom	Chi Square	Chi Square P-Value
Tonga	2	1.140	.5655
Village/Town	3	1.494	.6836
Household	3	.715	.8697

Table 5.7.2 Relationships between Age and Litter Perceptions

	Degree of Freedom	Chi Square	Chi Square P-Value
Tonga	8	7.667	.4666
Village/Town	12	8.534	.7421
Household	12	4.557	.9712

Table 5.7.3 Relationships between Household Size and Litter Perceptions

	Degree of Freedom	Chi Square	Chi Square P-Value
Tonga	4	1.299	.8615
Village/Town	6	5.622	.4668
Household	6	5.547	.4758

Table 5.7.4 Relationships between Educational Level and Litter Perceptions

	Degree of Freedom	Chi Square	Chi Square P-Value
Tonga	2	4.606	.0999
Village/Town	3	4.664	.1981
Household	3	1.946	.5838

Table 5.7.5 Relationships between Occupation and Litter Perceptions

	Degree of Freedom	Chi Square	Chi Square P-Value
Tonga	6	5.830	.4425
Village/Town	9	9.851	.3627
Household	9	10.701	.2968

Table 5.7.6 Relationships between Residence and Litter Perceptions

	Degree of Freedom	Chi Square	Chi Square P-Value
Tonga	2	2.485	2.887
Village/Town	3	2.584	.4602
Household	3	2.029	.5665

Table 5.8.1 Relationships between Gender and Litter Practices

	Degree of Freedom	Chi Square	Chi Square P-Value
Pangai	4	4.818	.3064
Road	4	2.359	.6701
Beach	4	6.983	.1368
Household	4	3.336	.5033

Table 5.8.2 Relationships between Age and Litter Practices

	Degree of Freedom	Chi Square	Chi Square P-Value
Pangai	16	19.656	.2361
Road	16	12.291	.7237
Beach	16	8.778	.9223
Household	16	11.100	.8033

Table 5.8.3 Relationships between Household Size and Litter Practices

	Degree of Freedom	Chi Square	Chi Square P-Value
Pangai	8	7.511	.4826
Road	8	3.073	.9297
Beach	8	6.247	.6196
Household	8	2.219	.9735

Table 5.8.4 Relationships between Educational Level and Litter Practices

	Degree of Freedom	Chi Square	Chi Square P-Value
Pangai	4	7.615	.1068
Road	4	4.976	2.897
Beach	4	3.561	.4686
Household	4	2.598	.6272

Table 5.8.5 Relationships between Occupation and Litter Practices

	Degree of Freedom	Chi Square	Chi Square P-Value
Pangai	12	11.642	.4748
Road	12	31.301	.0018
Beach	12	17.262	.1400
Household	12	20.628	.0561

Table 5.8.6 Relationships between Residence and Litter Practices

	Degree of Freedom	Chi Square	Chi Square P-Value
Pangai	4	8.873	.0643
Road	4	7.882	.0960
Beach	4	5.045	.2827
Household	4	5.111	.2761

Table 5.9.1 Relationships between Gender and Affective Attitudes to Litter Disposal

	Degree of Freedom	Chi Square	Chi Square P-Value
Pangai	3	4.010	.2604
Road	3	4.525	.2101
Beach	3	6.986	.0723
Household	3	10.408	.0154

Table 5.9.2 Relationships between Age and Affective Attitudes to Litter Disposal

	Degree of Freedom	Chi Square	Chi Square P-Value
Pangai	12	17.513	.1313
Road	12	6.724	.8753
Beach	12	4.523	.9721
Household	12	12.090	.4385

Table 5.9.3 Relationships between Household Size and Affective Attitudes to Litter Disposal

	Degree of Freedom	Chi Square	Chi Square P-Value
Pangai	6	4.404	.6222
Road	6	3.072	.7997
Beach	6	7.934	.2430
Household	6	7.417	.2840

Table 5.9.4 Relationships between Educational Level and Affective Attitudes to Litter Disposal

	Degree of Freedom	Chi Square	Chi Square P-Value
Pangai	3	2.225	.5270
Road	3	4.929	.1770
Beach	3	3.669	.2994
Household	3	1.640	.6505

Table 5.9.5 Relationships between Occupation and Affective Attitudes to Litter Disposal

	Degree of Freedom	Chi Square	Chi Square P-Value
Pangai	9	10.837	.2871
Road	9	9.231	.4162
Beach	9	6.934	.6440
Household	9	6.305	.7091

Table 5.9.6 Relationships between Residence and Affective Attitudes to Litter Disposal

	Degree of Freedom	Chi Square	Chi Square P-Value
Pangai	3	4.526	.2099
Road	3	1.699	.6371
Beach	3	2.417	.4904
Household	3	3.584	.3101

Table 5.10.1 Relationships between Gender and Behavioural Attitudes to Litter Disposal

	Degree of Freedom	Chi Square	Chi Square P-Value
Pangai	4	4.375	.3576
Road	4	4.349	.3608
Beach	4	2.276	.6852
Household	4	6.101	.1917

Table 5.10.2 Relationships between Age and Behavioural Attitudes to Litter Disposal

	Degree of Freedom	Chi Square	Chi Square P-Value
Pangai	16	12.405	.7157
Road	16	19.766	.2309
Beach	16	17.501	.3539
Household	16	16.802	.3985

Table 5.10.3 Relationships between Household Size and Behavioural Attitudes to Litter Disposal

	Degree of Freedom	Chi Square	Chi Square P-Value
Pangai	8	3.367	.9093
Road	8	11.986	.1518
Beach	8	10.113	.2572
Household	8	10.558	.2280

Table 5.10.4 Relationships between Educational Level and Behavioural Attitudes to Litter Disposal

	Degree of Freedom	Chi Square	Chi Square P-Value
Pangai	4	3.239	.5187
Road	4	12.830	.0121
Beach	4	13.453	.0093
Household	4	14.225	.0066

Table 5.10.5 Relationships between Occupation and Behavioural Attitudes to Litter Disposal

	Degree of Freedom	Chi Square	Chi Square P-Value
Pangai	12	15.637	.2084
Road	12	16.027	.1900
Beach	12	8.777	.7219
Household	12	11.979	.4474

Table 5.10.6 Relationships between Residence and Behavioural Attitudes to Litter Disposal

	Degree of Freedom	Chi Square	Chi Square P-Value
Pangai	4	4.555	.3361
Road	4	2.103	.7168
Beach	4	3.113	.5391
Household	4	3.971	.4099

Table 5.11 Relationship between socio-demographic variables and waste separation practices

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	1	3.957	.0467
Age	4	5.117	.2755
Household size	2	4.297	.1167
Education	1	1.946	.16303
Occupation	3	7.241	.0646
Residence	1	.059	.8079

Table 5.12 Relationship between socio-demographic variables and affective attitude to waste separation

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	3	1.369	.7129
Age	12	30.134	.0027
Household size	6	6.208	.4002
Education	3	4.574	.2058
Occupation	9	10.224	.3327
Residence	3	9.013	.0291

Table 5.13 Relationship between socio-demographic variables and behavioural attitude to waste separation

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	3	1.737	.6287
Age	12	12.852	.3799
Household size	6	3.116	.7941
Education	3	3.005	.3909
Occupation	9	7.308	.6051
Residence	3	12.314	.0064

Table 5.14.1 Relationships between Gender and Household Waste Storage Practices

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	4	2.363	.6693
Plastic packaging	4	.983	.9123
Paper/cardbd packg	4	6.058	.1948
Waste paper	4	3.960	.4114
Garden yard waste	4	.685	.9531
Glass jars containers	4	1.151	.8861
Aluminum cans	4	1.673	.7955
Tin cans	4	1.501	.8264
Food scraps	4	2.428	.6575
Cloth	4	1.781	.7759
Diapers	4	2.189	.7011
Others	4	7.086	.1314

Table 5.14.2 Relationships between Age and Household Waste Storage Practices

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	16	15.971	.4550
Plastic packaging	16	12.694	.6950
Paper/cardbd packg	16	14.616	.5529
Waste paper	16	16.816	.3976
Garden yard waste	16	19.042	.2665
Glass jars containers	16	13.812	.6128
Aluminum cans	16	15.352	.4990
Tin cans	16	13.748	.6175
Food scraps	16	17.230	.3709
Cloth	16	28.360	.0286
Diapers	16	14.186	.5849
Others	16	10.801	.8216

Table 5.14.3 Relationships between Educational Level and Household Waste Storage Practices

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	4	5.878	.2085
Plastic packaging	4	7.104	.1305
Paper/cardbd packg	4	2.107	.7162
Waste paper	4	1.633	.8028
Garden yard waste	4	1.188	.8800
Glass jars containers	4	1.165	.8839
Aluminum cans	4	6.594	.1589
Tin cans	4	2.747	.6010
Food scraps	4	2.998	.5581
Cloth	4	3.570	.4673
Diapers	4	7.296	.1211
Others	4	8.158	.0860

Table 5.14.4 Relationships between Occupation and Household Waste Storage Practices

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	12	9.850	.6291
Plastic packaging	12	14.333	.2800
Paper/cardbd packg	12	14.688	.2589
Waste paper	12	8.691	.7291
Garden yard waste	12	8.439	.7500
Glass jars containers	12	22.570	.0316
Aluminum cans	12	22.238	.0349
Tin cans	12	23.303	.0253
Food scraps	12	19.309	.0813
Cloth	12	18.494	.1015
Diapers	12	15.107	.2356
Others	12	21.743	.0405

Table 5.14.5 Relationships between Income and Household Waste Storage Practices

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	12	9.297	.6773
Plastic packaging	12	17.216	.1417
Paper/cardbd packg	12	8.134	.7746
Waste paper	12	10.980	.5307
Garden yard waste	12	15.732	.2038
Glass jars containers	12	20.431	.0594
Aluminum cans	12	17.037	.1482
Tin cans	12	23.592	.0231
Food scraps	12	12.232	.4273
Cloth	12	10.452	.5764
Diapers	12	17.601	.1283
Others	12	18.101	.1127

Table 5.14.6 Relationships between Residence and Household Waste Storage Practices

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	4	1.313	.8592
Plastic packaging	4	9.983	.0407
Paper/cardbd packg	4	3.073	.5456
Waste paper	4	8.633	.0710
Garden yard waste	4	3.614	.4608
Glass jars containers	4	8.181	.0852
Aluminum cans	4	4.005	.4054
Tin cans	4	5.969	.2015
Food scraps	4	5.039	.2833
Cloth	4	6.648	.1557
Diapers	4	4.493	.3433
Others	4	3.887	.4215

Table 5.15.1 Relationships between Gender and Affective Attitude to Household Waste Storage

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	3	3.657	.3010
Plastic packaging	3	2.559	.4647
Paper/cardbd packg	3	5.190	.1584
Waste paper	3	5.165	.1601
Garden yard waste	3	.906	.8240
Glass jars containers	3	5.289	.1518
Aluminum cans	3	3.031	.3868
Tin cans	3	1.624	.6539
Food scraps	3	3.565	.3124
Cloth	3	.950	.8134
Diapers	3	3.108	.3753
Others	3	.334	.9536

Table 5.15.2 Relationships between Age and Household Waste Storage Practices

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	12	11.036	.5259
Plastic packaging	12	13.070	.3639
Paper/cardbd packg	12	5.333	.9459
Waste paper	12	11.312	.5024
Garden yard waste	12	20.717	.0547
Glass jars containers	12	21.219	.0473
Aluminum cans	12	8.171	.7716
Tin cans	12	8.803	.7197
Food scraps	12	20.841	.0528
Cloth	12	9.449	.6641
Diapers	12	6.543	.8863
Others	12	8.453	.7488

Table 5.15.3 Relationships between Educational Level and Household Waste Storage Practices

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	3	3.275	.3512
Plastic packaging	3	4.391	.2223
Paper/cardbd packg	3	1.059	.2552
Waste paper	3	8.437	.0378
Garden yard waste	3	2.236	.5250
Glass jars containers	3	5.610	.1322
Aluminum cans	3	4.994	.1722
Tin cans	3	2.561	.4643
Food scraps	3	6.448	.0917
Cloth	3	4.253	.2354
Diapers	3	5.967	.1132
Others	3	1.826	.6093

Table 5.15.4 Relationships between Occupation and Household Waste Storage Practices

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	9	11.770	.2266
Plastic packaging	9	13.691	.1337
Paper/cardbd packg	9	5.578	.7813
Waste paper	9	13.832	.1284
Garden yard waste	9	13.584	.1379
Glass jars containers	9	13.228	.1526
Aluminum cans	9	9.950	.3545
Tin cans	9	13.770	.1307
Food scraps	9	13.970	.1234
Cloth	9	10.199	.3346
Diapers	9	6.352	.7043
Others	9	5.948	.7541

Table 5.15.5 Relationships between Income and Household Waste Storage Practices

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	9	24.331	.0038
Plastic packaging	9	16.160	.0636
Paper/cardbd packg	9	17.849	.0370
Waste paper	9	18.330	.0315
Garden yard waste	9	10.978	.2772
Glass jars containers	9	11.122	.2674
Aluminum cans	9	13.197	.1539
Tin cans	9	11.353	.2523
Food scraps	9	14.086	.1193
Cloth	9	11.091	.2696
Diapers	9	11.757	.2273
Others	9	4.141	.9019

Table 5.15.6 Relationships between Residence and Household Waste Storage Practices

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	3	1.220	.7482
Plastic packaging	3	9.322	.0253
Paper/cardbd packg	3	.390	.9423
Waste paper	3	1.606	.6580
Garden yard waste	3	1.957	.5813
Glass jars containers	3	.526	.9132
Aluminum cans	3	3.867	.2762
Tin cans	3	3.080	.3794
Food scraps	3	1.314	.7257
Cloth	3	.621	.8917
Diapers	3	4.104	.2504
Others	3	1.237	.7440

Table 5.16.1 Relationships between Gender and Behavioural Attitude to Household Waste Storage

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	4	3.928	.4158
Plastic packaging	4	5.003	.2869
Paper/cardbd packg	4	1.525	.8222
Waste paper	4	.800	.9385
Garden yard waste	4	9.251	.0551
Glass jars containers	4	7.347	.1187
Aluminum cans	4	1.415	.8416
Tin cans	4	1.173	.8825
Food scraps	4	6.683	.1536
Cloth	4	3.214	.5227
Diapers	4	3.935	.4149
Others	4	7.228	.0650

Table 5.16.2 Relationships between Age and Behavioural Attitude to Household Waste Storage

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	16	19.727	.2328
Plastic packaging	16	15.822	.4655
Paper/cardbd packg	16	25.199	.0664
Waste paper	16	20.665	.1917
Garden yard waste	16	8.537	.9313
Glass jars containers	16	27.466	.0366
Aluminum cans	16	17.867	.3317
Tin cans	16	19.681	.2349
Food scraps	16	11.706	.7639
Cloth	16	19.371	.2499
Diapers	16	12.568	.7041
Others	16	6.614	.8820

Table 5.16.3 Relationships between Educational Level and Behavioural Attitude to Household Waste Storage

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	4	4.496	.3430
Plastic packaging	4	10.917	.0275
Paper/cardbd packg	4	1.128	.8899
Waste paper	4	3.092	.5425
Garden yard waste	4	5.221	.2653
Glass jars containers	4	4.450	.3485
Aluminum cans	4	1.888	.7563
Tin cans	4	6.037	.1964
Food scraps	4	2.747	.6011
Cloth	4	3.427	.4890
Diapers	4	2.476	.6489
Others	4	4.924	.1775

Table 5.16.4 Relationships between Occupation and Behavioural Attitude to Household Waste Storage

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	12	16.887	.1539
Plastic packaging	12	16.741	.1596
Paper/cardbd packg	12	13.642	.3241
Waste paper	12	15.089	.2366
Garden yard waste	12	17.459	.1331
Glass jars containers	12	11.927	.4516
Aluminum cans	12	14.471	.2716
Tin cans	12	18.257	.1081
Food scraps	12	13.007	.3685
Cloth	12	9.682	.6438
Diapers	12	14.765	.2546
Others	12	8.728	.4627

Table 5.16.5 Relationships between Income and Behavioural Attitude to Household Waste Storage

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	12	20.796	.0534
Plastic packaging	12	21.912	.0385
Paper/cardbd packg	12	13.291	.3482
Waste paper	12	9.121	.6926
Garden yard waste	12	30.382	.0024
Glass jars containers	12	20.562	.0572
Aluminum cans	12	12.361	.4172
Tin cans	12	16.993	.1499
Food scraps	12	16.786	.1578
Cloth	12	18.699	.0961
Diapers	12	17.175	.1431
Others	12	9.543	.3887

Table 5.16.6 Relationships between Residence and Behavioural Attitude to Household Waste Storage

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	4	8.179	.0852
Plastic packaging	4	10.973	.0269
Paper/cardbd packg	4	3.398	.4936
Waste paper	4	5.375	.2510
Garden yard waste	4	4.183	.3819
Glass jars containers	4	7.258	.1229
Aluminum cans	4	7.472	.1129
Tin cans	4	6.519	.1636
Food scraps	4	5.819	.2131
Cloth	4	3.118	.5382
Diapers	4	6.278	.1793
Others	4	3.079	.3795

Table 5.17.1 Relationships between Gender and Length of Household Waste Storage

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	4	6.623	.1572
Plastic packaging	4	6.052	.1953
Paper/cardbd packg	4	3.756	.4401
Waste paper	4	5.976	.2009
Garden yard waste	4	1.733	.7848
Glass jars containers	4	5.398	.2488
Aluminum cans	4	3.505	.4771
Tin cans	4	5.924	.2049
Food scraps	4	4.653	.3248
Cloth	4	4.534	.3386
Diapers	4	2.063	.7241
Others	4	2.025	.7312

Table 5.17.2 Relationships between Age and Length of Household Waste Storage

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	16	12.025	.7423
Plastic packaging	16	8.767	.9227
Paper/cardbd packg	16	8.684	.9259
Waste paper	16	8.269	.9404
Garden yard waste	16	23.116	.1107
Glass jars containers	16	19.654	.2362
Aluminum cans	16	27.740	.0340
Tin cans	16	23.405	.1033
Food scraps	16	13.761	.6165
Cloth	16	19.520	.2426
Diapers	16	28.864	.0723
Others	16	19.177	.2596

Table 5.17.3 Relationships between Educational Level and Length of Household Waste Storage

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	4	12.241	.0156
Plastic packaging	4	4.821	.3062
Paper/cardbd packg	4	3.144	.5339
Waste paper	4	10.781	.0291
Garden yard waste	4	2.002	.7354
Glass jars containers	4	3.863	.4249
Aluminum cans	4	3.137	.5351
Tin cans	4	3.252	.5166
Food scraps	4	5.924	.2049
Cloth	4	12.023	.0172
Diapers	4	3.925	.4163
Others	4	2.894	.5757

Table 5.17.4 Relationships between Occupation and Length of Household Waste Storage

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	12	16.964	.1509
Plastic packaging	12	17.690	.1254
Paper/cardbd packg	12	15.768	.2021
Waste paper	12	18.138	.1116
Garden yard waste	12	9.728	.6398
Glass jars containers	12	15.705	.2051
Aluminum cans	12	6.915	.8632
Tin cans	12	6.959	.8603
Food scraps	12	10.641	.5599
Cloth	12	13.051	.3653
Diapers	12	16.018	.1904
Others	12	8.079	.7790

Table 5.17.5 Relationships between Residence and Length of Household Waste Storage

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	4	7.910	.0949
Plastic packaging	4	3.553	.4698
Paper/cardbd packg	4	6.050	.1955
Waste paper	4	6.304	.1776
Garden yard waste	4	5.179	.2694
Glass jars containers	4	3.688	.4499
Aluminum cans	4	3.336	.5033
Tin cans	4	4.172	.3832
Food scraps	4	6.808	.1464
Cloth	4	1.814	.7699
Diapers	4	5.876	.2086
Others	4	2.312	.6785

Table 5.17.6 Relationships between Household Size and Length of Household Waste Storage

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	8	10.605	.2251
Plastic packaging	8	14.506	.0695
Paper/cardbd packg	8	7.094	.5265
Waste paper	8	15.626	.0481
Garden yard waste	8	4.354	.8239
Glass jars containers	8	5.874	.6613
Aluminum cans	8	4.872	.7711
Tin cans	8	8.799	.3595
Food scraps	8	3.633	.8886
Cloth	8	14.843	.0623
Diapers	8	7.276	.5072
Others	8	3.784	.8761

Table 5.18 Relationship between Socio-demographic Variables and Perceptions of Waste Storage problems

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	3	6.991	.0722
Age	12	8.658	.7318
Household size	6	3.966	.6812
Education	3	2.387	.4960
Occupation	9	8.933	.4435
Residence	3	1.909	.5916

Table 5.19.1 Relationship between Gender and Respondent's Perceptions of Waste Storage Problems

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	1	2.030	.1543
Plastic packaging	1	2.030	.1543
Paper/cardbd packg	1	1.192	.2749
Waste paper	1	1.054	.3045
Garden yard waste	1	.708	.4000
Glass jars containers	1	.020	.8888
Aluminum cans	1	.243	.6223
Tin cans	1	1.423	.2329
Food scraps	1	.004	.9469
Cloth	1	.708	.4000
Diapers	1	2.101	.1472
Others	1	1.087	.5806

Table 5.19.2 Relationship between Age and Respondent's Perceptions of Waste Storage Problems

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	4	4.375	.3577
Plastic packaging	4	8.772	.0671
Paper/cardbd packg	4	2.523	.6404
Waste paper	4	3.421	.4899
Garden yard waste	4	3.468	.4828
Glass jars containers	4	1.596	.8096
Aluminum cans	4	1.567	.8148
Tin cans	4	4.005	.4053
Food scraps	4	3.857	.4257
Cloth	4	2.045	.7276
Diapers	4	7.536	.1102
Others	4	5.110	.7458

Table 5.19.3 Relationship between Educational Level and Respondent's Perceptions of Waste Storage Problems

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	1	2.751	.0972
Plastic packaging	1	2.751	.0972
Paper/cardbd packg	1	.137	.7117
Waste paper	1	.810	.3682
Garden yard waste	1	.051	.8220
Glass jars containers	1	2.074	.1498
Aluminum cans	1	.084	.7718
Tin cans	1	.668	.4137
Food scraps	1	.437	.5084
Cloth	1	.291	.5893
Diapers	1	1.628	.2019
Others	1	2.393	.3023

Table 5.19.4 Relationship between Occupation and Respondent's Perceptions of Waste Storage Problems

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	3	5.436	.1425
Plastic packaging	3	5.091	.1652
Paper/cardbd packg	3	2.252	.5217
Waste paper	3	3.401	.3338
Garden yard waste	3	.784	.8533
Glass jars containers	3	3.870	.2758
Aluminum cans	3	6.758	.0800
Tin cans	3	6.329	.0966
Food scraps	3	.192	.9789
Cloth	3	4.902	.1791
Diapers	3	2.357	.5017
Others	3	6.864	.3336

Table 5.19.5 Relationship between Residence and Respondent's Perceptions of Waste Storage Problems

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	1	1.523	.2171
Plastic packaging	1	3.652	.0560
Paper/cardbd packg	1	1.771	.1833
Waste paper	1	4.115	.0425
Garden yard waste	1	.286	.5930
Glass jars containers	1	.180	.6711
Aluminum cans	1	.825	.3637
Tin cans	1	.009	.9246
Food scraps	1	3.425	.0642
Cloth	1	1.249	.2637
Diapers	1	3.077	.0794
Others	1	2.545	.2801

Table 5.20.1 Relationship between Gender and Household Waste Disposal Practices

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	4	3.125	.5371
Plastic packaging	4	1.138	.8882
Paper/cardbd packg	4	2.472	.6496
Waste paper	4	1.513	.8243
Garden yard waste	4	4.270	.3706
Glass jars containers	4	5.291	.2587
Aluminum cans	4	6.807	.1465
Tin cans	4	4.859	.3020
Food scraps	4	5.881	.2082
Cloth	4	1.989	.7377
Diapers	4	7.675	.1042
Others	4	8.097	.0881

Table 5.20.2 Relationship between Age and Household Waste Disposal Practices

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	16	15.400	.4956
Plastic packaging	16	12.815	.6862
Paper/cardbd packg	16	11.956	.7470
Waste paper	16	17.880	.3310
Garden yard waste	16	17.702	.3416
Glass jars containers	16	21.620	.1559
Aluminum cans	16	25.406	.0630
Tin cans	16	22.387	.1311
Food scraps	16	19.912	.2242
Cloth	16	5.883	.9893
Diapers	16	14.925	.5301
Others	16	19.255	.2556

Table 5.20.3 Relationship between Educational Level and Household Waste Disposal Practices

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	4	13.406	.0095
Plastic packaging	4	4.425	.3516
Paper/cardbd packg	4	1.149	.8864
Waste paper	4	5.298	.2581
Garden yard waste	4	4.406	.3538
Glass jars containers	4	7.848	.0973
Aluminum cans	4	10.124	.0384
Tin cans	4	9.648	.0468
Food scraps	4	2.049	.7268
Cloth	4	11.186	.0246
Diapers	4	8.523	.0742
Others	4	3.224	.5211

Table 5.20.4 Relationship between Occupation and Household Waste Disposal Practices

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	12	19.920	.0686
Plastic packaging	12	12.324	.4200
Paper/cardbd packg	12	10.924	.5354
Waste paper	12	16.832	.1560
Garden yard waste	12	8.448	.7492
Glass jars containers	12	22.645	.0309
Aluminum cans	12	17.068	.1470
Tin cans	12	19.303	.0815
Food scraps	12	9.138	.6873
Cloth	12	13.615	.3260
Diapers	12	12.511	.4056
Others	12	11.662	.4732

Table 5.20.5 Relationship between Income and Household Waste Disposal Practices

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	12	8.975	.7051
Plastic packaging	12	13.506	.3334
Paper/cardbd packg	12	12.516	.4052
Waste paper	12	11.064	.5234
Garden yard waste	12	10.998	.5291
Glass jars containers	12	10.910	.5367
Aluminum cans	12	14.325	.2804
Tin cans	12	23.297	.0253
Food scraps	12	13.630	.3250
Cloth	12	12.985	.3701
Diapers	12	10.861	.5409
Others	12	17.831	.1209

Table 5.20.6 Relationship between Residence and Household Waste Disposal Practices

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	4	12.990	.0113
Plastic packaging	4	25.371	< .0001
Paper/cardbd packg	4	2.527	.6398
Waste paper	4	8.929	.0629
Garden yard waste	4	4.915	.2961
Glass jars containers	4	9.110	.0584
Aluminum cans	4	15.997	.0030
Tin cans	4	14.163	.0068
Food scraps	4	5.578	.2329
Cloth	4	4.638	.3265
Diapers	4	17.512	.0015
Others	4	5.751	.2185

Table 5.21.1 Relationship between Gender and Opinions to Waste Disposal

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	1	.105	.7460
Plastic packaging	1	.005	.9464
Paper/cardbd packg	1	.207	.6494
Waste paper	1	.174	.6767
Garden yard waste	1	.878	.3486
Glass jars containers	1	.001	.9695
Aluminum cans	1	.135	.7130
Tin cans	1	.037	.8481
Food scraps	1	1.698	.1925
Cloth	1	.013	.9108
Diapers	1	.175	.6760
Others	1	.219	.6400

Table 5.21.2 Relationship between Age and Opinions to Waste Disposal

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	4	7.954	.0933
Plastic packaging	4	6.079	.1933
Paper/cardbd packg	4	6.051	.1954
Waste paper	4	5.458	.2434
Garden yard waste	4	4.866	.3014
Glass jars containers	4	2.501	.6445
Aluminum cans	4	6.290	.1785
Tin cans	4	6.829	.1452
Food scraps	4	2.073	.7224
Cloth	4	8.260	.0825
Diapers	4	6.688	.1533
Others	4	6.706	.1523

Table 5.21.3 Relationship between Educational Level and Opinions to Waste Disposal

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	1	2.011	.1561
Plastic packaging	1	2.705	.1001
Paper/cardbd packg	1	1.106	.2929
Waste paper	1	1.611	.2043
Garden yard waste	1	2.104	.1469
Glass jars containers	1	1.388	.2388
Aluminum cans	1	4.131	.0421
Tin cans	1	3.410	.0648
Food scraps	1	3.718	.0538
Cloth	1	1.495	.2214
Diapers	1	.224	.6362
Others	1	.624	.4297

Table 5.21.4 Relationship between Occupation and Opinions to Waste Disposal

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	3	5.465	.1407
Plastic packaging	3	3.100	.3764
Paper/cardbd packg	3	1.912	.5909
Waste paper	3	3.431	.3298
Garden yard waste	3	1.377	.7110
Glass jars containers	3	3.968	.2649
Aluminum cans	3	3.299	.3477
Tin cans	3	5.690	.1277
Food scraps	3	3.463	.3256
Cloth	3	4.146	.2461
Diapers	3	5.093	.1651
Others	3	6.230	.1009

Table 5.21.5 Relationship between Residence and Opinions to Waste Disposal

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	1	1.471	.2252
Plastic packaging	1	1.831	.1760
Paper/cardbd packg	1	3.919	.0478
Waste paper	1	5.716	.0168
Garden yard waste	1	.607	.4361
Glass jars containers	1	6.057	.0138
Aluminum cans	1	3.948	.0469
Tin cans	1	6.776	.0092
Food scraps	1	2.480	.1153
Cloth	1	5.581	.0182
Diapers	1	.019	.8897
Others	1	.643	.4227

Table 5.22 Relationship between Socio-demographic Variables and Awareness of MOH Waste Collection Service

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	1	1.603	.2055
Age	4	3.305	.5082
Education	1	.964	.3263
Occupation	3	13.137	.0044
Residence	1	7.185	.0074

Table 5.23 Relationship between Socio-demographic Variables and Utilisation of the MOH Waste Collection Service

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	1	.001	.9797
Age	4	2.294	.6818
Education	1	.083	.7729
Occupation	3	3.627	.3047
Residence	1	28.313	< .0001

Table 5.24.1 Relationship between Gender and Cognitive Attitude to MOH Current Waste Collection Service

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	3	1.069	.7845
Plastic packaging	3	.409	.9384
Paper/cardbd packg	3	.530	.9122
Waste paper	3	1.149	.7653
Garden yard waste	3	5.884	.1174
Glass jars containers	3	1.995	.5734
Aluminum cans	3	1.262	.7381
Tin cans	3	3.727	.2925
Food scraps	3	3.217	.3594
Cloth	3	.886	.8289
Diapers	3	2.949	.3996
Others	3	1.666	.6446

Table 5.24.2 Relationship between Age and Cognitive Attitude to MOH Current Waste Collection Service

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	12	12.969	.3713
Plastic packaging	12	13.802	.3135
Paper/cardbd packg	12	12.760	.3867
Waste paper	12	12.365	.4168
Garden yard waste	12	4.144	.9807
Glass jars containers	12	9.394	.6690
Aluminum cans	12	7.473	.8248
Tin cans	12	9.469	.6625
Food scraps	12	5.397	.9434
Cloth	12	13.111	.3610
Diapers	12	7.886	.7939
Others	12	18.589	.0990

Table 5.24.3 Relationship between Educational Level and Cognitive Attitude to MOH Current Waste Collection Service

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	6	14.061	.0290
Plastic packaging	6	11.752	.0677
Paper/cardbd packg	6	5.671	.4610
Waste paper	6	5.273	.5093
Garden yard waste	6	1.575	.9544
Glass jars containers	6	11.610	.0713
Aluminum cans	6	9.641	.1406
Tin cans	6	6.157	.4059
Food scraps	6	3.925	.6868
Cloth	6	5.134	.5268
Diapers	6	2.047	.9154
Others	6	-	-

Table 5.24.4 Relationship between Occupation and Cognitive Attitude to MOH Current Waste Collection Service

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	15	21.707	.1157
Plastic packaging	15	20.652	.1483
Paper/cardbd packg	15	13.975	.5275
Waste paper	15	22.561	.0939
Garden yard waste	15	12.746	.6219
Glass jars containers	15	9.929	.8242
Aluminum cans	15	13.283	.5804
Tin cans	15	10.376	.7954
Food scraps	15	-	-
Cloth	15	15.113	.4433
Diapers	15	-	-
Others	15	-	-

Table 5.24.5 Relationship between Residence and Cognitive Attitude to MOH Current Waste Collection Service

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	6	6.116	.4103
Plastic packaging	6	3.320	.7678
Paper/cardbd packg	6	1.571	.9547
Waste paper	6	1.461	.9621
Garden yard waste	6	5.569	.4732
Glass jars containers	6	3.934	.6856
Aluminum cans	6	5.789	.4472
Tin cans	6	8.652	.1941
Food scraps	6	7.123	.3096
Cloth	6	3.902	.6899
Diapers	6	5.063	.5358
Others	6	-	-

Table 5.25 Relationship between Socio-demographic Variables and Behavioural Attitude to the MOH Waste Collection Service

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	1	.005	.9449
Age	4	1.099	.8944
Education	1	.300	.5838
Occupation	3	1.267	.7369
Income	3	3.604	.3076
Residence	1	1.031	.3099

Table 5.26 Relationship between Socio-demographic Variables and Affective Attitude with Provision of MOH Waste Collection Service

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	1	1.025E-4	.9919
Age	4	2.356	.6707
Education	1	1.339	.2472
Occupation	3	3.188	.3636
Income	3	2.453	.4838
Residence	1	.208	.6483

Table 5.27 Relationship between Socio-demographic Variables and Waste Reduction by Using a Shopping Bag

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	4	8.506	.0747
Age	16	32.092	.0097
Education	4	5.119	.2753
Occupation	12	15.033	.2396
Income	12	7.000	.8576
Residence	4	.838	.9333

Table 5.28 Relationship between Socio-demographic Variables and Cognitive Attitude to Using Shopping Bag (whether its good or not)

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	2	5.021	.0812
Age	8	7.057	.5305
Education	2	1.974	.3726
Occupation	6	7.102	.3115
Income	6	3.555	.7366
Residence	2	.021	.9896

Table 5.29 Relationship between Socio-demographic Variables and Behavioural Attitude to Using Shopping Bag

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	4	13.353	.0097
Age	16	19.039	.2667
Education	4	12.341	.0150
Occupation	12	29.299	.0036
Income	12	10.405	.5805
Residence	4	1.825	.7679

Table 5.30.1 Relationship between Gender and Practice of Reusing Waste

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	1	.853	.3557
Plastic bottle containers	1	.088	.7663
Glass bottles/jars	1	1.048	.3060
Cardboard boxes	1	.134	.7142
Papers	1	.001	.9798
Cloth	1	7.086	.0078
Aluminium cans	1	.833	.3615
Tin cans	1	1.075	.2999
Foodscraps	1	.405	.5243
Others	1	7.061	.0079

Table 5.30.2 Relationship between Age and Practice of Reusing Waste

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	4	2.371	.6680
Plastic bottle containers	4	2.062	.7244
Glass bottles/jars	4	1.733	.7847
Cardboard boxes	4	3.639	.4571
Papers	4	3.682	.4507
Cloth	4	2.238	.6920
Aluminium cans	4	2.339	.6736
Tin cans	4	3.656	.4545
Foodscraps	4	2.398	.6630
Others	4	5.572	.2335

Table 5.30.3 Relationship between Educational Level and Practice of Reusing Waste

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	1	.100	.7515
Plastic bottle containers	1	6.006	.0143
Glass bottles/jars	1	2.556	.1099
Cardboard boxes	1	.705	.4011
Papers	1	.760	.3833
Cloth	1	.063	.8014
Aluminium cans	1	.625	.4290
Tin cans	1	.706	.4008
Foodscraps	1	1.660	.1976
Others	1	.480	.4884

Table 5.30.4 Relationship between Occupation and Practice of Reusing Waste

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	3	2.877	.4110
Plastic bottle containers	3	2.067	.5586
Glass bottles/jars	3	1.558	.6690
Cardboard boxes	3	.787	.8525
Papers	3	3.742	.2907
Cloth	3	.324	.9555
Aluminium cans	3	1.171	.7599
Tin cans	3	1.392	.7074
Foodscraps	3	2.110	.5500
Others	3	3.974	.2643

Table 5.30.5 Relationship between Residence and Practice of Reusing Waste

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	1	.160	.6891
Plastic bottle containers	1	.176	.6745
Glass bottles/jars	1	.275	.6001
Cardboard boxes	1	.119	.7303
Papers	1	2.880	.0897
Cloth	1	.537	.4636
Aluminium cans	1	.892	.3449
Tin cans	1	.057	.8115
Foodscraps	1	1.535	.2153
Others	1	5.143	.0233

Table 5.31 Relationship between Socio-demographic Variables and Waste Reuse Appropriateness to Waste Management

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	2	1.118	.5717
Age	8	9.050	.3381
Education	2	10.903	.0043
Occupation	6	6.476	.3720
Income	6	13.372	.0375
Residence	2	2.811	.2453

Table 5.32 Relationship between Socio-demographic Variables and Factors Influencing Waste Reuse

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	3	5.766	.1236
Age	12	10.110	.6063
Education	3	11.739	.0083
Occupation	9	9.155	.4231
Income	9	6.212	.7186
Residence	3	3.269	.3520

Table 5.33 Relationship between Socio-demographic Variables with Recycling Knowledge

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	2	5.955	.0509
Age	8	6.750	.5638
Education	2	20.690	< .0001
Occupation	6	18.221	.0057
Income	6	13.409	.0370
Residence	2	13.236	.0013

Table 5.34 Relationship between Socio-demographic Variables with Knowledge of Recycling Services

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	1	3.140	.0764
Age	4	2.289	.6827
Education	1	1.609	.2046
Occupation	3	1.282	.7333
Income	3	2.986	.3938
Residence	1	.323	.5700

Table 5.35 Relationship between Socio-demographic Variables with Using of Recycling Services

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	1	1.634	.2011
Age	4	.698	.9516
Education	1	.012	.9121
Occupation	3	3.554	.3138
Income	3	1.829	.6087
Residence	1	.445	.5047

Table 5.36 Relationship between Socio-demographic Variables with Eagerness to Recycle

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	2	2.119	.3467
Age	8	3.780	.8764
Education	2	4.937	.0847
Occupation	6	6.698	.3496
Income	6	10.357	.1104
Residence	2	.850	.6539

Table 5.37 Relationship between Socio-demographic Variables Composting Knowledge

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	1	4.106	.0427
Age	4	2.031	.7300
Education	1	8.335	.0039
Occupation	3	6.306	.0976
Income	3	5.684	.1281
Residence	1	.047	.8289

Table 5.38 Relationship between Socio-demographic Variables with Composting Practices

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	1	.107	.7433
Age	4	12.439	.0144
Education	1	1.132	.2874
Occupation	3	1.893	.5949
Income	3	2.963	.3973
Residence	1	1.059	.3035

Table 5.39 Relationship between Socio-demographic Variables with Reasons for Not Composting

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	2	1.241	.5377
Age	8	16.053	.0416
Education	2	1.490	.4747
Occupation	6	6.457	.3739
Income	6	8.820	.1840
Residence	2	2.107	.3487

Table 5.40 Relationship between Socio-demographic Variables with Eagerness to Compost

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	2	1.423	.4909
Age	8	5.452	.7083
Education	2	1.957	.3758
Occupation	6	4.907	.5558
Income	6	3.289	.7719
Residence	2	2.932	.2308

Table 6.1 Relationship between Socio-demographic Variables with Awareness and Knowledge of Waste Management Information

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	1	.004	.9507
Age	4	9.147	.0575
Education	1	17.468	< .0001
Occupation	3	12.063	.0072
Income	3	5.552	.1356
Residence	1	3.300	.0693

Table 6.2 Relationship between Socio-demographic Variables with Types of Waste Management Information they see and hear

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	2	.069	.9661
Age	8	8.417	.3938
Education	2	3.672	.1594
Occupation	6	6.706	.3489
Income	6	8.145	.2277
Residence	2	10.188	.0061

Table 6.3.1 Relationship between Socio-demographic Variables with Health Impact Awareness

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	2	1.566	.4571
Age	8	14.884	.0614
Household Size	4	4.859	.3021
Education	2	1.658	.4364
Occupation	6	23.064	.0008
Income	6	4.903	.5564
Residence	2	4.782	.0915

Table 6.3.2 Relationship between Socio-demographic Variables with Environmental Impact Awareness

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	2	1.722	.4228
Age	8	17.513	.0252
Household Size	4	3.863	.4249
Education	2	4.898	.0864
Occupation	6	8.148	.2275
Income	6	12.851	.0455
Residence	2	7.552	.0229

Table 6.3.3 Relationship between Socio-demographic Variables with Economy Impact Awareness

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	2	.989	.6098
Age	8	10.430	.2362
Household Size	4	3.320	.5057
Education	2	3.259	.1960
Occupation	6	14.171	.0278
Income	6	7.767	.2557
Residence	2	2.743	.2537

Table 6.4 Relationship between Socio-demographic Variables with Knowledge of Waste Management Legislation/Regulations

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	3	2.781	.4267
Age	12	7.833	.7981
Household Size	6	1.380	.9671
Education	3	2.376	.4981
Occupation	9	18.073	.0343
Income	9	6.957	.6416
Residence	3	1.940	.5850

Table 6.5 Relationship between Socio-demographic Variables with Willingness to Prosecute Waste Dumping on Unoccupied Land

	Degree of Freedom	Chi Square	Chi Square P-Value
Gender	2	1.410	.4940
Age	8	5.451	.7085
Household Size	4	4.643	.3259
Education	2	6.298	.0429
Occupation	6	4.349	.6296
Income	6	4.388	.6243
Residence	2	1.203	.5479

Table 6.6.1 Relationship between Health Impact Awareness and Waste Clearance per week

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	4	4.627	.3277
Plastic packaging	4	5.101	.2771
Paper/cardbd packg	4	4.683	.3214
Waste paper	4	9.172	.0569
Garden yard waste	4	2.837	.5855
Glass jars containers	4	3.331	.5041
Aluminum cans	4	2.451	.6534
Tin cans	4	1.524	.8224
Food scraps	4	5.986	.2002
Cloth	4	1.444	.8364
Diapers	4	5.720	.2211
Others	4	4.665	.3234

Table 6.6.2 Relationship between Environmental Impact Awareness and Waste Clearance per week

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	4	3.742	.4420
Plastic packaging	4	4.960	.2914
Paper/cardbd packg	4	2.043	.7279
Waste paper	4	11.315	.0232
Garden yard waste	4	6.338	.1753
Glass jars containers	4	3.040	.5511
Aluminum cans	4	2.206	.6980
Tin cans	4	3.333	.5038
Food scraps	4	4.736	.3154
Cloth	4	4.118	.3903
Diapers	4	5.783	.2160
Others	4	1.110	.8927

Table 6.7.1 Relationship between Health Impact Awareness and Litter Perception

	Degree of Freedom	Chi Square	Chi Square P-Value
Tonga	4	9.073	.0593
Village/Town	6	6.718	.3477
Household	6	2.920	.8188

Table 6.7.2 Relationship between Environmental Impact Awareness and Litter Perception

	Degree of Freedom	Chi Square	Chi Square P-Value
Tonga	4	15.644	.0035
Village/Town	6	13.303	.0385
Household	6	6.465	.3732

Table 6.8.1 Relationship between Health Impact Awareness and Litter Disposal Practices

	Degree of Freedom	Chi Square	Chi Square P-Value
Pangai	8	5.299	.7252
Road	8	7.218	.5133
Beach	8	6.493	.5922
Household	8	10.386	.2390

Table 6.8.2 Relationship between Environmental Impact Awareness and Litter Disposal Practices

	Degree of Freedom	Chi Square	Chi Square P-Value
Pangai	8	4.468	.8126
Road	8	3.159	.9240
Beach	8	7.731	.4601
Household	8	5.677	.6833

Table 6.9.1 Relationship between Health Impact Awareness and Affective Attitude to Waste Disposal

	Degree of Freedom	Chi Square	Chi Square P-Value
Pangai	6	4.178	.6526
Road	6	4.937	.5519
Beach	6	2.466	.8722
Household	6	4.579	.5988

Table 6.9.2 Relationship between Environmental Impact Awareness and Affective Attitude to Waste Disposal

	Degree of Freedom	Chi Square	Chi Square P-Value
Pangai	6	6.502	.3694
Road	6	11.745	.0679
Beach	6	4.979	.5466
Household	6	6.726	.3469

Table 6.10.1 Relationship between Health Impact Awareness and Waste Disposal Behaviour

	Degree of Freedom	Chi Square	Chi Square P-Value
Pangai	8	16.480	.0360
Road	8	8.930	.3482
Beach	8	8.181	.4160
Household	8	3.982	.8588

Table 6.10.2 Relationship between Environmental Impact Awareness and Waste Disposal Behaviour

	Degree of Freedom	Chi Square	Chi Square P-Value
Pangai	8	19.568	.0121
Road	8	8.372	.3980
Beach	8	5.146	.7418
Household	8	6.971	.5398

Table 6.11.1 Relationship between Health Impact Awareness and Household Waste Disposal Practices

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	8	4.554	.8040
Plastic packaging	8	13.903	.0843
Paper/cardbd packg	8	4.558	.8036
Waste paper	8	5.462	.7072
Garden yard waste	8	6.197	.6252
Glass jars containers	8	14.757	.0641
Aluminum cans	8	10.794	.2136
Tin cans	8	21.141	.0068
Food scraps	8	8.617	.3756
Cloth	8	3.059	.9306
Diapers	8	13.726	.0892
Others	8	6.285	.6153

Table 6.11.2 Relationship between Environmental Impact Awareness and Household Waste Disposal Practices

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	8	5.206	.7353
Plastic packaging	8	14.542	.0687
Paper/cardbd packg	8	7.363	.4698
Waste paper	8	4.378	.8215
Garden yard waste	8	4.729	.7861
Glass jars containers	8	17.702	.0236
Aluminum cans	8	12.195	.1427
Tin cans	8	27.928	.0005
Food scraps	8	6.734	.5656
Cloth	8	2.501	.9617
Diapers	8	23.458	.0028
Others	8	7.229	.5121

Table 6.11.3 Relationship between Economic Impact Awareness and Household Waste Disposal Practices

Waste types	Degree of Freedom	Chi Square	Chi Square P-Value
Plastic bag	8	13.382	.0994
Plastic packaging	8	12.681	.1233
Paper/cardbd packg	8	5.124	.7443
Waste paper	8	9.484	.3031
Garden yard waste	8	11.274	.1866
Glass jars containers	8	18.054	.0208
Aluminum cans	8	9.102	.3338
Tin cans	8	16.708	.0333
Food scraps	8	6.191	.6258
Cloth	8	4.160	.8424
Diapers	8	23.857	.0024
Others	8	4.315	.8277

Table 6.12 Relationship between Health, Environment and Economic Impacts Awareness with Eagerness to Recycle

	Degree of Freedom	Chi Square	Chi Square P-Value
Health	4	6.967	.1376
Environment	4	9.036	.0602
Economic	4	8.325	.0804

Table 6.13 Relationship between Health, Environment and Economic Impacts Awareness with Eagerness to Compost

	Degree of Freedom	Chi Square	Chi Square P-Value
Health	4	3.100	.5412
Environment	4	9.483	.0501
Economic	4	5.073	.2799