A STUDY OF THE PERCEPTION AND PRACTICES OF ADULTS ON SOLID WASTE MANAGEMENT IN SHILLONG

A Thesis Submitted to
NORTH-EASTERN HILL UNIVERSITY, SHILLONG
For the Award of the Degree of
Doctor of Philosophy in
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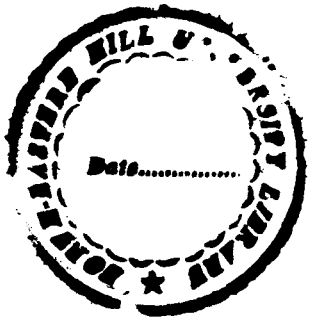

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I, Jemino Mawthoh, hereby declare that the subject matter of this thesis is the record of work done by me, that the contents of this thesis did not form basis of the award of my previous degree to me or to the best of my knowledge to anybody else, and that the thesis has not been submitted by me for any research degree in any other University/ Institute.

This is being submitted to North-Eastern Hill University for the degree of Doctor of Philosophy in Adult and Continuing Education.

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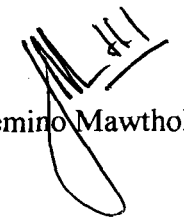

Jemino Mawthoh

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CHAPTER – I

INTRODUCTION

1.0 Introduction:

Solid wastes comprise all the wastes arising from human and animal activities that are normally solid and that are discarded as useless or unwanted. Because of their intrinsic properties, discarded waste materials are often reusable and may be considered a resource in another setting. Solid waste management may be defined as the discipline associated with the control of generation, storage, collection, transfer and transport, processing, and disposal of solid wastes in a manner that is in accord with the best principles of public health, economics, engineering, conservation, aesthetics, and other environmental considerations. In its scope, solid waste management includes all administrative, financial, legal, planning, and engineering functions involved in solutions to all problems of solid wastes. The solutions may involve complex interdisciplinary relationships among such fields as Political Science, City and Regional Planning, Geography, Economics, Public Health, Sociology, Demography, Communications, Conservation, Social Work as well as Engineering and Material Science.

From the days of primitive society, human and animals have used the resources of the earth to support life and to dispose off wastes. In early times, the disposal of human and other wastes did not pose a significant problem, as the population was small and the amount of land available for the assimilation of wastes was large. Problems with the disposal of wastes can be traced from the time when humans first began to congregate in

tribes, villages, and communities and the accumulation of wastes became a consequence of life.

The relationship between public health and the improper storage, collection and disposal of solid wastes is quite clear. Although nature has the capacity to dilute, disperse, degrade, absorb or otherwise reduce the impact of unwanted residues in the atmosphere, in the water bodies, and on the land, ecological imbalances have occurred where the natural assimilative capacity has been exceeded. Waste management in the past consisted of getting rid of the waste in the quickest and cheapest way possible. This often meant taking advantage of 'free' disposal into air, water and land. In essence, waste management was a non-issue.

World over, the problem of waste management exists. Waste generation is, at present, an activity that is not very controllable. Solid waste generated by domestic, commercial and industrial activities is often indiscriminately disposed. Unscientific management of such wastes leads to serious environmental problems. The problems are already acute in many cities and towns as the disposal facilities are not keeping pace with the quantum of waste being generated. Unsanitary method adopted for disposal of solid waste is a serious health concern. Poor solid waste management is associated with increased health problems in all sections of the population. Open dumping of garbage serves as breeding ground for disease vector such as flies, mosquitoes, cockroaches, rats and other pests. Often there is a high risk of spreading diseases like typhoid, cholera, dysentery, yellow fever, encephalitis, plague and dengue fever. The landfill sites, which are not well maintained, are prone to groundwater contamination. Inspite of comprehensive

laws that have been enacted, satisfactory results is yet to be seen especially in the developing and the third world countries.

In India also, solid waste management continues to remain one of the most neglected areas of urban development. In most of the cities almost more than half of the solid waste generated remains unattended. It is estimated that the total solid waste generated by 300 million people of the 1027 million total populations living in urban India is 38 million tones per year. It is also estimated that about 100000 MT of Municipal Solid Waste is generated in the country daily. Per capita waste generation in major cities ranges from 0.20 kg to 0.6 Kg. Generally the collection efficiency ranges between 70 to 90% in major metro cities whereas in several smaller cities the collection efficiency is below 50%. It is also estimated that the local urban bodies spend about Rs.500 to Rs.1500 per tonne on solid waste for collection, transportation, treatment and disposal. About 60-70 % of this amount is spent on street sweeping of waste collection, 20-30 % on transportation and nearby 5% on final disposal of waste, which shows that hardly any attention is given to scientific and safe disposal of waste. There are no authentic reports available on the generation of solid waste in most of the Indian cities. The sheer immensity of the problem, the financial and infrastructural constraints, including non-availability of land for safe disposal and lack of awareness and apathy at all levels has come in the way of efficient and safe management of solid waste. It was estimated that by the year 2020, about $1/3^{rd}$ of our country's population will be in urban areas. Unregulated growth of urban areas, particularly over the last two decades, without infrastructural services for proper collection, transportation, treatment and disposal of solid wastes has led to increased pollution and health hazards. The unplanned and uncontrolled growth has serious negative effects on

urban dwellers and their environment. Plan outlays for the urban sector have been far less compared to the basic and most essential requirements to meet the challenge of basic urban infrastructure such as water supply, sanitation and solid waste management. The local governments, responsible for urban governance and management lack capacity for planning, decision making, financial resources, autonomy and authority to take appropriate measures for constructive action. The local institutions of urban government have become weak over the years due to a host of factors that include encroachment on traditional and legitimate Municipal functions by creating para-statals and urban development authorities, weak executive system, fragile fiscal health and inadequate staffing and expertise in Municipal management. Government agencies and Non-governmental organizations are constantly trying to find a holistic and realistic approach to overcome the haphazard manner of disposal of solid waste and its adverse fallout. The situation has reached a stage where even the highest judiciary in the country is now involved in giving directions to the concerned authorities.

The pace and magnitude in which the city of Shillong has developed in recent years is tremendous. Till the early part of the sixties, Shillong was once famous for its salubrious climate and picturesque landscape, sparkling streams, rivulets and waterfalls. It was rightly called the Scotland of the east. However within a span of three decades, Shillong has undergone substantial change both in character and form. A tiny administrative unit has now become a vibrating city with commercial activities overshadowing the hill resort. At present, Shillong has lost most of its grandeur and importance due to degradation and pollution of its natural environment. With rapid urbanization, Shillong now faces shortage of water, inadequacy of sanitation and civic services that are strained to the limit. Further,

over a period of time, the city has witnessed the emergence of slums resulting from intra-state migration coupled with an influx from outside the state. According to 2001 census, there are at present 18 slum pockets with an estimated population of 73879 dwellers.

With rapid growth of population and urbanization leading to an increase in various man-made activities, large quantities of wastes/pollutants are being released continuously into the city environment. Thus in the race for progress and development, it is feared that the citizens of Shillong might lose the race for healthy survival if answers are not found to the twin specters of over-population and environmental pollution.

Unlike any other cities in the country, Shillong has a unique administrative structure. There are many agencies and local institutions that are responsible for providing civic amenties or are involved in this process directly or indirectly. In addition, there are government departments and agencies like Public Works, the Public Health Engineering, the Urban Affairs, the Meghalaya Urban Development Authority and the Meghalaya Urban Development Agency which implements various schemes and programmes of the State Government. Solid waste management is part of public health and sanitation, and according to the Indian constitution, falls within the purview of the state list. Since this activity is non-exclusive, non-rivaled and essential, the responsibility for providing the service lies within the public domain. The activity being of a local nature is entrusted to the local body. The Urban local body undertakes the task of solid waste delivery, with its own staff, equipment and funds. The Shillong Municipal Board which has some sort of waste disposal scheme collect about 102 MT (approximately) of waste per day. However, in other parts of the Shillong Urban Agglomeration (SUA) the waste is composted, burned or just dumped by the road side, drains and water bodies. In Shillong, the garbage is collected

by adopting the community bin system. Altogether, 63 RCC bins, and 8 trolleys of 1.5m^3 capacity are placed at different sites in the 27 wards .Collection is normally done every morning between 8a.m and 11a.m and between 2p.m and 4 p.m. in the afternoon. The sweepers doing the street cleaning collect the wastes and dump at the nearest community dustbins. The refuse collected at specific points are transported with the help of 16 garbage cleaner trucks, 7 truck-tippers, 4 tractor-trailer and 6 Dumper placers carrying the solid waste from Municipal area to the 18 acre trenching ground located 7 km away from the city on the Shillong-Guwahati road. According to data available from Shillong Municipality (2007) there are at present 176 daily-wage sweepers, 52 part time sweepers, 26 full-time sweepers (temporary) and 25 full-time sweepers (temporary).The other towns falling within the Shillong Urban Agglomeration are without any proper collection and disposal.

1.1 Location, Population and Literacy of Shillong Urban Agglomeration (SUA):

Located at 25^{0}34′ E and 91^{0}53′ E longitude, Shillong originally a non-tribal setting, is one of the largest and charming hill resort of the North Eastern Region of India. Before 1864 Shillong was an unknown nomenclature. During the Pre- British period, Shillong existed in the form of a few cluster of scattered hamlets under the jurisdiction of the Hima Mylliem. In 1863, the British administration shifted the headquarter of United Khasi and Jaintia hills District from Cherrapunjee to Shillong and consequently upon the separation of Assam from Bengal in 1874, Shillong became the provincial headquarter of Assam. Subsequently when the United Khasi and Jaintia hills along with Garo hills was carved out of Assam it became the capital of the new state Meghalaya in 1972.

Shillong falls on the deeply dissected central upland zone of the Meghalaya plateau and is situated in an asymmetrical valley. It is drained by the Umkhrah and Umshyrpi river systems. The valley has the following physiographic divisions – the northern slopes of the Shillong range, the Umshyrpi Valley, the Laitumkhrah-Mawkhar upland, the Umkhrah Valley and the Umkhrah-Umshing divide. Malki, Lumparing, Madan Laban, Laban and Kench's Trace-Rilbong are situated mainly on the northern slopes of the Shillong range and partly in the Umshyrpi Valley. Laitumkhrah, European ward, Police Bazaar, part of Jail road, Mawkhar, Mission Compound-Jaiaw, SE Mawkhar and Mawprem are situated on the Laitumkhrah–Mawkhar upland. Part of Jail Road and Mawlai occupy the Umkhrah Valley and the Umkhrah –Umshing divide. Shillong Cantonment spreads over either side of the Umshyrpi. Nongthymmai is situated between the Wah Demthring, Wah Nongthymmai and Umkhrah spread over the hills.

The population of Shillong in 1872 was only 1368 persons. The present Shillong Urban Agglomeration (SUA) with a population of 2, 67,662 consists of six towns viz. Shillong Municipality, Shillong Cantonment, Nongthymmai, Mawlai, Pynthorumkhrah and Madanrting. Its total area is 21.27 sq. km., which is 0.11 percent of the total area of Meghalaya. Shillong Municipality is the largest with an area 10.36 sq.km and the cantonment with 1.84 sq. km. is the smallest. The population of Shillong Municipality according to the 2001 census is 132867 and the total number of household in all the 27 wards of Shillong is 26929 with 8687 holdings. Shillong in this study has been conceived as the area within the jurisdiction of the Shillong Municipality.

Looking at the history of Shillong in the educational field, formal education started around the later half of the 19th century. A Primary school was opened at Nongthymmai

locality of Shillong in 1857. In 1876 U Babu Jeebon Roy established a high school in Shillong. Thereafter dramatic changes with regard to the expansion of educational institutions occurred and Shillong now can boast of being the most important learning center in the whole of Northeast.

The literacy percentage of Shillong Urban Agglomeration in 1961 was 61.54 higher than the national average of 24 %. It rose to 66.11% in 1971 and consequently the upward trend continued. The literacy variation among the different wards of the Municipality has a random pattern. The highest percentage of literacy rate (76%) in 1961 was observed in Kench's Trace and the lowest was Laban with 38 %. In 1971, Laban had the highest literacy with 80 % and Mawprem the lowest with 60 %. Among the various towns, Mawlai has the lowest literacy rate of only 5%.

In 2001, literacy percentage of Shillong Urban agglomeration was 87.56%. Literacy percentage of Shillong Municipality in 1991 and 2001 was found to be 77.26% and 89.1% respectively. During early part of 1991, Shillong Literacy Drive was started. Shillong Urban Agglomeration shares 49.2% of total literates in East Khasi hills and 22.8% in Meghalaya. But in respect of total population, SUA shares only 33.8% of total population in East Khasi Hills and 12.6% of total population of Meghalaya. This shows more literate urbanites in Shillong compared to the share of population in East Khasi Hills and Meghalaya. Within Shillong Urban Agglomeration we find that Shillong Municipality and Nongthymmai shares more number of literate populations. In the Shillong cantonment area, the male folk shares proportionate number of literates to their population in Shillong Urban Agglomeration. All other localities in Shillong Urban Agglomeration have less literates in respect of total population of Shillong.

1.2 Review of Literature:

Porteous, Andrew (1977) does not take it as axiomatic that 'recycling is a good thing' and must therefore be pushed to the utmost – there are limits. While a case will be argued for recycling, both capital and energy expenditure will have to be looked into, the quality of the commodity obtained or service provided examined and assessments made to see whether it is a good thing or not. A composite picture should be obtained which will illustrate the need for recycling and how best to deploy the hidden resources in our wastes.

Bratley, Keith J. (1983) describes some of the best work on modern sanitary landfills. Every aspect of the art from selection of plant, the consumption of space in landfill operation, safety, day-to-day management and site administration are set down. A comprehensive and detailed instruction on responsible and cost-effective operations, health, safety and final restoration are also mentioned.

Higginson, A.E. (1983) opines that one of the key yardsticks by which the public judge the efficiency of cleansing officers is street cleansing and litter control. The nature of street debris, the legal background, the type of mechanical, manual tools and equipments used, the variety of organization for these services are described in his study. The control of litter and the contributions that can be made by voluntary organizations are also suggested.

Holmes, John R (1983) reviewed waste collection and disposal in United Kingdom and Western Europe, describes the financial and economic background to the service and explains the methods by which management decisions are taken between one treatment system and another. The size and scope of the private sector industries, the growth and

viability of waste reclamation systems and the future development of refuse collection and disposal in the United Kingdom are explored in the study.

Backman, M. and T. Lindhqvist (1992) were of the opinion that sustainable development must be based on a waste preventative strategy for the protection of the environment. The fundamental faults in the way in which the earth's resources are utilized, as reflected in waste and pollution, cannot be corrected by technology nor by law or stricter regulatory controls. The reason for this is that waste has been considered and treated as if it were independent of the sources of production in terms of its scale and contents. A waste prevention strategy requires the broad participation of society. The environmental responsibility of consumers must also increase in future. Through their purchases, consumers can exert a measure of control over the choice of products and thus they can contribute to the creation of markets for more environmentally sound alternatives.

Rajashekhara, C.V. (1992) pointed out that India has a unique feature of urban population which surpasses even the total population of some of the countries in the western world. The overcrowding in major Indian cities has increased the quantum of waste and the function of public cleansing by the local bodies and authorities which is being performed on different patterns is hardly satisfactory and calls for immediate remedial measures.

Turner, R.K. (1992) examined the management of Municipal solid waste from an economic perspective on issues surrounding the choice of the most appropriate future system given that there are a number of alternative configurations all of which are technically feasible. All the indications are that a fundamental philosophical switch is required from the conventional 'dispose, dilute and disperse' approach to a 'recycle,

concentrate and contain approach'. He also dwelt on the influences of market forces on waste management and also the private and social costs involved on the issue of Recycling versus Disposal.

Tchobanglous, G. et al. (1993) has elaborately dealt with the engineering principles and management issues related to integrated solid waste management. The book is organized in six parts with a historical perspective of solid waste management and its many facets right from the technology of the horse-drawn carts to legislation-driven technology. Since solid waste management has the dual functions of resource recovery and waste disposal, application of appropriate technology is important. Engineering principles must be applied to evaluate equipment and facility options, to make operational choices and to develop management systems. The book also includes exercises for developing analytical skills, with a series of discussion topics and problems in each chapter.

Jain A.P. et al. (1994) in a paper delivered at the 20th WEDC conference, Colombo, Sri Lanka opined that solid waste management in India is an emerging and engaging area of study and that information available in public domain is scanty and scattered. A distinction was also made between rural and urban solid wastes. The authors also mentioned about the feasibility and effectiveness of different processes of waste management viz. landfilling, composting, incineration, anaerobic digestion, refuse derived fuel and suggested measures for improvement by using appropriate technologies. The paper also touches upon the solid waste management in the Himalayan region wherein the constant flow of tourists has called for proper management of solid wastes which is of paramount importance.

Bogardus, Ellen. (1995) provides guidance on developing a source reduction and recycling plans, suggests actions that waste generators can consider for further pollution prevention and recycling, and presents case studies of several successful source reduction and recycling programs. According to the author, a pollution prevention assessment is the first crucial step in planning and implementing a successful source reduction and recycling program. The purpose of this assessment is to study the waste stream and accordingly identification of specific recyclable materials can be made. Knowing how and where material is generated can lead to a plan for recovering materials for recycling.

Botkin, Daniel B. et al (1995) brings about a comparison between the old inadequate 'dilute and disperse' concept of waste management and the newer concept of 'concentrate and contain' and how the former is slowly being replaced by the latter with focus on managing materials and eliminating waste. The modern environmentally concept with respect to waste management is to consider wastes as resources. Under this concept, waste would not exist, because it would not be produced or, if produced, would be a resource to be used again. This concept is referred as the 'zero waste'. According to the authors, the dominant concept today in managing waste is known as 'Integrated Waste management' (IWM) which is best defined as a set of management alternatives including reuse, reduce, recycling, composting, landfill and incineration.

Enger, Eldon D. and Smith, Bradley F. (1995) outlined some of the basic areas about the problem of solid waste throughout the world, provides an understanding about how the municipal solid waste is impacted by economics, changes in technology, citizen awareness and involvement. The authors also recognized the integrated approach in solid waste management and the various methods of waste disposal and the problems associated

with each method. An understanding about the difficulties in developing new sanitary landfills, the problems associated with incineration as a method of waste disposal, the benefits and drawbacks of recycling were also featured.

Sinha Rajiv K. (1997) expressed apprehension on the generation of wastes as a result of human activity and saw it as a threat to bury humanity alive. He also presented data on the generation of solid waste of different countries and also in major cities of India and the type of wastes generated in the Municipalities of Indian cities.

Sinha, Rajiv K. (1997) mentions about the waste recycling/management by employing the vermi-culture biotechnology as now more and more emphasis is being laid on organic farming and use of earthworms for the conversion of organic waste into inorganic manure. Diverse organic wastes emanating from homes, agro-based industries such as sugar mills, fruit and vegetable processing units, cattle and poultry units, and slaughter houses can be used as raw materials for producing vermi-composing on the commercial scale.

Sherman, Rhonda (1998) listed the three R's – reduce, reuse and recycle – in order of importance for actions that should be taken to manage solid waste and considered reducing and reusing before recycling. A comprehensive Reuse strategy and Reuse operation for individuals, households, businesses, industries, institutions and local Governments has also been highlighted.

Dev, Jayanth Kumar (2001) in a study on Solid Waste Management in Cuttack of Orissa presents innovations in the management of solid waste as taken up by the Cuttack Municipal Corporation. The corporation adopted an eight pronged strategy to restructure the solid waste management system in Cuttack. These include training and exposure of

staff, political and executive functionaries, on the job training of sanitary workers, initiating pilot project of house to house waste collection, provision and supply of basic equipments, installation of compost plant, and social audit of solid waste management services. The strategy adopted has improved solid waste management significantly and promoted decentralization, optimum collection and resource generation from the activity.

Jain, A.K. (2001) in a case study discusses the initiative by Municipal corporation of greater Mumbai whereby the residents of a building or a group of buildings are motivated to organize advanced locality management societies. These societies are responsible for solid waste management by adopting the principle of Reduce, Recycle and Reuse garbage. This is intended to achieve the 'zero garbage level'. Awareness is being created through mass media to divert the recyclable components of solid wastes to the recycling industries and vermi compost the biodegradable waste, wherever possible.

Jain, Sudeep (2001) in a case study discusses various innovations in solid waste management undertaken by bringing fiscal discipline, change in the organization culture and citizen participation. Some of the main areas of intervention mentioned are privatization of sanitation through Residents Associations, provision of subsidized loans to the dependents of sanitary workers for purchasing tipper autos, tree plantation at the compost yard and conversion of dumping site into forested area.

Mohapatra, G. P. (2001) highlighted the new approach in solid waste management which completely transformed Surat from one of the filthiest cities to one of the cleanest cities in the country. Surat's experience, in a short span of 18 months, shows that such constraints could largely be overcome through basic tenet of democracy 'rule by law'. Urban management systems in Surat were geared to bring in decentralization with

accountability. Management of information- for decision support, evolving methods to service and empowering the citizens, bringing about transparency in various activities through inculcating public awareness and civic participation and putting into place early warning system to effectively control the outbreak of public health diseases.

1.3 Need and Significance of the Study:

Waste is an inevitable part of human activity. The problems associated with the management of solid wastes in today's society are complex because of the quantity and diverse nature of the wastes, the development of sprawling urban areas, the funding limitations for public services, the impacts of technology, and the emerging limitations in both energy and raw materials. As a consequence, if solid waste management is to be accomplished in an efficient and orderly manner, the fundamental aspects and relationships involved at all levels must be identified and corrective measures taken. Some of the pertinent questions arising out of solid waste management issue are: What are the impacts of solid waste generation? What is the magnitude of the waste management problem? What is its impact on human health and environment? What are the future challenges and opportunities for change? What are the various activities associated with the functional elements of solid waste management? What are the day to day responsibilities of an operating agency? What is the role of the different governmental and non-governmental agencies? What are the impacts of legislations? What is the role of the community? These are some of the contentious areas that are required to be delved into.

The purpose of the study is to create:

1. An understanding that Municipal Solid waste Management is part of a broader urbanization process.
2. An understanding of the practices and perception of the people especially in the hilly areas with respect to solid waste management at the household and community level.
3. An awareness of need for competent management of Municipal solid waste in urban areas through information, education and communication strategies.
4. An understanding of various systems available for collection, transportation, recycling, resource recovery and disposal.
5. An approach to prepare Municipal Solid Waste Management plans in the light of the potential problems and issues which may become apparent during project development and
6. To provide operational guidelines at the governmental level for the efficient Municipal solid waste management plans.

Effective solid waste management systems are needed to ensure better human health and safety. They must be safe for workers and safeguard public health by preventing the spread of disease. In addition to these prerequisites, an effective system of solid waste management must be both environmentally and economically sustainable.

1.4 Statement of the Problem:

This study is an attempt to assess the status of solid waste generation, collection, disposal and treatment in selected localities of Shillong municipality. The purpose of this study is to find out, how do Shillong inhabitants manage their garbage, how they feel about

the possibilities of future improvement and the factors which influence the formation of their waste management practices. In view of the above the statement of the problem is stated as **"A study of the perception and practices of the Adults on Solid Waste Management in Shillong".**

1.5 Operational Definitions of Terms Used:

All unwanted and discarded materials from domestic, urban, industrial and agricultural activities are together termed as wastes. Under the British Environment Protection Act (1990), waste is defined as including (a) any substance which constitutes a scrap material or an effluent or unwanted surplus substance arising from the operation of any process; and (b) any substance or article which requires to be disposed of as being broken, worn out, contaminated or otherwise spoiled. Solid waste accounts for the highest proportion of all types of wastes.

Adult: An adult is a person who is above 15 years of age.

Solid Waste: Solid wastes are the wastes arising from human and animal activities that are normally solid and are discarded as useless or unwanted. The term solid waste as used in this study is all inclusive, encompassing the heterogeneous mass of throwaways from the urban community as well as the more homogeneous accumulation of agricultural, industrial and mineral wastes. Because of their intrinsic properties, discarded waste materials are often reusable and may be considered as a resource in another setting.

Municipal Solid Wastes: Municipal Solid Wastes includes all the wastes generated from the residential households and apartment buildings, commercial and business

establishments, institutional facilities, construction and demolition activities, municipal services and treatment plant sites.

Integrated Solid Waste Management: The management of solid waste is based on consideration of source reduction, recycling, waste transformation, and disposal arranged in a hierarchical order. The purposeful, systematic control of the functional elements of generation; waste handling, separation, and processing at source; collection; separation and processing and transformation of solid waste; transfer and transport; and disposal associated with the management of solid wastes from the point of generation to final disposal.

Functional Element: Functional element is used in this study to describe the various activities associated with the management of solid wastes from the point of generation to final disposal. In general, a functional element represents a physical activity. The functional elements used in this study are waste generation; waste handling, separation, storage and processing at source; collection; separation and processing and transformation of solid waste; transfer and transport; and disposal.

Waste Generation: The act or process of generating solid wastes.

Waste Collection: The act of picking up wastes at homes, businesses, commercial and industrial plants, and other locations; loading them into a collection vehicle; and hauling them to a facility for further processing or transfer to a disposal site.

Waste Segregation: Waste segregation is to divide waste into groups of similar materials, such as paper products, glass, food wastes and metals. It is also used to describe the further sorting of materials into more specific categories, such as clear glass and dark glass. Segregation may be done manually or mechanically with specialized equipments.

Waste Transformation: The transformation of waste materials involving a phase change (e.g., solid to gas). The most commonly used chemical and biological transformation processes are combustion and aerobic composting.

Transport: The transport of solid wastes transferred from collection vehicles to a facility or disposal site for further processing or action.

Disposal: The activities associated with the long term handling of (i) solid wastes that are collected and of no further use and (ii) the residual matter after solid wastes have been processed and the recovery of conversion products or energy has been accomplished. Normally, disposal is accomplished by means of sanitary filling.

Composting: The controlled biological decomposition of organic solid waste materials which involves both the separation and bacterial decomposition of the organic fraction of the solid wastes. Decomposition of the organic solids may be accomplished either aerobically or anaerobically depending on the availability of oxygen.

Recycling: Recycling is the process of separating a given waste material from the waste stream and processing it so that it may be used again as a useful material for products which may or may not be similar to the original.

Sanitary Landfill: An engineered method of disposing of solid wastes on land in a manner that protects human health and environment. Waste is spread in thin layers, compacted to the smallest practical volume, and covered with soil or other suitable material at the end of each working day.

Refuse: A term often used interchangeably with the term solid waste.

Litter: The highly visible portion of solid wastes that is generated by the consumer and carelessly discarded outside the regular disposal system.

Hazardous Wastes: Hazardous wastes may be defined as a waste or combination of wastes, which because of its quantity, concentration or physical, chemical or pathogenic characteristics may (i) cause or significantly contribute to, an increase in mortality or an increase in a serious illness or (ii) pose a potential health hazard to human health or the environment when improperly treated, stored, transported or disposed of. Hazardous wastes include radioactive substances, toxic chemicals, biological wastes, flammable wastes, and explosives.

Biomedical Wastes: Biomedical wastes or hospital wastes is a broad term applied to waste generated in the diagnosis, treatment, or immunization of human beings or animals, in research, production, or testing of biological products and waste from medical treatment given at home. It includes soiled dressings, used needles and syringes, pathology wastes, drugs, chemicals, and pharmaceutical products used for testing in laboratories.

Incineration: The controlled process by which solid, liquid, or gaseous combustible wastes are burned and changed into gases, and the residue produced contains little or no combustible material.

Biodegradable Wastes: A compound that can be degraded or converted to simpler compounds by microorganisms.

Energy Recovery: The process of recovering energy from the conversion products derived from solid wastes, such as heat produced from the burning of solid wastes.

Garbage: Animal and vegetable wastes resulting from the handling, storage, sale, preparation, cooking, and serving of foods.

Container: A receptacle used for the storage of solid wastes until they are collected.

1.6 Objectives:

For the purpose of the study, the following objectives were framed by the investigator.

1. To study the practices of solid waste generation, waste handling and segregation, storage and processing at source, collection and disposal at the household and community level.
2. To study the perception of people with regard to the management of household solid waste in terms of generation, collection, segregation and disposal.
3. To study the Role of traditional Institutions in solid waste management.
4. To study the method of solid waste management with respect to disposal and utilization pattern by the Municipal Board.
5. To study the existing strictures, rules, and regulations , environmental planning, coordination, IEC components and other institutional arrangements for solid waste management at the Governmental level.
6. To assess the overall state of environment with respect to sanitation and health of the community.
7. To suggest appropriate mechanisms (interplay of generation of waste, storage, collection, transfer, transport, processing/treatment, recovery and disposal of Solid Waste) for converting waste into resources through modern available techniques and technologies.
8. To suggest measures for organizational networking for efficient implementation and monitoring of solid waste in the urban agglomerates of Shillong.

1.7 Hypotheses:

For the purpose of the study, the following null hypotheses were framed by the Investigator.

1. There exist no significant differences in the practices of solid waste management in the different regions of Shillong Municipality.
2. There exist no significant differences in the perception of people on solid waste management amongst different income groups.
3. There exist no significant differences in the opinion of educational groups with regard to the role of Traditional Institutions on solid waste management.
4. There exist no significant differences in the opinion of the respondents of Slum, Commercial, Hospital and Residential areas on solid waste management by the Municipality.
5. There exist no significant differences in the opinion of the respondents on the role of the government on solid waste management with respect to the respondent's sex and age group.
6. There exist no significant differences in the opinion of different occupational groups and types of families on solid waste management with respect to the state of environment in Shillong.

1.8 Delimitation of the Present Study:

In Social Sciences, the research has to delimit the problem under investigation to a certain possible extent, for it is quite impossible either control or include all the factors involved in it.

The delimitation of the present study have presented as under:

1. The present study was delimited to NE, NW, SE and SW regions of Shillong.
2. The study was restricted to the respondents belonging to different occupational status, income status, educational status, types of families, residents of slum, hospital, commercial and residential areas and types of family.
3. The present study was delimited to a sample size of 420 respondents.
4. The present study was restricted to the Municipal Areas of Shillong.
5. The present study was restricted to the statistical techniques of 't' values and 'r' values.

CHAPTER – II

DESIGN OF THE STUDY

The present study on 'A study of the perception and practices of the Adults on Solid Waste Management in Shillong' has been designed mainly to spell out a comparative profile of Solid Waste Management in Shillong. According to the objectives of the study, the researcher has planned the entire process of research work in terms of social research design applicable to the present study. The research design has been prepared in such a manner that Solid Waste Management practices in Shillong can be focused and a thorough comparative feature on perception and practices of solid waste management can be explored.

2.0 Research Methodology:

Keeping in view the purpose and importance of the present study, the investigator has adopted 'Survey Studies' based on Descriptive Research Method. The Survey Study Method was adopted to collect detailed description of existing practices on solid waste management with the intent of employing data to justify current conditions, practices and perception of the people and to make intelligent plans for improving them. The objective of adopting 'Survey Study' was to analyze, interpret and report the status of Solid Waste Management in Shillong, to guide practice of Solid waste management in the immediate future and to determine the present status of Solid Waste Management. Further, while

adopting this method, the investigator has made use of schedule for gathering data from the households located in different regions of Shillong by appropriate sampling procedure.

This study entails data on the characteristics and quantities of solid waste generated in the different localities vis-à-vis existing methods for the handling, storage, collection, transportation, treatment and disposal of solid wastes. A survey was conducted in twelve localities of Shillong Municipality. The localities covered were Jaiaw, Lumdiengjri, Mawprem, Jailroad, Lawmali, Wahingdoh, Rilbong, Bishnupur, Lumparing, Dhankheti, Cleve Colony and Laitumkhrah. This was done by dividing the Shillong Municipal area into four divisions, viz. North West, North East, South West and South East. The localities were selected based on random sampling from each division.

To achieve all the stated objectives, both primary and secondary data was extensively used. Primary data was collected by personal interview method through well designed and pre-tested schedule, especially structured for the study. Secondary data was collected from the various published and unpublished sources of the relevant departments. The different households were identified on the basis of simple random sampling technique; each household was treated as one unit as described in the subsequent sampling procedure adopted for the purpose of the study. From each unit only one adult respondent was chosen according to the convenience and time availability of the respondent.

2.1 Profile of Shillong:

Located at $25^0 34'$ E latitude and $91^0 53'$ E longitude, Shillong originally a non-tribal setting, is one of the largest and charming hill resort of the North Eastern Region of India. Before 1864, Shillong was an unknown nomenclature. During the Pre- British period,

Shillong existed in the form of a few cluster of scattered hamlets under the jurisdiction of the Hima Mylliem. In 1863, the British administration shifted the headquarter of United Khasi and Jaintia hills District from Cherrapunjee to Shillong and consequently upon the separation of Assam from Bengal in 1874, Shillong became the provincial headquarter of Assam. Subsequently the United Khasi and Jaintia hills along with Garo hills was carved out of Assam and it became the capital of Meghalaya in 1972.

The population of Shillong in 1872 was only 1368 persons. The present Shillong Urban Agglomeration (SUA) with a population of 267662 consists of six towns viz. Shillong Municipality, Shillong Cantonment, Nongthymmai, Mawlai, Pynthorumkhrah and Madanrting. Its total area is 21.27 sq. km. which is 0.11 percent of the total area of Meghalaya. Owing to the fast expansion of Shillong town particularly in the last two decades and the preponderance of urban characteristics, around 32 villages located in the fringe area of the town now forms a part of the Shillong Urban Area. Shillong Municipality is the largest with an area 10.36 sq.km and the cantonment with 1.84 sq. km. is the smallest. The population of Shillong Municipality according to the 2001 census is 132867 and the total number of household in all the 27 wards of Shillong is 26,929 with 8687 holdings.

Topographically, Shillong falls on the deeply dissected central upland zone of the Meghalaya plateau and is situated in an asymmetrical valley. It is drained by the Umkhrah and Umshyrpi river systems. The valley has the following physiographic divisions – the northern slopes of the Shillong range, the Umshyrpi valley, the Laitumkhrah-Mawkhar Upland, the Umkhrah valley and the Umkhrah-Umshing divide. Malki, Lumparing, Madan Laban, Laban and Kench's Trace-Rilbong are situated mainly on the Northern slopes of the

Shillong range and partly in the Umshyrpi Valley. Laitumkhrah, European ward, Police Bazar, part of Jail road, Mawkhar, Mission Compound-Jaiaw, SE Mawkhar and Mawprem are situated on the Laitumkhrah–Mawkhar Upland. Part of Jail road and Mawlai occupy the Umkhrah valley and the Umkhrah–Umshing divide. Shillong Cantonment spreads over either side of the Umshyrpi. Nongthymmai is situated between the Wah Demthring, Wah Nongthymmai and Umkhrah spread over the hills. For the present study Shillong has been conceived as the area within the jurisdiction of the Shillong Municipality.

2.2 Universe of the Study:

The subject chosen for this study is comparatively a new area of focus in social science research. For the purpose of fulfilling the objectives of the present study, the researcher has selected different localities falling within the jurisdiction of the Shillong Municipality. All the households of different localities under the jurisdiction of Shillong Municipality constitute the universe of the present study. The decision for selecting the localities under the jurisdiction of Shillong Municipality was because of its large concentration of households, commercial, slum and institutional establishments.

2.3 Sample:

For the purpose of sampling, the researcher divided the entire Shillong Proper into four divisions, namely North-East (NE), North-West (NW), South-East (SE) and South-West (SW) based on purposive sampling. This sampling method was adopted on the basis of division pattern followed by Survey of India.

The second stage of sampling was organized in five stages.

At first stage the researcher selected 3 localities from each division/region by adopting simple random sampling technique. Thus, the total localities from 4 divisions/ region worked out to be 12 localities.

In the second stage, the researcher selected 15 households as the sample from each region (NE, NW, SE and SW) for pre- try out of the Solid Waste Management scale using simple random sampling technique. Thus, the total sample was 60 respondents from 60 households.

At the third stage, a sample of 35 households from each of the 9 localities were taken from the four regions (NE, NW, SE and SW) under the study using random sampling technique for the try out of the SWM scale. Thus, the total sample was 315 respondents from 315 households.

Again for establishing the reliability of SWM scale, a sample of 48 households was chosen at random. The distribution of the households are presented in table 2.1. From each household, one respondent was chosen at random thus constituting a total sample of 48 respondents. The same number of respondents were also administered the SWM Scale for retest.

Table 2.1
Distribution of households

Region	No. of Localities	No. of Households from each Locality	Total Households
NE	3	4	12
NW	3	4	12
SE	3	4	12
SW	3	4	12
Total	12	16	48

At the sixth stage, for the selection of respondents for the final administration of the schedule, a sample of 35 heads from each household (Male/Female) was selected using

simple Random Sampling technique. Hence a total of 105 respondents from each division/ region (NE, NW, SE and SW) was administered the schedule. The total sample for final administration thus comes out to be 420.

2.4 Tools Used:

As per the need and objectives of the present study, appropriate SWM scale was developed by the researcher. The detailed procedures adopted for the development of SWM was as under:

2.4.1 ***Selection of Items of SWM Scale:***

In order to prepare a scientific scale for the present study, first of all the investigator went through a number of available literature related with SWM system in different parts of India. After a thorough study of the literature, a list of items were drawn according to the objectives of the study. The researcher has drawn the following dimensions for the present study.

Practices: Generation of waste, waste handling, segregation, storage, and processing at source, collection and disposal of waste at the household and the community level.

Perception: Management of household solid waste in terms of generation, collection, segregation and disposal.

Role of Traditional Institutions: Solid waste management system and its interface.

Municipal Board: Delivery system.

Government: Strictures, rules, regulations, legislations and existing infrastructural facilities.

Environment: Sanitation and health.

2.4.2 *Selection of Items in Each Dimension of the Study:*

Thus as evident from above, items for each dimension according to the objectives were selected. The dimensions were selected after formulation of sufficient number of items for each dimension. The items were formulated by taking into consideration the content and meaning of the dimensions and with a clear personal judgment of the literature available. In the process, the investigator had to spend much time in studying the various books, journals, periodicals, abstracts and research articles. Every care was taken to include the content and purpose of the dimensions of the SWM scale while formulating it. The doubts, confusions and ambiguities over the items itself and the usage of the items therein, could be clarified with the literature related to the present study. Thus taking into account the principles of selecting items, the investigator selected 154 items in all for the SWM scale. The detailed distribution of the items under each dimensions of the SWM scale is presented in table 2.2.

Table 2.2
Distribution of items under each dimension of SWM scale

Objectives	Dimensions of SWM	No. of Items Selected
I: Practices	Generation of Waste, Waste Handling, Segregation, Storage, and Processing at Source, Collection and Disposal of Waste at the Household and Community Level	34
II: Perception	Management of Household Solid Waste in terms of Generation, Collection, Segregation and Disposal	28
III: Role of Traditional Institutions	Solid Waste Management System and its Interface	20
IV: Municipal Board	Delivery system	21
V: Government	Strictures, Rules, Regulations, Legislations and Existing Infrastructural Facilities	19
VI: Environment	Sanitation and Health	32
Total		**154**

2.4.3 *Editing of the Items*:

After selecting 154 items in all, for the SWM scale, the next step was editing. For this purpose, the SWM scale was given to the subject experts, experts in the field of test constructions and working professionals in the Municipality. The content and purpose of the SWM scale were explained to them. On the basis of their judgment and agreement of their opinion 20 items were rejected and 17 items were modified. The rejection and modifications could be done on the principles of language disability, content disability and other technical deficiencies. The items which could not fit to fulfill the purpose of the present study were also taken into account for their rejection from the SWM scale. Thus, after editing of the scale, a total number of 113 items were included for the HRDS scale. The next step in the process of scale development was preliminary try-out of the scale.

2.4.4 *Pre-Tryout of the SWM Scale*:

In order to ascertain, the suitability of the items of the SWM scale, a preliminary tryout was conducted on a sample of 60 respondents, 15 respondents from each region (NE, NW, SE and SW) through Random Sampling Technique. In the light of preliminary tryout, some modifications were made in the items of different dimensions of SWM scale. Some items as indicated in table 2.2 were also dropped for its tryout. Items of each dimension of SWM scale were arranged in increasing order of difficulty based on the individual's observations during the course of preliminary tryout. Instructions for administering the SWM scale were prepared at this stage. An answer sheet was also prepared to record the individual response to each item of the SWM scale. A score key was also prepared for the evaluation of the respondent's responses at the tryout stage.

The distribution of items of each dimension of the SWM scale is present in table 2.3.

Table 2.3
Distribution of items in various dimensions before and after preliminary tryout of the SWM scale

Objective No.	SWM Dimension	No. of items before pre-tryout	No. of items after pre-tryout
1	**Practices**	**30**	**24**
2	**Perception**	**26**	**22**
3	**Role of Traditional Institutions**	**17**	**14**
4	**Municipal Board**	**20**	**19**
5	**Government**	**15**	**12**
6	**Environment**	**26**	**22**
Total		**134**	**113**

2.4.5 *Tryout of the SWM Scale*:

The next step in the development of any scale is its try-out involving the administration of the preliminary tryouts and its scoring for item analysis. As the present test involves the requirement of responses from respondents of different occupation, education and income groups, a sample of 315 were selected through Random Sampling Technique. While selecting the sample for tryout of the scale, due consideration was taken for the proportional inclusion of different groups as mentioned above.

2.4.6 *Considerations in the Administration of the Scale:*

The problem of getting the schedule filled under normal life running conditions through the method of interview was experienced by the investigator. To get the appropriate response the investigator had to establish rapport with different people from different households and different localities. The filling up of the schedule by the investigator was the house of the respondent. The only essential condition of the administration, assured to them was to pay greater attention and concentration while choosing a particular response out of the defined alternatives. Any possible difficulty faced by them while a question was asked during the interview process was explained to them by the investigator himself.

2.4.7 *Scoring:*

Scoring of SWM scale was easy and simple. The items of each dimension of the SWM scale were scored separately. For the purpose of scoring, a scoring key was adopted

on the line of the scales developed by Likert (1932). The key for scoring of the items were assigned as given under.

Always	Frequently	Sometimes	Rarely	Never
5	4	3	2	1

Fully Agree	Agree	Undecided	Disagree	Fully Disagree
5	4	3	2	1

The above key for scoring of the items of the scale of SWM was found to be justified on the ground of taking cue from different research studies. The first scale was developed to find the different practices and the second scale was developed for studying the perception of the people on solid waste management. So, the first scale was adopted for objective-1 of the study and the second scale was adopted for objectives 2 – 6.

2.4.8 *Item Analysis:*

Item analysis is one of the essential step in the development of a scale. It reveals ambiguities, clues, ineffective distracters, and other technical defects that were missed during the preparation of the scale. Item analysis makes it possible to shorten a test and at the same time to increase its validity and reliability. Moreover, it is a procedure by which it is demonstrated how effectively a given test item functions within a total test. Through item analysis, the poorly functioning items were studied in an attempt to find out the reasons for their being defective or weak, so that these weaknesses could be minimized for subsequent use.

The procedure for item analysis involves the mean difference approach. When the mean difference technique is employed the items of the test are scored after tryout and the

higher group and the lower group of subjects are screened out taking certain percentage of subjects viz. 33 %, 27 %, 25 %, 16 % etc from the top and the bottom. The significance of difference between the means or the 't' values are tested. These items which show higher 't' values are considered worthy and taken into the final form on priority.

Hence, for the present study the determination of item validity was found out with the help of statistical techniques of 't' value. After the answer sheets were scored these were arranged in order of ascending total scores and the top and bottom 27 % scripts are taken out. Then, the significance of the mean difference between the mean scores in the top and the bottom pile was tested. The items which showed a significant difference in favour of the upper group were considered to be worth retaining. The result of item analysis on different subsystems of SWM scale has been presented in the following tables.

Table 2.4
Results of Item Analysis for SWM Scale

Item (Questions)	M_u (N=85)	M_L (N=85)	SD_u	SD_L	M_u-M_L	SED	t	Remarks	Sl. No. of Items selected (obj)
1	4.835	4.4	0.401	0.923	0.435	0.110	3.962	Sig	1(1)
2	3.047	2.274	1.236	1.028	0.773	0.175	4.407	Sig	2(1)
3	3.153	2.765	1.522	1.569	0.388	0.239	1.627	Insig	-(1)
4	2.247	2.059	1.43	1.358	0.188	0.215	0.874	Insig	-(1)
5	4.176	3.824	1.257	1.139	0.352	0.185	1.902	Insig	-(3)
6	4.353	3.682	0.917	0.997	0.671	0.148	4.54	Sig	46(4)
7	4.047	3.188	1.454	1.568	0.859	0.233	3.682	Sig	3(1)
8	4.435	4.012	1.183	1.183	0.423	0.183	2.317	Sig	4(1)
9	4.376	3.859	0.65	1.238	0.517	0.153	3.389	Sig	5(1)
10	3.741	3.976	1.512	1.283	0.235	0.216	1.086	Insig	-(1)
11	4.365	3.776	0.852	1.141	0.589	0.155	3.791	Sig	6(1)
12	4.447	3.906	1.163	1.271	0.541	0.188	2.878	Sig	7(1)
13	3.906	2.894	1.523	1.616	1.012	0.242	4.177	Sig	47(4)
14	2.671	1.906	1.514	1.07	0.765	0.202	3.782	Sig	8(1)
15	3.047	2.294	1.397	1.156	0.753	0.198	3.806	Sig	9(1)
16	3.859	3.282	1.365	1.584	0.577	0.228	2.529	Sig	10(1)
17	3.541	3.106	1.333	1.355	0.435	0.207	2.097	Sig	11(1)
18	4.118	2.647	1.212	1.493	1.471	0.21	7.011	Sig	48(4)
19	4.224	2.647	1.202	1.403	1.577	0.202	7.823	Sig	36(3)
20	2.988	2.094	1.418	1.243	0.894	0.206	4.345	Sig	12(1)
21	2.894	1.906	1.645	1.194	0.988	0.222	4.455	Sig	13(1)

22	3.682	2.729	1.449	1.619	0.953	0.237	4.02	Sig	14(1)
23	3.035	2.518	1.451	1.419	0.517	0.221	2.335	Sig	15(1)
24	4.624	4.153	0.508	0.875	0.471	0.11	4.267	Sig	16(1)
25	3.188	3.153	1.333	1.112	0.035	0.189	0.185	Insig	-(1)
26	3.212	2.882	1.456	1.45	0.33	0.224	1.472	Insig	-(3)
27	3.729	3.906	1.162	1.07	0.177	0.172	1.027	Insig	-(1)
28	2.929	2.224	1.387	1.056	0.705	0.19	3.707	Sig	17(1)
29	3.976	3.4	1.137	1.219	0.576	0.182	3.167	Sig	18(1)
30	4.565	3.824	0.832	1.238	0.741	0.163	4.553	Sig	19(1)
31	2.835	2.212	1.245	1.118	0.623	0.183	3.412	Sig	20(2)
32	3.235	2.353	1.386	1.195	0.882	0.2	4.417	Sig	21(2)
33	2.965	2.294	1.332	1.136	0.671	0.191	3.513	Sig	69(2)
34	4.2	2.671	0.794	1.01	1.529	0.14	10.908	Sig	70(6)
35	3.871	3.518	1.015	1.08	0.353	0.162	2.183	Sig	22(2)
36	4.282	4.224	0.729	0.845	0.058	0.122	0.476	Insig	-(2)
37	2.553	2.576	1.112	0.95	0.023	0.16	0.144	Insig	-(3)
38	3.741	2.835	1.312	1.291	0.906	0.201	4.511	Sig	49(4)
39	3.835	2.553	1.027	1.279	1.282	0.179	7.163	Sig	60(5)
40	3.471	2.447	1.102	1.079	1.024	0.168	6.085	Sig	61(5)
41	4.047	2.765	0.932	1.036	1.282	0.152	8.432	Sig	37(3)
42	3.671	2.459	1.022	1.143	1.212	0.167	7.245	Sig	38(3)
43	4.176	3.647	0.722	1.175	0.529	0.15	3.516	Sig	62(5)
44	4.388	3.706	0.934	1.379	0.682	0.182	3.753	Sig	63(5)
45	4.365	3.776	0.852	1.141	0.589	0.155	3.791	Sig	23(2)
46	3.847	3.306	1.012	1.329	0.541	0.182	2.968	Sig	39(3)
47	4.082	2.365	3.211	1.115	1.717	0.371	4.63	Sig	50(4)
48	4.106	2.647	0.881	1.048	1.459	0.149	9.767	Sig	40(3)
49	4.271	3.859	1.022	1.18	0.412	0.17	2.419	Sig	51(4)
50	3.541	3.106	1.333	1.355	0.435	0.207	2.097	Sig	64(5)
51	3.765	3.224	1.013	1.221	0.541	0.173	3.125	Sig	52(4)
52	2.035	1.871	0.818	0.98	0.164	0.139	1.177	Insig	-(2)
53	3.871	3.341	0.943	1.112	0.53	0.159	3.332	Sig	41(3)
54	4.129	3.812	0.764	0.988	0.317	0.136	2.326	Sig	24(2)
55	1.859	1.871	0.814	0.878	0.012	0.131	0.092	Insig	-(4)
56	4.106	2.647	0.881	1.048	1.459	0.149	9.767	Sig	53(4)
57	4.141	3.388	0.705	1.107	0.753	0.143	5.258	Sig	54(4)
58	4.341	4.035	0.82	1.045	0.306	0.145	2.111	Sig	25(2)
59	3.929	3.2	0.93	1.038	0.729	0.152	4.794	Sig	42(3)
60	2.988	2.341	1.435	1.232	0.647	0.206	3.135	Sig	71(6)
61	2.153	1.941	0.939	0.872	0.212	0.14	1.516	Insig	-(5)
62	1.624	1.647	0.751	0.747	0.023	0.116	0.199	Insig	-(3)
63	3.671	2.459	1.022	1.143	1.212	0.167	7.245	Sig	65(5)
64	4.506	4.247	0.791	0.839	0.259	0.126	2.059	Sig	26(2)
65	3.482	2.882	1.174	0.987	0.6	0.167	3.585	Sig	27(2)
66	2.376	2.553	1.04	1.023	0.177	0.159	1.112	Insig	-(4)
67	2.812	2.235	1.012	0.903	0.577	0.148	3.899	Sig	28(2)
68	3.859	3.282	1.365	1.584	0.577	0.228	2.529	Sig	55(4)
69	2.271	2.035	0.913	1.023	0.236	0.15	1.577	Insig	-(6)
70	3.929	3.2	0.93	1.038	0.729	0.152	4.794	Sig	66(5)
71	2.365	2.141	1.016	0.87	0.224	0.146	1.535	Insig	-(6)

72	1.988	2.235	0.563	1.002	0.247	0.125	1.97	Sig	72(6)
73	3.871	3.341	0.943	1.112	0.53	0.159	3.332	Sig	67(5)
74	3.906	3.859	0.953	1.17	0.047	0.165	0.285	Insig	-(6)
75	4.565	3.824	0.832	1.238	0.741	0.163	4.553	Sig	68(5)
76	4.376	3.859	0.65	1.238	0.517	0.153	3.389	Sig	29(2)
77	3.576	3.024	1.033	1.227	0.552	0.175	3.154	Sig	30(2)
78	4.176	2.235	0.689	1.092	1.941	0.141	13.778	Sig	56(4)
79	4.071	2.553	0.647	1.09	1.518	0.138	10.976	Sig	43(3)
80	4.141	3.388	0.705	1.107	0.753	0.143	5.258	Sig	31(2)
81	3.341	2.282	1.154	1.091	1.059	0.173	6.112	Sig	32(2)
82	3.706	3.553	0.852	1	0.153	0.143	1.067	Insig	-(2)
83	1.882	2.212	0.676	0.947	0.33	0.127	2.599	Sig	33(2)
84	4.188	4	0.861	0.97	0.188	0.142	1.328	Insig	-(2)
85	1.753	1.835	1.062	0.992	0.082	0.159	0.517	Insig	-(4)
86	1.753	1.906	0.853	0.953	0.153	0.14	1.096	Insig	-(2)
87	3.753	2.929	0.893	1.166	0.824	0.16	5.142	Sig	34(2)
88	2.941	2.4	1.24	1.043	0.541	0.177	3.06	Sig	73(6)
89	3.047	2.274	1.236	1.028	0.773	0.175	4.407	Sig	35(2)
90	3.4	2.494	1.054	1.036	0.906	0.161	5.619	Sig	57(4)
91	4.365	3.776	0.852	1.141	0.589	0.155	3.791	Sig	44(3)
92	3.894	2.847	0.84	1.132	1.047	0.154	6.807	Sig	58(4)
93	3.882	2.894	0.926	1.117	0.988	0.158	6.241	Sig	59(4)
94	3.976	3.4	1.137	1.219	0.576	0.182	3.167	Sig	74(6)
95	4.024	4.141	0.867	0.738	0.117	0.124	0.942	Insig	-(2)
96	4.4	4.059	0.672	0.872	0.341	0.12	2.839	Sig	45(3)
97	1.353	1.518	0.478	0.566	0.165	0.081	2.041	Sig	75(6)
98	2.894	2.071	1.138	0.905	0.823	0.159	5.188	Sig	76(6)
99	2.412	1.788	1.211	0.855	0.624	0.162	3.858	Sig	77(6)
100	2.047	1.706	0.88	0.865	0.341	0.135	2.533	Sig	78(6)
101	1.588	1.624	0.656	0.811	0.036	0.114	0.316	Insig	-(6)
102	1.906	2	0.941	1.117	0.094	0.159	0.59	Insig	-(5)
103	1.847	1.906	0.677	1.036	0.059	0.135	0.437	Insig	-(6)
104	1.6	1.706	0.578	1.015	0.106	0.127	0.832	Insig	-(4)
105	1.6	1.529	0.723	0.876	0.071	0.124	0.573	Insig	-(6)
106	1.459	1.635	0.565	0.906	0.176	0.116	1.511	Insig	-(5)
107	4.635	4.541	0.591	0.775	0.094	0.106	0.884	Insig	-(6)
108	4.624	4.153	0.508	0.875	0.471	0.11	4.267	Sig	79(6)
109	4.4	4.282	0.578	0.889	0.118	0.116	1.02	Insig	-(6)
110	2.424	2.188	1.11	0.888	0.236	0.155	1.522	Insig	-(6)
111	1.812	1.635	0.888	0.648	0.177	0.12	1.476	Insig	-(4)
112	2	1.741	0.958	0.769	0.259	0.134	1.932	Insig	-(6)
113	1.941	1.776	0.962	0.859	0.165	0.141	1.173	Insig	-(6)

Note: Sig – Significant at .05 level; Insig – Insignificant at .05 level; df = 168.

The table value of 't' for significance with df 168 in this case was found to be 1.98 at 0.05 level of significance. The items marked insignificant and significant are shown in

table 2.4. All dimension of SWM were judged at 0.05 level of significance. The items with significant difference were considered to be included for final SWM Scale.

2.4.9 *Items Selected for Final Draft*:

All the items having significant differences between the upper and the lower group were selected for the final SWM scale. All the items having no significant differences at .05 level were rejected. The items were found mostly of medium difficulty but there were some of high and low difficulty items. The selected items were arranged and the serial numbers to the items selected for the final draft were assigned. In all, out of 113 items at the tryout stage, 79 items came out to be included in the final draft of the scale on the basis of their value. The distribution of number of items in each dimension of the SWM is given in the table 2.5.

Table 2.5
Distribution of items after final tryout

Objectives	Dimensions of SWM	No. of Items Selected
I: Practices	Generation, Waste Handling, Segregation, Storage, and Processing at Source, Collection and Disposal at the Household and Community Level	19
II: Perception	Management of Household Solid Waste in terms of Generation, Collection, Segregation and Disposal	16
III: Role of traditional Institutions	Solid Waste Management System and its Interface	10
IV: Municipal Board	Delivery system	14
V: Government	Strictures, Rules, Regulations, Legislations and Existing Infrastructural Facilities	9
VI: Environment	Sanitation and Health	11
Total		**79**

2.5 Reliability and Validity:

Reliability of a test determines the degree and consistency of scores from one measurement to another measurement of the same group of subjects. Reliability of a test increases the value in use of the same test. There are various methods of determining the reliability of a test result. The investigator could find out the reliability of the full test used in the present study with the help of test-retest method because other methods of estimating reliability were not suitable for the present investigation due to their difficulty in administration.

Table 2.6
Product-Moment Co-efficient of Correlation for test retest reliability of the test

Item No.	Test Scores (X)	Retest Score (Y)	X^2	Y^2	XY
1	219	195	47961	38025	42705
2	127	140	16129	19600	17780
3	178	178	31684	31684	31684
4	176	158	30976	24964	27808
5	200	198	40000	39204	39600
6	159	161	25281	25921	25599
7	208	196	43264	38416	40768
8	202	207	40804	42849	41814
9	170	180	28900	32400	30600
10	115	117	13225	13689	13455
11	125	137	15625	18769	17125
12	186	172	34596	29584	31992
13	164	172	26896	29584	28208
14	164	168	26896	28224	27552
15	159	160	25281	25600	25440
16	111	137	12321	18769	15207
17	111	128	12321	16384	14208
18	168	143	28224	20449	24024
19	161	156	25921	24336	25116
20	189	168	35721	28224	31752
21	140	126	19600	15876	17640
22	174	167	30276	27889	29058
23	201	200	40401	40000	40200
24	108	121	11664	14641	13068
25	118	112	13924	12544	13216
26	113	114	12769	12996	12882
27	153	155	23409	24025	23715

28	172	176	29584	30976	30272
29	179	181	32041	32761	32399
30	167	175	27889	30625	29225
31	155	148	24025	21904	22940
32	165	163	27225	26569	26895
33	158	152	24964	23104	24016
34	187	194	34969	37636	36278
35	200	206	40000	42436	41200
36	186	190	34596	36100	35340
37	178	186	31684	34596	33108
38	177	140	31329	19600	24780
39	159	159	25281	25281	25281
40	187	194	34969	37636	36278
41	164	172	26896	29584	28208
42	171	172	29241	29584	29412
43	184	210	33856	44100	38640
44	179	192	32041	36864	34368
45	159	159	25281	25281	25281
46	170	166	28900	27556	28220
47	184	195	33856	38025	35880
48	174	177	30276	31329	30798
49	122	125	14884	15625	15250
50	158	152	24964	23104	24016
51	199	210	39601	44100	41790
52	161	153	25921	23409	24633
53	122	115	14884	13225	14030
54	186	172	34596	29584	31992
55	174	177	30276	31329	30798
56	111	101	12321	10201	11211
57	172	172	29584	29584	29584
58	201	200	40401	40000	40200
59	201	192	40401	36864	38592
60	153	153	23409	23409	23409
61	150	158	22500	24964	23700
62	145	155	21025	24025	22475
63	170	166	28900	27556	28220
64	137	140	18769	19600	19180
65	117	101	13689	10201	11817
66	152	151	23104	22801	22952
67	130	117	16900	13689	15210
68	127	146	16129	21316	18542
69	146	147	21316	21609	21462
70	191	190	36481	36100	36290
71	159	173	25281	29929	27507
72	170	177	28900	31329	30090
73	174	167	30276	27889	29058
74	207	206	42849	42436	42642

75	74	67	5476	4489	4958
76	114	109	12996	11881	12426
77	87	90	7569	8100	7830
78	90	94	8100	8836	8460
79	196	194	38416	37636	38024
Total	**12650**	**12643**	**2102890**	**2101013**	**2097383**

Note: df = 94; Level of Significance .05.

The test-retest method of estimating reliability of a test was found out on a sample of 48 respondents belonging to different occupational, income and educational groups form the form the four regions (NE, NW, SE and SW) under the study. For this, the investigator had to collect data again from the same to respondents after establishing good rapport from whom the data was obtained at the final try-out stage of data collection. And again the retest was done on the same respondents after a gap of 15 days. The test scores of these respondents and the retest scores were then correlated with the statistical technique of Product Moment Co-efficient of Correlation in order to find out the test retest reliability of the test. The formula adopted for this method of estimating reliability is given below –

$$\textbf{Correlation Coefficient (rtt)} = \frac{\Sigma XY - \Sigma X\,\Sigma Y/N}{\sqrt{[\Sigma X^2 - (\Sigma X)^2/N]\,[\Sigma Y^2 - (\Sigma Y)^2/N]}}$$

Where, X = Test Scores; Y = Re-test Scores; rtt = co-efficient of test- retest reliability
N= size of the sample **=48**

Hence, with the help of this formula the coefficient of test-retest validity of the present study was found to be 0.94. This value was more than the table value with d.f. 94 at 0.05 level of significance which indicated that the results obtained on first and second occasion were highly correlated. Hence, the test-retest coefficient of reliability was reasonable and determined the degree of consistency of the result. The test-retest reliability

coefficients established the high degree reliability of the present study and found to be satisfactory and reasonable.

The validity of a test refers to the extent to which the result of an evaluation procedure serves the particular uses for which they are intended. It means if a test measures what it desires to measure, then we can say that the test is a valid one. It establishes the degree of truthfulness of the test. There are various methods of estimating the validity of a test. The method of content validity and face validity were taken into account for their unsuitability for the present study. The face and content validity of the test were found out before the pre-tryout and tryout of the test on the basis of the high agreement of the opinions of the field personnel and experts. This could establish the content and face validities of the present study.

2.6 Data Collection:

After the schedule was ready, the investigator went to the different regions of Shilling to collect information based on SWM scale from the respondents. Before the interview, the purpose of investigation was explained to the subjects. The investigator first of all made the respondents at ease, took some time to establish rapport with them and then interviewed them to collect data through structured questions as framed in the SWM scale. The investigator for the purpose of data collection had to spend lot of time and energy and moreover had to bear the pain with lot of patience.

2.7 Statistical Techniques Used:

For the fulfillment of objectives of the present study, the investigator had employed the following statistical techniques

- measures of central tendency – the mean
- measures of dispersion – the SD
- measures of correlation – the product moment correlation
- significance of the difference between means
- Spearman Brown Prophecy Formula

With the help of the above statistical techniques the 't' ratios, and 'r' values had been calculated for the purpose of present investigation.

CHAPTER – III

ANALYSIS AND INTERPRETATION OF DATA

3.0 Introduction

The data collected with the help of various tools, however reliable, valid and accurate, these may be, are yet but raw. These needs to be systematized and organized, i.e., classified, tabulated and analysed before it can serve any worthwhile purpose. Hence the present chapter is devoted to analysis and interpretation of data.

[PART A]

The present part is framed according to the first objective of the study which states to "to study the practices of solid waste generation, waste handling and segregation, storage and processing at source, collection and disposal at the household and community level".

The results obtained for this part have been analysed and interpreted item wise for the first objective of the study which has the following dimensions of Solid Waste Management system.

3.1 Analysis and Interpretation based on Objective-1

Practices: Generation of Waste, Waste Handling, Segregation, Storage, and Processing at Source, Collection and Disposal of Waste at the Household and Community Level.

All the results obtained from objective-1, i.e. 3.1 to 3.19 have been presented in the form of tables and interpretated subsequently after each table. In the tables, items have been placed according to its significance in a tabular form for easy reference.

Household Solid Waste Stored in Container/Dustbin:

Waste handling involves the activity associated with the management of wastes until they are placed in storage containers/dustbins for collection. The cost of providing storage for solid wastes at the source is normally borne by the homeowner or apartment owner in the case of individuals. The types of containers used also depend on the methods for collecting the wastes produced. The choice of container materials depends on the preferences of the home owner. To a large extent, the types and capacities of the containers used depend on the types and capacities of solid wastes collected, the type of collection system in use, the collection frequency and the space available for the placement of containers. Unsightly makeshift containers and even open ground storage, both of which are undesirable, are often seen at many residential and commercial sites in Shillong. Factors that must be considered in the storage of solid wastes include (1) The effects of storage on the waste components (2) The type of container to be used (3) The container location in the house (4) public health and aesthetics. The important considerations in the storage of wastes are the effects of storage itself on the characteristics of wastes being stored. These effects of storing wastes include (1) Biological decomposition – if wastes are allowed to remain in storage containers for extended periods of time, flies start to breed and odorous compounds develop (2) The absorption of fluids – waste components have differing initial moisture contents and where mixed wastes are stored together, re-

equilibration takes place. The degree of absorption that takes place depends on the length of time the wastes are stored until collection (3) Contamination of waste components – Perhaps the most serious effect of storage of wastes is the contamination that occurs. The effect of this contamination is to reduce the value of the individual components for recycling. It is usually seen in Shillong that the waste components generated in the household are stored in only one dustbin which is usually placed in a convenient location in the kitchen. In some households it is also observed that they have two dustbins, one for the kitchen wastes (biodegradable) and another one for collection of dusts, paper wastes and other household items. With the above explanation, the table 3.1 reveals the following trends with respect to the item-1 on 'solid waste generated at the household level is stored in a container or dustbin'.

Table 3.1

Item 1: Solid waste generated at the household level is stored in a container/dustbin

Region/Division	M	SD	SED	t	Level of Significance
NE	4.495	0.885			
vs.			0.1198	1.032	NS
SW	4.371	0.842			
NE	4.495	0.885			
vs.			0.1088	2.103	5%
SE	4.724	0.669			
NE	4.495	0.885			
vs.			0.1088	1.665	NS
NW	4.676	0.669			
SW	4.371	0.842			
vs.			0.1055	3.340	5%
SE	4.724	0.669			
SW	4.371	0.842		2.889	
Vs.			0.1055		5%
NW	4.676	0.669			
SE	4.724	0.669	0.0928	0.513	
Vs.					NS
NW	4.676	0.669			

It was found from the table 3.1 that the calculated 't' values of 2.103, 3.340 and 2.889 between NE vs SE, SW vs SE and SW vs NW were more than the table value with df at 208 at .05 level of significance respectively. Hence the 't' values of 2.103, 3.340 and 2.889 between NE vs SE, SW vs SE and SW vs NW were significant at .05 level of significance. It indicated that there existed significant differences between the mean scores of NE vs SE, SW vs SE and SW vs NW on household wastes being stored in a container or dustbin. Again the table 3.1 revealed that the calculated 't' values of 1.032, 1.665 and 0.513 between NE vs SW, NE vs NW and SE vs NW were less than the table value with df 208 at .05 level of significance respectively. Hence the 't' values of 1.032, 1.665 and 0.513 were insignificant at .05 level of significance. It indicated that there existed insignificant differences between the mean scores of NE vs SW, NE vs NW and SE vs NW on item-1. When compared with the mean item scores of SE (M = 4.724, SD = 0.669) was higher than NW (M=4.676, SD = 0.669), NE (M=4.495, SD = 0.885) and SW (M=4.371, SD=0.842).

Household Solid Waste Stored in Plastic Bag:

The use of disposable plastic bags by consumers has increased over the years. The growth in use of plastics has occurred because plastics have largely replaced metals, glass and paper as a packaging material. Although plastics have several advantages as they are light, durable, flexible, good insulation capacity, Low density polyethylene (LDPE) which are being used extensively in individual homes are not environmentally sound. Temporary and disposable plastic containers and bags are routinely used in Shillong as temporary and disposable containers for accumulated wastes. Under normal circumstances, temporary containers are removed along with the wastes. The principal problem in the use of

temporary containers is the difficulty involved in the collection and loading process. Plastic bags or containers frequently stretch or break at the seams when the collection is done. Such breakage is potentially hazardous and may lead to injuries to the collector because of the presence of broken glasses or other dangerous items in the wastes. In Solid Waste Management, bag storage is more costly. Plastic bags tear easily, causing littering of wastes and unsightly conditions. The thin film is easily susceptible to breakage as the bags stretch and break when climate is warm. Plastic lightness and durability causes later disposal problems. The plastic materials found in Municipal Solid Waste fall into the following seven categories: Polyethylene Terephthalate (PETE), High–Density Polyethylene (HDPE), Polyvinyl Chloride (PVC), Low-Density Polyethylene (LDPE), Polypropylene (PP), Polystyrene (PS) and other multilayered plastic materials. It is the usual practice in Shillong to cover the dustbin with a plastic bag and throw the bag along with the waste either on the nearby drain or road side or community dustbin. With the above explanation, table 3.2 has been framed which reveals the following trend with respect to 'household solid waste stored in a plastic bag'.

Table 3.2

Item 2: Solid waste generated at the household level is stored in a plastic bag

Region/Division	M	SD	SED	t	Level of Significance
NE	2.543	1.060			
vs.			0.1665	3.147	5%
SW	3.067	1.326			
NE	2.543	1.060			
vs.			0.1550	1.721	NS
SE	2.810	1.172			
NE	2.543	1.060			
vs.			0.1524	1.812	NS
NW	2.819	1.136			
SW	3.067	1.326			
vs.			0.1735	1.482	NS
SE	2.810	1.172			
SW	3.067	1.326	0.1712	1.446	
Vs.					NS
NW	2.819	1.136			
SE	2.810	1.172	0.1601	0.059	
Vs.					NS
NW	2.819	1.136			

It was found from the table 3.2 that the calculated 't' value of 3.147 between NE vs SW was more than the table value with df at 208 at .05 level of significance. Hence the 't' value of 3.147 between NE vs SW was significant at 0.05 level of significance. It indicated that there existed significant differences between the mean scores of NE vs SW on solid wastes generated at the household level stored in a plastic bag. The data also revealed that the 't' values of 1.721, 1.812, 1.482, 1.446 and 0.059 between NE vs SE, NE vs NW, SW vs SE, SW vs NW and SE vs NW were less than the table value with df 208 at .05 level of significance. Hence the 't' values of 1.721, 1.812, 1.482, 1.446 and 0.059 were insignificant at .05 level of significance. It indicated that there existed no significant difference on the item ' solid waste generated at the household level is stored in a plastic bag' between NE vs SE, NE vs NW, SW vs SE, SW vs NW and SE vs NW region of Shillong. When compared to the mean item scores of SW (M= 3.067, SD = 1.326) was

higher than NW (M= 2.819, SD = 1.136), SE (M=2.810, SD=1.1.72) and NE (M=2.543, SD=1.060).

Disposal of Solid Waste in Drains:

Household solid wastes generated at the household level are sometimes disposed directly into the nearby drains, thus creating nuisances or hazards to public health or safety, blockage and contamination of water pipes and acts as breeding ground for rats and insects. In many of the localities, this kind of practice has become a serious problem. Action as deemed fit need to be initiated to ensure that citizens do not dispose off any waste into drains. These drains need to be cleaned on a regular basis to permit free flow of waste water. Lack of awareness and education about quality of environment and aesthetics is quite obvious. There exists a positive relationship between public health and disposal of solid waste. Perhaps the single most important issue here is to find a location that is acceptable to public and Local Regulatory Agency for disposal of solid wastes. Selection of proper disposal site will minimize the impact of environmental hazards. With the above explanation table 3.3 has been framed which reveals the following trend with respect to 'disposal of solid waste in drains'

Table 3.3

Item 3: Solid waste generated is disposed directly in the nearby drain

Region/Division	M	SD	SED	t	Level of Significance
NE	3.305	1.481			
vs.			0.2097	1.362	NS
SW	3.019	1.543			
NE	3.305	1.481			
vs.			0.2090	2.369	5%
SE	3.800	1.533			
NE	3.305	1.481			
vs.			0.1999	2.668	5%
NW	3.838	1.402			
SW	3.019	1.543			
vs.			0.2133	3.661	5%
SE	3.800	1.533			
SW	3.019	1.543	0.2044	4.007	
Vs.					5%
NW	3.838	1.402			
SE	3.800	1.533	0.2037	0.187	
Vs.					NS
NW	3.838	1.402			

It was found from the table 3.3 that the calculated 't' values of 2.369, 2.668, 3.661 and 4.007 between NE vs SE, NE vs NW, SW vs SE and SW vs NW were more than the table value with df 208 at .05 level of significance respectively. Hence the 't' values of 2.369, 2.668, 3.661 and 4.007 were significant at .05 level of significance. It indicated that there existed significant differences between the mean scores of NE vs SE, NE vs NW, SW vs SE and SW vs NW on the item "solid waste generated are disposed directly in the nearby drain". Again the 't' values of 1.362 and 0.187 between NE vs SW and SE vs NW were less than the table value with df 208 at .05 level of significance. Hence the 't' values of 1.362 and 0.187 were insignificant at .05 level of significance. It indicated that there existed no significant differences on this item with respect to NE vs SW and SE vs NW region of Shillong. When compared to the mean item scores, NW region (M=3.838,

SD=1.402) scored higher than SE region (M=3.800, SD=1.533), NE region (M=3.305, SD=1.481) and SW region (M=3.109, SD=1.543)

Disposal of Solid Waste in Streams:

Most of the drains in the City of Shillong flows into the water bodies viz the Wah Umkhrah and Wah Umshyrpi which flows through the heart of the city and goes down to the Umiam Reservoir which generates electricity. The accumulation of solid waste and other waste materials at the Umiam Lake is posing a serious threat not only to the environment but also to public health. Along with sedimentation, the accumulated wastes has created a serious hazard to the aquatic animals, flora and fauna of the lake. The State Government in September 2007 undertook the task of cleaning the two water course by engaging Municipal workers. The initiative is appreciative but without a proper mechanism to dispose waste in the different localities situated adjacent to the water bodies, the effort may be a futile exercise. With the above explanation table 3.4 has been framed which reveals the following trend with respect to 'disposal of Solid wastes in streams'.

Table 3.4

Item 4: Solid waste generated is disposed directly in the nearby stream

Region/Division	M	SD	SED	t	Level of Significance
NE	3.810	1.353			
vs.			0.1999	1.382	NS
SW	3.533	1.525			
NE	3.810	1.353			
vs.			0.1675	4.207	5%
SE	4.514	1.043			
NE	3.810	1.353			
vs.			0.1641	3.772	5%
NW	4.429	0.984			
SW	3.533	1.525			
vs.			0.1812	5.414	5%
SE	4.514	1.043			
SW	3.533	1.525	0.1780	5.029	
Vs.					5%
NW	4.429	0.984			
SE	4.514	1.043	0.1406	0.610	
Vs.					NS
NW	4.429	0.984			

It was found from the table 3.4 that the calculated 't' values of 4.207, 3.772, 5.414 and 5.029 between NE vs SE, NE vs NW, SW vs SE and SW vs NW were more than the table value with df 208 at .05 level of significance. Hence the 't' values of 4.207, 3.772, 5.414 and 5.029 between NE vs SE, NE vs NW, SW vs SE and SW vs NW were significant at .05 level of significance. It indicated that there existed significant differences between the mean scores of NE vs SE, NE vs NW, SW vs SE and SW vs NW with respect to 'the generated solid wastes being disposed off directly in the nearby stream'. Again the 't' values of 1.382 and 0.610 between NE vs SW and SE vs NW were less than the table value with df 208 at .05 level of significance. Hence the 't' values of 1.382 and 0.610 were insignificant at .05 level of significance. It indicated that there existed no significant difference on this item with respect to NE vs SW and SE vs NW region of Shillong. When compared with the mean item scores, SE region (M=4.514, SD=1.043) scored higher than

NW region (M=4.429, SD=0.984), NE region (M=3.810, SD=1.353) and SW region (M=3.533, SD=1.525).

Collection of Solid Waste directly in Community Bin/Outside Collection Point:

There are different practices for waste collection across the world from door-to-door collection to dumping at the nearest dumping site or community collection points. The term collection includes not only the gathering or picking up of solid wastes from the various sources, but also the hauling of those wastes to the location where the contents of the collection vehicles are emptied. Typically, collection is provided under various management arrangements, ranging from Municipal services to Local traditional bodies or to NGOs and CBOs. Most community bins in Shillong are not properly maintained; the size does not match with the waste generated by the growing number of households and the structures in most cases are not systematically constructed to make provisions for segregation. Further due to the inconsistency of collection services, insanitary conditions have become the feature in Shillong. In the absence of covered bins, Public health authorities have shown that rodents, flies and other disease vectors breed in open dumps as well in poorly constructed Community bins. Flies can develop in less than two weeks after the eggs are laid. The extent to which flies develop from the larva (maggot) stage in storage containers depends on certain facts. If maggots develop, they are difficult to remove when containers are emptied. Those remaining may develop into flies. Maggots can also crawl from uncovered cans and develop into flies in the surrounding environment. With the above explanation table 3.5 has been framed which reveals the following trend

with respect to 'collection of solid wastes directly in Community bin /outside Collection Point'

Table 3.5
Item 5: Solid waste generated is collected directly in the community bin/outside collection point

Region/Division	M	SD	SED	t	Level of Significance
NE	3.238	1.470			
vs.			0.1967	0.920	NS
SW	3.419	1.365			
NE	3.238	1.470			
vs.			0.2026	3.714	5%
SE	3.990	1.451			
NE	3.238	1.470			
vs.			0.2080	2.152	5%
NW	2.790	1.529			
SW	3.419	1.365			
vs.			0.1953	2.926	5%
SE	3.990	1.451			
SW	3.419	1.365	0.2009	3.129	
Vs.					5%
NW	2.790	1.529			
SE	3.990	1.451	0.2067	5.806	
Vs.					5%
NW	2.790	1.529			

It was found from the table 3.5 that the calculated 't' values of 3.714, 2.152, 2.926, 3.129 and 5.806 between NE vs SE, NE vs NW, SW vs SE, SW vs NW and SE vs NW were more than the table value with df at 208 at .05 level of significance respectively. Hence the 't' values of 3.714, 2.152, 2.926, 3.129 and 5.806 between NE vs SE, NE vs NW, SW vs SE, SW vs NW and SE vs NW were significant at 0.05 level of significance. It indicated that there existed significant differences between the mean scores of NE vs SE, NE vs NW, SW vs SE, SW vs NW and SE vs NW on 'solid wastes generated are thrown in the community bin or outside collection point'. Again the 't' value of 0.920 between NE vs SW was less than the table value at .05 level of significance. Hence the 't' value of 0.920

was insignificant at .05 level of significance. It indicated that no significant difference exist on this item between NE vs SW. When compared with the mean item scores, SE (M=3.990, SD=1.451) scored higher than SW (M=3.419, SD=1.365), NE (M=3.238, SD=1.470) and NW (M=2.790, SD=1.529) regions of Shillong.

Waste Generated is Stored in the House Overnight:

Storage of waste at source is the first essential step of solid waste management. Storage at the household level is of primary importance because of health concerns and aesthetics considerations. Limited storage space is also an important factor in smaller dwellings because of significant health and aesthetics impacts. Storage of Solid wastes overnight whether in container or paper or plastic bags is usually the practice. The health hazard posed by uncovered containers or bags which are susceptible to breakage is often overlooked by members of the household. Rodents and other disease vectors transfer the wastes materials to all corners of the house giving rise to putrefaction and false odours. With the above explanation table 3.6 has been framed which reveals the following trend with respect to 'waste generated is stored in the house overnight'.

Table 3.6

Item 6: The waste generated is stored in the house overnight

Region/Division	M	SD	SED	t	Level of Significance
NE	4.219	1.163			
vs.			0.1790	2.660	5%
SW	3.743	1.408			
NE	4.219	1.163			
vs.			0.1514	2.014	5%
SE	4.524	1.015			
NE	4.219	1.163			
vs.			0.1565	0.791	NS
NW	4.343	1.094			
SW	3.743	1.408			
vs.			0.1702	4.588	5%
SE	4.524	1.015			
SW	3.743	1.408	0.1748	3.432	
Vs.					5%
NW	4.343	1.094			
SE	4.524	1.015	0.1463		
Vs.				1.237	NS
NW	4.343	1.094			

It was found from the table 3.6 that the calculated 't' values of 2.660, 2.014, 4.558 and 3.432 between NE vs SW, NE vs SE, SW vs SE and SW vs NW were more than the table value with df at 208 at .05 level of significance respectively. Hence, the 't' values of 2.660, 2.014, 4.558 and 3.432 between NE vs SW, NE vs SE, SW vs SE and SW vs NW were significant at .05 level of significance. It indicated that there existed significant difference between the mean scores of NE vs SW, NE vs SE, SW vs SE and SW vs NW on 'Wastes generated in the household is stored overnight'. Again the table 3.6 revealed that the calculated 't' values of 0.791 and 1.237 between NE vs NW and SE vs NW were less than the table value with df 208 at .05 level of significance. Hence the 't' values of 0.791 and 1.237 were insignificant at .05 level of significance. It indicated that there existed insignificant difference between the mean scores of NE vs NW and SE vs NW on item-6. When compared with the mean item scores, it was found that SE (M=4.524, SD=1.015)

scored over NW (M=3.343, SD=1.094), NE (M=4.219, SD=1.163) and SW (M=3.743, SD=1.408)

Waste is Dumped on the Road or Vacant Land:

The dumping of solid waste on the road or vacant land is not an uncommon site in some localities. Wastes have been dumped wherever land is available, without regard to safety, health hazards and aesthetic considerations. Random dumping of wastes on road or vacant land creates a nuisance by being unsightly, providing breeding grounds for pests, creating health hazard, polluting the air, and sometimes polluting groundwater and surface water. In some cases, refuses are ignited and allowed to burn on the road or vacant land. With the above explanation table 3.7 has been framed which reveals the following trend with respect to 'wastes are dumped on the road or vacant land'.

Table 3.7
Item 7: Wastes are dumped on the road or vacant land

Region/Division	M	SD	SED	t	Level of Significance
NE	4.038	1.323			
vs.			0.1866	2.194	5%
SW	3.629	1.368			
NE	4.038	1.323			
vs.			0.1663	2.634	5%
SE	4.476	1.061			
NE	4.038	1.323			
vs.			0.1655	2.244	5%
NW	4.410	1.048			
SW	3.629	1.368			
vs.			0.1698	4.992	5%
SE	4.476	1.061			
SW	3.629	1.368			
Vs.			0.1690	4.621	5%
NW	4.410	1.048			
SE	4.476	1.061			
Vs.			0.1463	0.456	NS
NW	4.410	1.048			

It was found from the table 3.7 that the calculated 't' values of 2.194, 2.634, 2.244, 4.992 and 4.621 were more than the table value with df 208 at .05 level of significance when comparisons were made between NE vs SW, NE vs SE, NE vs NW, SW vs SE and SW vs NW respectively. Hence the 't' values of 2.194, 2.634, 2.244, 4.992 and 4.621 between NE vs SW, NE vs SE, NE vs NW, SW vs SE and SW vs NW were significant at .05 level of significance. It indicated that there existed high significant differences in the mean item scores between NE vs SW, NE vs SE, NE vs NW, SW vs SE and SW vs NW regions of Shillong on "Wastes are dumped on the road or vacant land". Again table 3.7 showed that the calculated 't' value of 0.456 was less than the table value when comparison was made between SE vs NW region of Shillong at df 208 at .05 level of significance .Hence the 't' value 0.456 between SE vs NW was not significant at .05 level of significance. It revealed that there existed no significant difference in practice of throwing wastes on the vacant land or road in SE vs NW regions of Shillong. When compared with the mean item scores of NE, SW, SE and NW regions, it was found that the mean item score of SE (M= 4.476, SD= 1.061) was higher than that of NW (M=4.410, SD=1.048), NE (M= 4.038, SD= 1.323) and SW (M= 3.629, SD= 1.368).

The Services of a Hired Labour is used for Collection of Waste:

In the collection of solid waste, there is no conscious attempt to reduce the amount of lifting required by the collector. In the United States, mechanical equipment is popular because it reduces long-term disability costs, and system workers are using more skills and less brute strength. The identification, evaluation and implementation options for waste collection are the most important part of an integrated solid waste management because an

estimated 50% to 60% of all solid waste system expenditures are for collection in India. In Shillong Municipal areas, collection by hired labour is uncommon except in few localities where private individuals or agencies are engaged. With the above explanation table 3.8 has been framed which reveal the following trend with respect to 'the services of a hired labour is used for collection of waste'.

Table 3.8
Item 8: The services of a hired labour is used for disposal of waste

Region/Division	M	SD	SED	t	Level of Significance
NE	2.038	1.187			
vs.			0.1852	3.755	5%
SW	2.733	1.469			
NE	2.038	1.187			
vs.			0.1925	1.237	NS
SE	2.276	1.564			
NE	2.038	1.187			
vs.			0.1745	0.928	NS
NW	2.200	1.327			
SW	2.733	1.469			
vs.			0.2104	2.173	5%
SE	2.276	1.564			
SW	2.733	1.469	0.1941	2.748	
Vs.					5%
NW	2.200	1.327			
SE	2.276	1.564	0.2011	0.379	
Vs.					NS
NW	2.200	1.327			

It was found from the table 3.8 that the calculated 't' values of 3.755, 2.173, and 2.748 between NE vs SW, SW vs SE and SW vs NW were more than the table value with df 208 at .05 level of significance respectively. Hence, the 't' values of 3.755, 2.173, and 2.748 between NE vs SW, SW vs SE and SW vs NW were significant at .05 level of significance. It indicated that there existed significant difference between the mean scores of NE vs SE, SW vs SE, and SW vs NW on the services of a hired labour being used for collection of wastes. Again it was found from the table 3.8 that the calculated 't' values of

1.237, 0.928 and 0.379 between NE vs SE, NE vs NW and SE vs NW were less than the table value with df 208 at .05 level of significance respectively. Hence, the 't' values of 1.237, 0.928 and 0.379 between NE vs SE, NE vs NW and SE vs NW were insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of NE vs SE, NE vs NW and SE vs NW on the services of a hired labour is used for the disposal of waste. When compared with the mean item scores, it was found that SW region (M=2.733, SD=1.469) scored higher than that of SE. region (M=2.276, SD=1.564), NW region (M=2.200, SD=1.327) and NE region (M=2.038, SD=1.187).

Usage of Household Waste as Compost or Manure:

Composting is one of the methods of waste utilization. It is defined as the decomposition of heterogeneous organic matter by a mixed microbial population in the moist, warm and aerobic environment. These micro-organisms convert organic waste into humus which has significant value to agriculture farming. Processing at source which involves activities such as compaction and yard waste composting, however, is not practiced widely in Shillong. In other parts of the India, especially in the cities, home composting as a means of recycling organic materials gained popularity. It is an effective means of reducing the volume and altering the physical composition of solid wastes and at the same time producing a useful by-product. A variety of methods of composting are prevalent in India, depending on the amount of space available and the wastes to be composted. The simplest backyard composting method involves placement of the material to be composted in a pile and occasionally watering and turning it to provide moisture and oxygen to the microorganisms within the pile. Leaves, grass clippings, bush clippings and

organic household waste are the most commonly composted yard wastes. Stumps and wood are also compostable, but only after they have been chipped to produce a smaller, more uniform size. During the composting period, which can take up to a year, the material placed in the pile undergoes bacterial and fungal decomposition until only a humus material known as compost remains. The composted material, which is biologically stabilized, can be used as a soil amendment or as a mulching material. A number of additives are also available to enhance the composting process. In Shillong, people usually dump all the biodegradable and non-biodegradable wastes in a dugged pit along with leaves, grass and bush clippings. Most of the time, it is burnt and hardly it is used as a manure. With the above explanation table 3.9 has been framed which reveals the following trend with respect to 'usage of household waste as compost or manure'

Table 3.9

Item 9: Do you make use of your household waste as compost or manure

Region/Division	M	SD	SED	t	Level of Significance
NE	2.619	1.305			
vs.			0.1875	1.524	NS
SW	2.905	1.397			
NE	2.619	1.305			
vs.			0.1846	1.135	NS
SE	2.410	1.357			
NE	2.619	1.305			
vs.			0.1724	1.878	NS
NW	2.943	1.178			
SW	2.905	1.397			
vs.			0.1910	2.593	5%
SE	2.410	1.357			
SW	2.905	1.397	0.1792	0.213	
Vs.					NS
NW	2.943	1.178			
SE	2.410	1.357	0.1762	3.027	
Vs.					5%
NW	2.943	1.178			

It was found from the table 3.9 that the calculated 't' values of 2.593 and 3.027 between SW vs SE and SE vs NW were more than the table value with df 208 at .05 level of significance respectively. Hence the 't' values of 2.593 and 3.027 between SW vs SE and SE vs NW were significant at .05 level of significance. It indicated that there existed significant differences between the mean scores of SW vs SE and SE vs NW on making use of household wastes as compost or manure. Again the table revealed that the calculated 't' values of 1.524, 1.135, 1.878 and 0.213 between NE vs SW, NE vs SE, NE vs NW and SW vs NW respectively were less than the table value with df 208 at .05 level of significance respectively. Hence the 't' values of 1.524, 1.135, 1.878 and 0.213 were insignificant at .05 level of significance. It indicated that no significant difference on this item exist when comparison was made between NE vs SW, NE vs SE, NE vs NW and SW vs NW. The comparison between the mean scores indicate that NW region (M=2.943, SD1.178) scores over SW (M=2.905, SD=1.397), NE (M=2.619, SD=1.305) and SE (M=2.410, SD=1.357).

Burning and Disposing of Plastic Materials and Polythene Bags along with Household Waste:

Plastic is glamorous. Plastic is synonymous with development. Our daily life without plastics cannot be imagined. From ball point pens and moulded chairs to electrical switches and plugs, plastic dominate over every household item. This phony material is actually quite vital for some applications. All plastics are highly toxic and non-biodegradable but based on their longevity they can be divided into three categories – 60% can be called 'good plastics' as they stay in use for years. These are used in radios, TV

sets, cars, plastic panels, pipes, furniture, boxes, crates, buckets, water tanks, suitcases, doors etc. They save our forests and other resources and hence can be considered pro-environment. With new technologies today, these can be remoulded into new products which can even last longer. About 22% fall in the 'bad list'. These include detergent packets, shampoo bottles, cosmetic jars etc. 18% of these are discarded immediately after use like soft drink glasses, chips and noodle packets. In India, approximately 5% to 45% of consumer spending arises from non-eco friendly packaging. The 'ugly' comprise small, thin and coloured polybags. About 58%–60% of these lasts only from the shop to the home Most of these choke drains, soil and cause animal deaths. Besides, toxic dyes are used to colour them, which are not only hazardous for people eating food products stored in them but also to workers during the process of manufacturing. According to a Delhi based Environmentalist, Iqbal Malik, 60% of plastics are disposed off immediately or within ten days, 30% within a month and only 10 % stays for a longer period. The percentage of use of plastic materials and polythene bags has increased significantly in recent years. In Shillong, temporary and disposable containers such as plastic bags are routinely used for accumulated wastes and their disposal. This culture not only involves high cost in the management of solid wastes but is also harmful to the environment. The problem with plastic is that while all phenomenons in nature are cyclic, the plastic phenomenon is not. Plastic being non-biodegradable, its decomposition does not take place at the disposal site. The most important fact to be noted in case of polybag is its limited recyclability. Most plastics are made of low density plastic, not suitable for repeated heating. Burning of plastics release organohalogens in the air, one of them being Dioxins. Dioxins are known to cause cancer. If a person is exposed to excessive emissions by

plastic it can lead to damage of the immunity system, blood, kidneys and nervous system. It might even cause the defects in the brain. Besides, plastic causes choking of drains and environmental pollution when burnt under uncontrolled condition. Public awareness with regard to health hazard and damage to the environment posed by plastic materials and polythene bags is comparatively low. Hence, the burning of such materials together with solid wastes is not uncommon. Problems associated with recycling tend to be either technical or economic. Technical questions are of particular concern when recycling plastics. While the plastics used in packaging are recyclable, the technology to do differ from plastic to plastic. There are many different types of plastic polymers. Since each has its own chemical makeup, different plastics cannot be recycled together. In other words, a milk container is likely to be high density poly-ethylene (HDPE) while an egg container is polystyrene (PS) and a soft drink bottle is polyethylene terephthalate (PET). In India, recycling of plastics is now receiving more attention, which will reduce the proportion of this waste component at disposal sites. With the above explanation table 3.10 has been framed which reveals the following trend with respect to 'burning and disposing of plastic materials and polythene bags along with household waste'.

Table 3.10

Item 10: Do you burn and dispose plastic materials and polythene bags along with household waste

Region/Division	M	SD	SED	T	Level of Significance
NE	3.476	1.448			
vs.			0.1994	1.433	NS
SW	3.190	1.428			
NE	3.476	1.448			
vs.			0.1950	1.954	NS
SE	3.857	1.362			
NE	3.476	1.448			
vs.			0.1890	2.771	5%
NW	4.000	1.272			
SW	3.190	1.428			
vs.			0.1935	3.445	5%
SE	3.857	1.362			
SW	3.190	1.428	0.1876	4.315	
Vs.					5%
NW	4.000	1.272			
SE	3.857	1.362	0.1828	0.781	
Vs.					NS
NW	4.000	1.272			

It was found from the table 3.10 that the calculated 't' values of 2.771, 3.445 and 4.315 between NE vs NW, SW vs SE and SW vs NW were more than the table value with df at 208 at .05 level of significance respectively. Hence the 't' values of 2.771, 3.445 and 4.315 between NE vs NW, SW vs SE and SW vs NW were significant at .05 level of significance. It indicated that there existed significant differences between the mean scores of NE vs NW, SW vs SE and SW vs NW region of Shillong with respect to burning of disposable plastic materials and polythene bags along with household wastes. Again it was found from the table that the calculated 't' values of 1.433, 1.954 and 0.781 between NE vs SW, NE vs SE and SE vs NW were less than the table value with df 208 at .05 level of significance. Hence the 't' values of 1.433, 1.954 and 0.781 between NE vs SW, NE vs SE and SE vs NW were insignificant at .05 level of significance. It indicated that no

significant difference exist on this item between NE vs SW, NE vs SE and SE vs NW region of Shillong.When compared with the mean item score, it was found that NW region (M=4.000, SD=1.272) scored over SE region (M=3.857, SD=1.362), NE region (M=3.476, SD=1.448) and SW region (M=3.190, SD=1.428).

Burning and Disposing of Paper Materials and Newspapers along with Household Waste:

Although there are more than 40 classifications for paper, the waste paper found in Municipal Solid Waste is typically composed of newspaper, books and magazines, commercial printing, office paper, other paperboard, paper packaging, non packaging paper, tissue paper and towels and corrugated cardboard. On a weight basis, paper constitutes the largest component of Municipal Solid Waste. Because this percentage is significantly large, one might expect that increased paper recycling represents a relatively easy opportunity to divert materials from landfills, reduce impact on forests and reduce energy consumption. Unfortunately, only a portion of discarded paper can be reused, owing to both economic and logistical considerations. The use of volatile solids in describing the biodegrability of the organic fraction of solid wastes is misleading, as some of the organic constituents of Municipal Solid Waste are highly volatile but low in biodegrability eg newsprint. The biodegrability of several of the organic compounds is based on lignin content. Wastes with high lignin contents, such as newsprint, are significantly less biodegradable than other organic wastes found in Municipal Solid Waste. With the above explanation table 3.11 has been framed which revealed the following trend

with respect to 'burning and disposing of paper materials and newspapers along with household waste'.

Table 3.11
Item 11: Do you burn and dispose waste paper materials and newspapers along with household waste

Region/Division	M	SD	SED	T	Level of Significance
NE vs. SW	3.381 3.124	1.369 1.357	0.1890	1.360	NS
NE vs. SE	3.381 3.524	1.369 1.332	0.1873	0.763	NS
NE vs. NW	3.381 3.381	1.369 1.326	0.1869	0.051	NS
SW vs. SE	3.124 3.524	1.357 1.332	0.1864	2.146	5%
SW Vs. NW	3.124 3.371	1.357 1.326	0.1860	1.331	NS
SE Vs. NW	3.524 3.371	1.332 1.326	0.1842	0.827	NS

It was found from the table 3.11 that the calculated 't' value of 2.146 between SW vs SE was more than the table value with df at 208 at .05 level of significance. Hence the 't' value of 2.146 was significant at .05 level of significance. It indicated that there existed significant difference between the mean score of SW vs SE region of Shillong on burning paper and newspapers along with household wastes. Again the table revealed that the calculated 't' values of 1.360, 0.763, 0.051, 1.331 and 0.827 between NE vs SW, NE vs SE, NE vs NW, SW vs NW and SE vs NW were less than the table value with df 208 at .05 level of significance. Hence the 't' values of 1.360, 0.763, 0.051, 1.331 and 0.827 were insignificant at .05 level of significance. It indicated that no significant difference on this

item existed when comparisons were made between NE vs SW, NE vs SE, NE vs NW, SW vs NW and SE vs NW region of Shillong. The comparison between the mean scores indicated that NE region (M=3.381, SD=1.369) scored over SE region (M=3.524, SD=1.332), NW region (M=3.381, SD=1.326) and SW region (M=3.124, SD=1.357).

Biodegradable and Non-biodegradable Wastes are Collected Separately:

Household solid wastes generated normally consist of organic (combustible) and inorganic (non combustible), though occasionally special and hazardous wastes also commingled in the storage container. Typically, the organic fraction of residential solid waste consists of materials such as food waste (also called garbage), paper of all types, cardboard (also known as paperboard and corrugated paper), plastics of all types, textiles, rubber, leather, wood and yard wastes. The inorganic fraction consists of items such as glass, crockery, tin cans, aluminum and ferrous metals. Waste separation at the source is an essential activity in an integrated solid waste management system. The driving force for choosing a source separation option is threefold: improved effectiveness of recycling, improved quality of the recovered materials and decreased costs of landfills. Non-biodegradable waste includes plastics, non-combustibles materials such as glass, ceramic, metals and construction wastes. Non-combustibles account for 30%-50 % of the dry solids.In general, the organic materials present in solid wastes can be divided into two classifications (1) those materials that will decompose rapidly (3 months to 5 years) and (2) those materials that will decompose slowly (upto 50 years or more). The separation of solid waste components at the source of generation is one of the most positive and effective ways to achieve the recovery and reuse of materials. The effectiveness of residential waste separation depends

on the type of system used for the collection of separate wastes. In the United States of America a number of communities use a collection system in which three containers are used for recycled materials in addition to one or more containers for non-recyclable materials. In the three container system, newspaper is placed in one container. Aluminium cans, glass and plastics are placed in the second container. The remaining wastes are placed in the third container. The separated materials placed in special containers are collected at the curb. In another system, four containers are used. All paper and cardboard materials are placed in one container. All plastics, glass, tin cans, aluminium and any other metals are placed in a second container. Garden wastes are placed in the third container and all remaining waste materials are placed in the fourth container. Realistically, this practice is totally absent in Shillong Municipal area. In one area in Malki, few years ago an NGO, had taken the initiative by placing used water tanks at selected sites in three numbers for collection of different waste materials, organic as well as inorganic to be kept separately. In the absence of public consciousness and education, commingled wastes are dumped in all the three containers. With the above explanation table 3.12 has been framed which reveals the following trend with respect to 'biodegradable and non-biodegradable wastes are collected separately'.

Table 3.12

Item 12: Biodegradable and non-biodegradable waste are collected separately

Region/Division	M	SD	SED	t	Level of Significance
NE	2.600	1.384			
vs.			0.1971	2.175	5%
SW	3.029	1.457			
NE	2.600	1.384			
vs.			0.1952	1.073	NS
SE	2.390	1.431			
NE	2.600	1.384			
vs.			0.1932	0.887	NS
NW	2.771	1.402			
SW	3.029	1.457			
vs.			0.2003	3.186	5%
SE	2.390	1.431			
SW	3.029	1.457			
Vs.			0.1983	1.297	NS
NW	2.771	1.402			
SE	2.390	1.431			
Vs.			0.1965	1.939	NS
NW	2.771	1.402			

It was found from the table 3.12 that the calculated 't' values of 2.175 and 3.186 between NE vs SW and SW vs SE were more than the table value with df 208 at .05 level of significanmce respectively. Hence, the 't' values of 2.175 and 3.186 were significant at .05 level of significance. It indicated that there existed significant differences between the mean scores of NE vs SW and SW vs SE region of Shillong on biodegradable and non-biodegradable waste being collected separately. Again the table revealed that the calculated 't' values of 1.073, 0.887, 1.297 and 1.939 between NE vs SE, NE vs NW, SW vs NW and SE vs NW were less than the table value with df 208 at .05 level of significance. Hence the 't' values of 1.073, 0.887, 1.297 and 1.393 were insignificant at .05 level of significance. It indicated that no significant differences on this item existed when comparisons were made between NE vs SE, NE vs NW, SW vs NW and SE vs NW region of Shillong. The

comparison between the mean score revealed that SW region (M=3.029, SD=1.457) scored over SE (M=2.390, SD=1.431), NW (M=2.771, SD=1.402) and NE (M=2.600, SD=1.384).

Hazardous Waste is kept in Separate Storage Containers at Home:

Hazardous waste are those whose physical, chemical or biological characteristics are potentially dangerous to human and the environment like household cleaners, personal care products, automotive products, paint products, batteries etc. Any waste is said to be hazardous if it exhibits any of the following characteristics like ignitability, corrosivity, reactivity or toxicity. In some cases although the active agents may be liquid or gaseous, they are classified as solid wastes because they are confined in solid containers. Typical examples are liquid hazardous waste, solvents, paints and pesticides, whose spent containers are frequently mixed with household wastes and become part of the urban waste stream. With the above explanation table 3.13 has been framed which reveals the following trend with respect to 'hazardous waste is kept in separate storage containers at home'

Table 3.13

Item 13: Hazardous waste is kept in separate storage containers at home

Region/Division	M	SD	SED	t	Level of Significance
NE	2.381	1.319			
vs.			0.2006	4.226	5%
SW	3.229	1.563			
NE	2.381	1.319			
vs.			0.2004	0.190	NS
SE	2.343	1.560			
NE	2.381	1.319			
vs.			0.1949	1.368	NS
NW	2.648	1.486			
SW	3.229	1.563			
vs.			0.2166	4.089	5%
SE	2.343	1.560			
SW	3.229	1.563			
Vs.			0.2115	2.747	5%
NW	2.648	1.486			
SE	2.343	1.560			
Vs.			0.2113	1.442	NS
NW	2.648	1.486			

It was found from the table 3.13 that the calculated 't' values of 4.226, 4.089 and 2.747 between NE vs SW, SW vs SE and SW vs NW region were more than the table value with df 208 at .05 level of significance respectively. Hence the 't' values of 4.226, 4.089 and 2.747 were significant at .05 level of significance. It indicated that there existed significant differences between the mean scores of NE vs SW, SW vs SE and SW vs NW region of Shillong on 'Hazardous waste are kept in separate storage containers at home'. Again the table revealed that the calculated 't' values of 0.190, 1.368 and 1.442 between NE vs SE, NE vs NW and SE vs NW were less than the table value with df 208 at .05 level of significance. Hence the 't' values of 0.190, 1.368 and 1.442 were insignificant at .05 level of significance. It indicated that no significant differences on this item existed when comparison were made between NE vs SE, NE vs NW and SE vs NW. The comparison between the mean scores revealed that SW region (M=3.229, SD=1.563) scored over NW

region (M=2.648, SD=1.486), NE region (M=2.381, SD=1.319) and SE region (M=2.343, SD=1.560).

Grass Clippings, Fallen Leaves, Plants, Flowers etc are left for decay in the Backyard:

Unlike water-borne and air-dispersed wastes, solid waste will not go away. Where it is thrown is where it will be found in future. Garden waste should as far as possible be composted to the extent possible. Where it is not possible to dispose of garden waste within the premises and the waste is required to be disposed of outside the premises, it should be stored in large bags or bins on-site and transferred into a municipal system on a weekly basis. The generation of such waste should as far as practicable be regulated in such a way that it is generated only a day prior to the date of collection of such waste. It should be stored in the premises and kept ready for handing over to municipal authorities or the agency that may be assigned the work of collection of such waste. With the above explanation table 3.14 has been framed which reveals the following trend with respect to 'grass clippings, fallen leaves, plants, flowers etc are left for decay in the backyard'

Table 3.14

Item 14: Grass clippings, fallen leaves, plants, vegetable peels, flowers etc are left for decay in the backyard

Region/Division	M	SD	SED	t	Level of Significance
NE	3.200	1.521			
vs.			0.2025	2.163	5%
SW	2.762	1.397			
NE	3.200	1.521			
vs.			0.2125	1.389	NS
SE	3.495	1.544			
NE	3.200	1.521			
vs.			0.2042	2.379	5%
NW	3.686	1.423			
SW	2.762	1.397			
vs.			0.2042	3.591	5%
SE	3.495	1.544			
SW	2.762	1.397			
Vs.			0.1956	4.723	5%
NW	3.686	1.423			
SE	3.495	1.544			
Vs.			0.2059	0.925	NS
NW	3.686	1.423			

It was found from the table 3.14 that the calculated 't' values of 2.163, 2.379, 3.591 and 4.723 between NE vs SW, NE vs NW, SW vs SE and SW vs NW region were more than the table value with df 208 at .05 level of significance respectively. Hence, the 't' values of 2.163, 2.379, 3.591 and 4.723 were significant at .05 level of significance. It indicated that significant differences existed between the mean scores of NE vs SW, NE vs NW, SW vs SE and SW vs NW region of Shillong on 'Grass clippings, fallen leaves, plants, flowers etc are left for decay in the backyard'. Again the table showed that the calculated 't' values of 1.389 and 0.925 between NE vs SE and SE vs NW were less than the table value with df 208 at .05 level of significance. It indicated that no significant differences on this item existed when comparisons were made between NE vs SE and SE vs NW region of Shillong. The comparison between the mean scores revealed that NW

region (M=3.686, SD=1.423) scored over SE region (M=3.495, SD=1.544), NE region (M=3.200, SD=1.521) and SW region (M=2.762, SD=1.397).

Door to Door Collection of Waste is Practiced in the Neighbourhood:

The system of door-to-door collection is hardly practiced. In the absence of door-step-collection, the disposal of waste is done haphazardly without any concern for health and hygiene. Many cities in India have now initiated the door-to-door collection of garbage. Municipalities across the country have started to invite proposals for door-to-door collection of waste and transportation of the same to designated locations. In door-to- door collection, trolleys have to be purchased, funds have to be allocated for salaries and protective gear such as shoes and gloves are to be porocured. Unemployed youth of the area can get jobs. It was learnt that sweepers were opposed to door-to-door collection. They were afraid of increased workload and longer working hours. In some localities of Shillong, door-to-door collection has been started but the response is yet to gain momentum. Households were asked to pay a nominal sum of Rs. 20 – Rs. 30 per month for disposal of their garbage. The money collected from the localities is utilized for payment to drivers, collectors of garbage and for the cost of conveyance. With the above explanation table 3.15 has been framed which reveals the following trend with respect to 'door to door Collection of waste is practiced in the neighbourhood'.

Table 3.15

Item 15: Door to Door Collection of waste is practiced in the neighbourhood

Region/Division	M	SD	SED	t	Level of Significance
NE	3.371	1.456			
vs.			0.1905	3.499	5%
SW	2.705	1.287			
NE	3.371	1.456			
vs.			0.1996	3.435	5%
SE	2.686	1.423			
NE	3.371	1.456			
vs.			0.1945	1.665	NS
NW	3.048	1.348			
SW	2.705	1.287			
vs.			0.1881	0.101	NS
SE	2.686	1.423			
SW	2.705	1.287			
Vs.			0.1827	1.877	NS
NW	3.048	1.348			
SE	2.686	1.423			
Vs.			0.1922	1.883	NS
NW	3.048	1.348			

It was found from the table 3.15 that the calculated 't' values of 3.499 and 3.435 between NE vs SW region and NE vs SE region were more than the table value with df 208 at .05 level of significance respectively. Hence, the 't' values of 3.499 and 3.435 were significant at .05 level of significance. It indicated that there existed significant differences between the mean scores of NE vs SW and NE vs SE region of Shillong on throwing of polythene bags along with garbage. Again the table revealed that the calculated 't' values of 1.665, 0.101, 1.877 and 1.883 between NE vs NW, SW vs SE, SW vs NW and SE vs NW were less than the table value with df 208 at .05 level of significance. Hence the 't' values of 1.665, 0.101, 1.877 and 1.883 were insignificant at .05 level of significance. It indicated that no significant differences on this item existed when comparisons were made between NE vs NW, SW vs SE, SW vs NW and SE vs NW region of Shillong. The comparison between the mean scores revealed that NE region (M=3.371, SD=1.456)

scored over NW region (M=3.048, SD=1.348), SW region (M=2.705, SD=1.287) and SE region (M=2.686, SD=1.423).

Throwing of Old Clothes in the Garbage:

Worn out clothes and rags are sometimes hard to dispose. They usually find their way into the community bins. Sometimes they are used as second hand wears but the practice of handing out to others is not widely practiced except in few cases where they are handed to orphanage and such other institutions. With the above explanation table 3.16 has been framed which reveals the following trend with respect to 'throwing of old clothes in the garbage'

Table 3.16
Item 16: Do you throw old clothes in the garbage?

Region/Division	M	SD	SED	t	Level of Significance
NE	3.648	1.316			
vs.			0.1866	2.450	5%
SW	3.190	1.374			
NE	3.648	1.316			
vs.			0.1826	0.522	NS
SE	3.743	1.317			
NE	3.648	1.316			
vs.			0.1800	0.000	NS
NW	3.648	1.280			
SW	3.190	1.374			
vs.			0.1866	2.960	5%
SE	3.743	1.317			
SW	3.190	1.374			
Vs.			0.1841	2.483	5%
NW	3.648	1.280			
SE	3.743	1.317			
Vs.			0.1801	0.529	NS
NW	3.648	1.280			

It was found from the table 3.16 that the calculated 't' values of 2.450, 2.960 and 2.483 between NE vs SW, SW vs SE and SW vs NW region were more than the table

value with df 208 at .05 level of significance respectively. Hence, the 't' values of 2.450, 2.960 and 2.483 were significant at .05 level of significance. It indicated that there existed significant differences between the mean scores of NE vs SW, SW vs SE and SW vs NW region of Shillong on throwing of old clothes in the garbage. Again the table revealed that the calculated 't' values of 0.522, 0.000 and 0.529 between NE vs SE, NE vs NW and SE vs NW region were less than the table value with df 208 at .05 level of significance respectively. Hence, the 't' values of 0.522, 0.000 and 0.529 were insignificant at .05 level of significance. It indicated that no significant differences on this item existed when comparisons were made between NE vs SE, NE vs NW and SE vs NW region of Shillong. The comparison between the mean scores revealed that SE (M=3.743, SD=1.317) scored over NE (M=3.648, SD=1.316), NW (M=3.648, SD=1.280) and SW region (M=3.190, SD=1.374).

Non-biodegradable Waste are Handed over/disposed through Rag Pickers:

Rag pickers play a key role in the management of garbage in some cities of India. They work day and night on the garbage dump sites to collect the recyclable materials. Rag pickers were quite oftenly seen around waste receptacles/ community bins/ rummaging rivers, streams and drains engaged in picking up waste materials of some use. An excellent example of segregation of waste within dhalaos/ dustbins is provided by rag pickers, who make the living out of discarded materials. Ragpickers amongst themselves have good understanding for area-wise operation. After segregation, ragpickers either sell it to kabariwala or to the recycling party. However, rag picking as an activity is a cause of concern especially among children. Waste pickers are not aware of the forward linkages of

the waste recovery process, but thanks to globalization, for creating market prices. They are mostly very poor, face social and economic exploitation and have little to say in the formulation of policies that directly affect them. With the above explanation table 3.17 has been framed which reveals the following trend with respect to 'non-biodegradable waste are handed over / disposed through rag pickers'.

Table 3.17
Item 17: Non-biodegradable waste are handed over /disposed through rag pickers

Region/Division	M	SD	SED	t	Level of Significance
NE	2.667	1.224			
vs.			0.1750	1.959	NS
SW	3.010	1.298			
NE	2.667	1.224			
vs.			0.1754	0.109	NS
SE	2.686	1.304			
NE	2.667	1.224			
vs.			0.1683	1.188	NS
NW	2.867	1.204			
SW	3.010	1.298			
vs.			0.1805	1.794	NS
SE	2.686	1.304			
SW	3.010	1.298			
Vs.			0.1736	0.823	NS
NW	2.867	1.204			
SE	2.686	1.304			
Vs.			0.174	1.040	NS
NW	2.867	1.204			

It was found from the table 3.17 that the calculated 't' values of 1.959, 0.109, 1.188, 1.794,0.823 and 1.040 between NE vs SW, NE vs SE, NE vs NW, SW vs SE, SW vs NW and SE vs NW regions of Shillong were less than the table value with df 208 at .05 level of significance. Hence the 't' values of 1.959, 0.109, 1.188, 1.794, 0.823 and 1.040 were insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of NE vs SW, NE vs SE, NE vs NW, SW vs SE, SW vs NW and SE vs NW region of Shillong with respect to non-biodegradable waste being

disposed off through Rag pickers. The comparison between the mean scores revealed that SW region (M= 3.010, SD=1.298) scored over NW region (M=2.867, SD=1.204), SE region (M=2.686, SD=1.304) and NE region (M=2.667, SD=1.304) and NE region (M=2.667, SD=1.224).

Effort to Reduce Waste Generation at the Household Level:

The most fundamental way to reduce waste is to prevent it from becoming waste in the first place. Waste minimization or reduction at source is the most desirable activity because the community does not incur expenditure for waste handling, recycling and disposal of waste that is never created and delivered to the waste management system. However, it is an unfamiliar activity as it has not been included in earlier waste management systems. Reduction of waste at source, although not controlled by solid waste managers, is now included in system evaluations as a method of limiting the quantity of waste generated. Source reduction involves reducing the amount and /or toxicity of the wastes generated. Source reduction is first in the hierarchy of Integrated Solid Waste Management because it is the most effective way to reduce the quantity of waste, the cost associated with its handling and its environmental impacts. Waste reduction may occur at the household level through selective buying patterns and the reuse of products and materials. Product consumption is a natural activity. Society changes a standard of living by changing the quantity and quality of products it consumes. Solid wastes, the discards of product consumption, vary in quantity and quality as changes occur in the standard of living. The challenge is to change consumption habits that have been established over many years as a result of advertising pressure that glamorizes increased consumption.

Efforts must also be made to begin the process of recycling at the source. Source reduction is an alternative that will conserve resources and also has economic viability. Waste reduction may also occur through the design, manufacture and packaging of products with minimum toxic content, minimum volume of material or a longer useful life. Although the concept of limiting the consumption of raw materials and increase the rate of recovery and reuse of waste materials is simple, effecting this change in a modern technological society has proved extremely difficult. Essentially sound practice can help. Waste can be reduced by following the three R's – reduce, reuse and recycle. Disposables must be recognized as the real enemy. With the above explanation table 3.18 has been framed which reveals the following trend with respect to 'effort to reduce waste generation at the household level'.

Table 3.18

Item 18: Effort is made to limit/reduce the generation of waste at the household level

Region/Division	M	SD	SED	t	Level of Significance
NE	3.724	1.125			
vs.			0.1576	1.209	NS
SW	3.533	1.147			
NE	3.724	1.125			
vs.			0.1597	0.417	NS
SE	3.657	1.178			
NE	3.724	1.125			
vs.			0.1591	0.778	NS
NW	3.848	1.169			
SW	3.533	1.147			
vs.			0.1612	0.768	NS
SE	3.657	1.178			
SW	3.533	1.147			
Vs.			0.1606	1.957	NS
NW	3.848	1.169			
SE	3.657	1.178			
Vs.			0.1627	1.171	NS
NW	3.848	1.169			

It was found from from table 3.18 that the calculated 't' values of 1.209, 0.417, 0.778, 0.768, 1.957 and 1.171 between NE vs SW, NE vs SE, NE vs NW, SW vs SE, SW vs NW and SE vs NW region of Shillong were less than the table value with df 208 at .05

level of significance. Hence the 't' values of 1.209, 0.417, 0.778, 0.768, 1.957 and 1.171 were insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of NE vs SW, NE vs SE, NE vs NW, SW vs SE, SW vs NW and SE vs NW region of Shillong with respect to making an effort to reduce waste generation of the household level. The comparison between the mean scores revealed that NW region (M=3.848, SD=1.169) scored over NE region (M=3.724, SD=1.125), SE region (M=3.657, SD=1.178) and SW region (M=3.533, SD=1.147).

Carrying of Own Shopping Bag to the Market Place:

The habit of carrying own shopping bag to the market can greatly help in the reduction of waste. People are so used going to the market empty-handed and expecting the items bought to be covered or wrapped in plastic or paper bags. People can help to maintain the balance in nature by using reusable, recyclable, eco-friendly jute bags. These jute products are totally handcrafted, environment friendly and strong enough to carry the entire weekend's grocery. These earth bags are strong, durable and most importantly in harmony with nature. In Shillong, meat, fish and other vegetable items are always wrapped in low density polythene bags which are toxic and harmful to the environment. Although, the Government and other local bodies have issued stern warnings for their use and in the limited supply of alternative eco-friendly materials like banana leaves, the use and sale of polythene bags in the market place has not stopped. With the above explanation table 3.19 has been framed which reveals the following trend with respect to 'carrying of own shopping bag to the market'.

Table 3.19

Item 19: Do you carry your own shopping bag/jute bag/paper bag to the market place

Region/Division	M	SD	SED	t	Level of Significance
NE	3.990	1.151			
vs.			0.1607	0.119	NS
SW	4.010	1.167			
NE	3.990	1.151			
vs.			0.1525	2.623	5%
SE	4.390	1.046			
NE	3.990	1.151			
vs.			0.1573	2.603	5%
NW	4.400	1.118			
SW	4.010	1.167			
vs.			0.1537	2.479	5%
SE	4.390	1.046			
SW	4.010	1.167			
Vs.			0.1585	2.464	5%
NW	4.400	1.118			
SE	4.390	1.046			
Vs.			0.1501	0.063	NS
NW	4.400	1.118			

It was found from the table 3.19 that the calculated 't' values of 2.623, 2.603, 2.479 and 2.464 between NE vs SE, NE vs NW, SW vs SE and SW vs NW were more than the table value with df at 208 at .05 level of significance respectively. Hence the 't' values of 2.623, 2.603, 2.479 and 2.464 between NE vs SE, NE vs NW, SW vs SE and SW vs NW were insignificant at .05 level of significance. It indicated that there existed significant differences between the mean scores of NE vs SE, NE vs NW, SW vs SE and SW vs NW region of Shillong on carrying of own shopping bag to the market place. Again it was found from the table that the calculated 't' values of 0.119 and 0.063 between NE vs SW and SE vs NW were less than the table value with df 208 at .05 level of significance respectively. Hence, the 't' values of 0.119 and 0.063 were insignificant at .05 level of significance. It indicated that there existed no significant differences were found on this item with respect to NE vs SW and SE vs NW region of Shillong. The comparison of mean

scores revealed that NW region (M=4.400, SD=1.118) scored over SE region (M=4.390, SD=1.046), SW region (M=4.010, SD=1.167) and NE region (M=3.990, SD=1.151).

[PART B]

The present part is framed according to the second objective of the study which states to "to study the perception of people with regard to the management of household solid waste in terms of generation, collection, segregation and disposal."

The results obtained for this part have been analysed and interpreted item wise for the second objective of the study which has the following dimensions of Solid Waste Managemet system.

3.2 Analysis and Interpretation based on Objective-2

Perception: Management of household solid waste in terms of generation, collection, segregation and disposal.

All the results obtained from objective-2, i.e. 3.20 to 3.35 have been presented in the form of tables and interpretated subsequently after each table. In the tables, items have been placed according to its significance in a tabular form for easy reference.

Solid Waste Disposal is a Problem in your Household:

It is estimated that the total solid waste generated by 300 million people living in urban India is 38 million tonnes per year. The collection and disposal of household solid waste is one of the pressing problems in the management of Municipal Solid wastes. The

proper disposal of household waste is absolutely necessary for the preservation and improvement of public health but it has an immense potential for resource recovery. There has been no major effort to create community awareness on the simple steps that every citizen can take which will help in reducing waste generation and promote effective ways of disposing the waste generated. The degree of community sensitization and public awareness is low. There is no system of segregation of organic, inorganic and recyclable wastes at household level. Door to door collection is also not practised in many of the localities. In view of the above problems of Solid wastes disposal at the household level, item 20 was framed and the data was analysed in the context of household solid waste disposal problem at three different levels i.e Lower Income Group (LIG), Middle Income Group (MIG) and High Income Group (HIG). With the above explanation table 3.20 has been framed which reveals the following trend with respect to 'solid waste disposal is a problem in your household'.

Table 3.20
Item 20: Solid waste handling is a problem in your household

Item: 20	M	SD	SED	t	Level of Significance
LIG vs MIG	2.163 2.372	1.143 1.169	0.126	1.657	NS
LIG vs HIG	2.163 2.500	1.143 1.162	0.278	1.211	NS
MIG vs HIG	2.372 2.500	1.169 1.162	0.272	0.471	NS

It was found from the table 3.20 that the calculated't' values of 1.657, 1.211. 0.471 were less than the table value at df 398, 295 and 141 at .05 level of significance respectively on item 31. Hence the't' values of 1.657, 1.211. 0.471 between LIG vs MIG,

LIG vs HIG, and MIG vs HIG were insignificant at .05 level of significance. It indicated that there existed no significant differences in opinion of the respondents on 'solid waste disposal is a problem in the individual household' existed between LIG vs MIG, LIG vs HIG, and MIG vs HIG. When compared with mean item scores of MIG, with LIG and HIG, it was found that the mean item score of HIG (M= 2.500, SD= 1.162) was higher than that of MIG (M=2.372, SD=1.169) and LIG (M= 2.163, SD=1.143).

Distance of Dumping Site for Disposal of Household Waste:

In the absence of a proper system of collection and disposal of solid wastes coupled with unavailability of a proper site for disposal within short distance, the problem of storage and handling of household wastes becomes unmanageable by any standards. Unsightly makeshift containers and even open ground storage, both of which are undesirable are often seen at many residential sites in Shillong. The single most important issue for management of Solid Wastes is to find a location that is acceptable to the public and to local regulatory agencies. There is a dumping ground located nearly 8 kms away from the town which is maintained by the Shillong Municipal Board. As per the information received from the Board, there are 105 dustbins within the area of 10.8 sq. km which work out to one dustbin per approximately 102857 sqm. That means a person has to walk nearly 320 metres radius for reaching a dustbin which is not an ideal situation for collection and disposal of garbage.Normally, nobody should be required to walk more than 60 metres to reach a dustbin. In view of the above revelations, it was worthwhile to analyse the problem of distance of the dumping site in view of the difficulties faced by the residents of Shillong. The comparison was made between the three levels namely Lower

Income Group, Middle Income Group and High Income Group. With the above explanation table 3.21 has been framed which reveals the following trend with respect to 'distance of dumping site is a problem for disposal of your household waste'.

Table 3.21
Item 21: Distance of dumping site is a problem for disposal of your household waste

Item : 21	M	SD	SED	t	Level of Significance
LIG	2.211	1.245			
vs			0.141	2.723	5%
MIG	2.596	1.326			
LIG	2.211	1.245			
vs			0.293	2.520	5%
HIG	2.950	1.161			
MIG	2.596	1.326			
vs			0.299	1.185	NS
HIG	2.950	1.161			

It was found from the table 3.21 that the calculated 't' values of 2.723 and 2.520 were more than the table value at df 398, and 295 at .05 level of significance respectively. Hence the't' values of 2.723 and 2.520 between LIG vs MIG and LIG vs HIG respectively were significant at .05 level of significance . It indicated that there existed significant differences in the mean item scores of LIG vs MIG and LIG vs HIG on the item 'the distance to the dumping site is a problem for disposal of household wastes'. Again table 3.21 showed that the calculated't' value of 1.185 at df 141 between MIG vs HIG was less than the table value at .05 level of significance. Hence the't' value of 1.185 was insignificant at .05 level of significance when comparison was made between MIG vs HIG on 'the distance to the dumping site is a problem for disposal of your household wastes'. It revealed that no significant difference on "The distance to the dumping site is a problem for disposal of your household wastes" existed between MIG Vs HIG. When compared with the mean item scores of LIG, MIG and HIG it was found that the mean item score of

HIG (M= 2.950, SD=1.161) was higher than that of MIG (M=2.596, SD= 1.326) and LIG (M= 2.211, SD= 1.245).

Segregation of Solid Waste at the Household Level:

The handling and segregation of solid wastes at the source before they are collected is a critical step in the management of household wastes. The separation of solid waste components including waste paper, cardboard, aluminium cans, glass, plastics at the source of generation is one of the most positive and effective ways to achieve the recovery and reuse of materials.Once the waste component is separated, the question facing the homeowner is what to do with the wastes until they are collected. Some homeowners store the separated components within the home and periodically transferring the accumulated wastes to larger containers needed before final disposal.Ideally, three containers are needed for segregation. (a) Dry waste: scraps of paper, plastic, metals, glass pieces, rags, rubber, leather, crockery etc can all go into a used cardboard carton, sack or basket. This can be given to ragpickers once a week. (b) Wet waste: Kitchen waste such as vegetable peels and remains of fruits and vegetables can be fed to domestic animals or along with left overs and rotten food, garden litter, hedge clippings and the like, can be collected and composted in homes, schools, gardens and parks or in neighbouring composting sites. (c) Toxic waste: Unused medicines which have not expired can be given to free clinics and hospitals. However, unused toxic materials such as expired medicines, pesticides, chemicals, used batteries, tubelights etc have to be disposed off in a proper scientific manner. (d) Soiled waste: Soiled and infected cotton, drips, injections, syringes and needles, diapers, sanitary napkins, dressings, used tissues and condoms should be collected in throw away bags tied

at the mouth and left in the Municipality bin for safe disposal. The local body should formulate and notify a policy that no waste shall be disposed of on the streets, open spaces, drains, water bodies etc. and instead the recyclable and other biodegradable wastes shall be stored separately at the source of waste generation and shall be handed over to the waste collectors as per the arrangements that may be notified by the local body from time to time. In view of the above, item 22 was framed in accordance with the second objective of the study and the findings were analysed at three levels, i.e., Lower Income Group, Middle Income Group and High Income Group. With the above explanation table 3.22 has been framed which reveals the following trend with respect to 'solid waste should be segregated at the household level'.

Table 3.22
Item 22: Solid waste should be segregated at the household level

Item : 22	M	SD	SED	t	Level of Significance
LIG	3.707	1.002			
vs			0.111	0.352	NS
MIG	3.668	1.026			
LIG	3.707	1.002			
vs			0.229	0.468	NS
HIG	3.600	0.860			
MIG	3.668	1.026			
vs			0.226	0.302	NS
HIG	3.600	0.860			

It was found from the table 3.22 that the calculated't' values of 0.352, 0.468 ,and 0.302 were less than the table value at df 398, 295, and 141 at .05 level of significance respectively on item 35. Hence the 't' values of 0.352, 0.468 and 0.302 between LIG vs MIG, LIG vs HIG, and MIG vs HIG were insignificant at .05 level of significance. It indicated that there existed no significant differences in opinion of the respondents on "solid waste should be segregated at the household level", when comparisons were made

between LIG vs MIG, LIG vs HIG, and MIG vs HIG. When compared with mean item scores of MIG, with LIG and HIG, it was found that the mean item score of of LIG (M=3.707, SD=1.002) was higher than that of MIG (M=3.668, SD=1.026) and HIG (M=3.600, SD=0.860).

Banning of Plastic Bags at Source of Production:

Public laws concerning the use of plastic bags are generally needed to minimise its effect on public health, the environment and economics. Different States have adopted their own laws, restrictive covenants and have established new agencies for the control of use of plastics. Similarly in the State of Meghalaya, the Government as well as traditional bodies have made some endeavour for minimising the use of plastic bags, but the efforts has not borne fruit as expected. "Say 'No' to Polybags campaign" by Government, NGOs and other traditional bodies was a step in the right direction. However, Plastic loving industries defending their arguments say that "Plastics helps in conserving the environment by lessening the load on scarce natural resources like wood etc". The annual plastic production of India is one of the lowest in the world, being 2.1 kg per capita per year as against 40-60 kg in rich, developed countries in the West. So Industries sees big market and big money. They want to ensure that we use as much plastic as developed countries and they can earn fat profits out of it. Of all the plastic makers, Reliance industries are the biggest giant. It has a 56% share of the plastic market in India and they want it to grow. After the liberalisation of 1991 custom duties on petrochemicals products were lowered sharply from 130% to 30%. So Reliance has installed huge capacity petrochemical plants. This helps them to reduce the cost of production and sell cheap plastics and still earn huge

profits. Other materials like jute also cannot compete with plastics. Plastic slowly replaces other traditional materials and engulfs all in the web of plastic, plastic and more plastic. What is needed is a sustainable use of plastic. For this, the Government will have to ensure that petrochemical industries restrict the types of plastic produced and reduce the quantity. The following paragraph analyses the perception of the people on the item 'banning of plastic bags at source of production is practicable'. The item was analysed in the context of three levels, i.e. Lower Income Group, Middle Income Group and High Income Group. With the above explanation table 3.23 has been framed which reveals the following trend with respect to 'banning of plastic bags at source of production is practicable'.

Table 3.23
Item 23: Banning of plastic bags at source of production is practicable

Item: 23	M	SD	SED	t	Level of Significance
LIG	3.724	1.114			
vs			0.122	0.720	NS
MIG	3.812	1.131			
LIG	3.724	1.114			
vs			0.255	1.075	NS
HIG	3.450	1.117			
MIG	3.812	1.131			
vs			0.246	1.472	NS
HIG	3.450	1.117			

It was found from the table 3.23 that the calculated't' values of 0.720, 1.075 and 1.472 were less than the table value at df 398, 295 and 141 at .05 level of significance respectively on item 23. Hence the't' values of between LIG vs MIG, LIG vs HIG, and MIG vs HIG were insignificant at .05 level of significance. It indicated that there existed no significant differences in opinion of the respondents on "banning of plastic bags at source of production is practicable", when comparisons were made between LIG vs MIG, LIG vs HIG, and MIG vs HIG. When compared with mean item scores of MIG, with LIG

and HIG, it was found that the mean item score of MIG (M=3.812, SD=1.131) was higher than that of LIG (M=3.724, SD=1.114) and HIG (M=3.450, SD=1.117).

Reduction in Generation of Waste at the Household Level:

The success in the reduction of wastes depends largely on household participation. The issue is how to get the waste generators participate in a situation where they have multiple choices. Participation can be either voluntary or mandatory. The 4 'R's can be applied effectively for the reduction of waste at the household level. Recycling is important but it is the third choice. Refuse – to buy anything that is not really needed; Reduce – means eliminating or decreasing the amount of waste we produce or reducing the toxicity of materials.Redesigning products to reduce waste and make them more durable, eliminating excessive packaging, avoiding disposal products and decreasing consumption are all great ways to reduce solid waste. One has to make sure that whatever is being thrown is being done so after it has been reused to the maximum extent possible; Reuse – means taking products that would otherwise be discarded and using them again in their current form, or with few repairs or changes. People often mistakenly say they are recycling something when they are actually reusing it. Reuse saves or delays purchasing and disposal costs, conserves resources, reduces the waste stream, cause less pollution than recycling and makes needed items available to those who can't afford to buy them new. Recycle – involves collecting used materials, processing them mechanically and chemically and remanufacturing them into new products. Items that can be recycled should be kept for agents. However, covers or containers of poisons or chemicals should not be given for recycling. They need to be carefully disposed off as toxics. Advertisers,

educators and government officials constantly urge people to recycle but the latter have not assumed this as a civic duty. In view of the above, the question for item 24 was framed to find the perception of the people (Lower Income Group, Middle Income Group and High Income Group) on efforts to reduce waste generated at the household level. With the above explanation table 3.24 has been framed which reveals the following trend with respect to 'generation of waste can be reduced at the household level'.

Table 3.24
Item 3.24: Generation of waste can be reduced at the household level

Item : 24	M	SD	SED	t	Level of Significance
LIG	3.911	1.044			
vs			0.108	0.158	NS
MIG	3.928	0.970			
LIG	3.911	1.044			
vs			0.223	0.175	NS
HIG	3.950	0.669			
MIG	3.928	0.970			
vs			0.203	0.109	NS
HIG	3.950	0.669			

It was found from the table 3.24 that the calculated 't' values of 0.158, 0.175,and 0.109 were less than the table value at df 398, 295 and 141 at .05 level of significance respectively on item 54. Hence the't' values of between LIG vs MIG, LIG vs HIG, and MIG vs HIG were insignificant at .05 level of significance. It indicated that there existed no significant differences in opinion of the respondents on "generation of waste can be reduced at the household level", when comparisons were made between LIG vs MIG, LIG vs HIG, and MIG vs HIG. When compared with mean item scores of MIG, with that of LIG and HIG, it was found that the mean item score of HIG (M=3.950, SD=0.669) was higher than that of MIG (M=3.928, SD=0.970) and LIG (M=3.911, SD=1.044).

Waste Generation can be reduced Significantly by Educational Intervention:

Education and sustained awareness generation is an essential component of reduction of waste generation. The State Government has the responsibility to develop appropriate information, education and communication material (IEC) according to the local needs and take up statewide awareness campaign and help the urban local bodies to build public awareness in the city and promote the principle of 'Reduce, Reuse and Recycle'. It is possible to make SOLID WASTE MANAGEMENT Plan a people's programme by launching comprehensive IEC activities for awareness generation. Lulled by years of complete dependence on the Municipality, many people were apathetic and do not show much enthusiasm to cooperate. While this could have been addressed by a massive social marketing campaign through intensive IEC, Shillong city lacked the resources to undertake and sustain such an IEC effort. Manpower assigned to Solid Waste Management were not properly trained and lacked skill and knowledge about available appropriate technology that could be adopted in the city. Even the existing laws, rules and regulations are not enforced. In fact, the management of solid waste within the city is yet to be institutionalised. As IEC is one of the important components of SOLID WASTE MANAGEMENT, item 25 was framed in accordance with the second objective of the study and was analysed in three levels levels i.e Lower Income Group, Middle Income Group and High Income Group. With the above explanation table 3.25 has been framed which reveals the following trend with respect to 'waste generation can be significantly reduced by appropriate educational intervention'.

Table 3.25

Item 3.25: Waste generation can be significantly reduced by appropriate educational intervention

Item : 25	M	SD	SED	t	Level of Significance
LIG	3.813	1.164			
vs			0.111	3.490	5%
MIG	4.199	0.946			
LIG	3.813	1.164			
vs			0.255	0.734	NS
HIG	4.000	1.095			
MIG	4.199	0.946			
vs			0.201	0.990	NS
HIG	4.000	1.095			

It was found from the table 3.25 that the calculated 't' value of 3.490 was more than the table values with df at 398 at .05 level of significance. Hence the 't' value of 3.490 between LIG vs MIG was significant at .05 level of significance. It indicated that there existed high significant difference in the mean item score of LIG vs MIG with respect to "waste generation can be significantly reduced by appropriate educational intervention". Again the table 3.25 showed that the calculated 't' values of 0.734 and 0.990 at df 295 and 141 respectively are less than the table value at .05 level of significance. It indicated that there existed no significant differences in the mean items scores of LIG vs HIG and MIG vs HIG on "waste generation can be significantly reduced by appropriate educational intervention". When the mean item scores are compared between LIG, HIG and MIG, it was found that the mean item score of MIG (M= 4.199, SD=0.946) was higher than that of HIG (M=4.000, SD=1.095) and LIG (M=3.813, SD=1.164).

Proper Handling and Collection of Waste require Cooperation from Public:

The public habit today is to throw all wastes into a single container. People must first set goals for waste separation and then proceed with choosing facilities that can be

used to implement these goals.Public awareness is an important activity in solid waste management to keep the system sustainable.There has been no major effort to create community awareness either about the likely perils due to poor waste management or the simple steps that every citizen can take which will help in reducing waste generation and promote effective management of solid waste generated. The degree of community sensitisation and public awareness is low. There are inadequate systems and mechanisms to promote the participation of people in local development planning and in the implementation of priority programs and projects. While the concerned authority can initiate mobilisation of resources and technical skills to formulate medium term development plans, it has very limited skills and experience in consulting with its constituents. On the other hand, this is an area where the traditional institutions and NGOs could lend their experience and expertise. As observed from the households, there is no system of segregation of organic, inorganic and recyclable wastes at the household level. Door to door collection of solid waste is not practised in almost all the localities. In view of the above observations, the item 26 was analysed at three levels i.e. Lower Income Group, Middle Income Group and High Income Group. With the above explanation table 3.26 has been framed which reveals the following trend with respect to 'proper handling and collection of waste require extensive cooperation from the public'.

Table 3.26
Item 26: Proper handling and collection of waste require extensive cooperation from the public

Item: 26	M	SD	SED	t	Level of Significance
LIG	4.163	0.932			
vs			0.094	2.410	5%
MIG	4.390	0.837			
LIG	4.163	0.932			
vs			0.195	0.447	NS
HIG	4.250	0.698			
MIG	4.390	0.837			
vs			0.170	0.824	NS
HIG	4.250	0.698			

It was found from the table 3.26 that the calculated 't' value of 2.410 was more than the table value with df at 398 at .05 level of significance. It indicated that there existed significant differences in the mean item scores of LIG vs MIG Again table showed that the calculated 't' values of 0.447 and 0.824 were less than the table value with df at 295 and 141 at .05 level of significance respectively. Hence, the 't' values of 0.447 and 0.824 between LIG vs HIG and MIG vs HIG respectively were not significant at .05 level of significance. It revealed that no significant difference on 'proper handling and collection of waste requires extensive cooperation from the public' existed between LIG vs HIG and MIG vs HIG. When compared with the mean item scores of LIG, MIG and HIG, it was found that the mean score of MIG (M=4.390, SD=0.837) was higher than HIG (M=4.250, SD=0.698) and LIG (M=4.163, SD=0.932.

Awareness of the Usefulness of Recycling of Waste Products:

Recycling of waste is an important aspect that will definitely go a long way in solving the garbage problem. Recycling refers to the process by which material once used is used again to substitute for virgin material. Most household waste is recyclable. Paper,

plastic, metal, glass and rags can be reused in various manufacturing processes. Wet organic kitchen wastes can be used to generate compost rich in plant nutrients. In our country, most cities and towns have retailers and wholesellers who buy materials picked from garbage dumps and roadside bins by the ragpickers. These materials are then sorted out and sent to various large industries which use them in varying proportions to substitute for virgin materials in the manufacture of articles. Recycling has several benefits. It reduces the amount of waste that reaches the roadside bin. If managed properly it reduces the amount of energy needed to make new products. It reduces the requirement for virgin material and it generates employment. Recycling of post consumer materials found in MSW involves (1) the recovery of materials from the waste stream (2) intermediate processing such as sorting and compaction (3) transportation and (4) final processing, to provide a raw material for manufacturers or an end product. The primary benefits of recycling are conservation of natural resources and landfill space. The requirements for a successful programme are that a strong demand exists for recovered materials and that the market values of the materials are sufficient to pay for collection and transportation costs. In view of the above preposition, the item 27 was analysed with respect to the three levels of the community i.e. Lower Income Group, Middle Income Group and High Income Group. With the above explanation table 3.27 has been framed which reveals the following trend with respect to 'people are aware of the usefulness of recycling of waste products'.

Table 3.27

Item 3.27: People are aware of the usefulness of recycling of waste products

Item : 27	M	SD	SED	t	Level of Significance
LIG	3.537	1.022			
vs			0.120	3.520	5%
MIG	3.116	1.134			
LIG	3.537	1.022			
vs			0.216	1.331	NS
HIG	3.250	0.942			
MIG	3.116	1.134			
vs			0.226	0.592	NS
HIG	3.250	0.942			

It was found from the table 3.27 that the calculated 't' value of 3.520 at df 398 was more than the table value.. It indicated that there existed high significant difference in the mean item score of LIG vs MIG on item 27. Again the table 3.27 showed that the calculated 't' values of 1.331 and 0.592 between LIG vs HIG and MIG vs HIG at df 295 and 141 respectively were less than the table value at .05 level of significance. Hence the 't' values of 1.331 and .0592 between LIG vs HIG and MIG vs HIG respectively were not significant at .05 level of significance. It revealed that no significant differences on ' people are aware of the usefulness of recycling of waste products' existed between LIG vs HIG and MIG vs HIG. When compared with the mean item scores of LIG, MIG and HIG, it was found that LIG (M=3.537, SD=1.022) was higher than of HIG (M=3.250, SD=0.942) and MIG (M=3.116, SD=1.134)

Values and Attitudes of People with regard to Solid Waste Management:

Traditionally, people dispose their household waste mainly by digging pits in their backyard or disposing the waste outside their homes in any vacant land. Wastes disposed in the backyard are burnt from time to time. However, with growing urbanisation,

increasing consumerism and generation of more non-biodegradable waste, aesthetic and health concern are being felt by the people. However, due to lack of participatory planning initiative at the community level, people are complacent and indifferent towards envisioning a proper and effective system for waste disposal. In view of the above, the item 28 was framed and analysed at three levels i.e. Lower Income Group, Middle Income Group and High Income Group. With the above explanation table 3.28 has been framed which reveals the following trend with respect to 'values and attitudes of people have not changed with regard to Solid Waste Management over the years'.

Table 3.28
Item 28: Values and attitudes of people have not changed with regard to solid waste management over the years

Item: 28	M	SD	SED	t	Level of Significance
LIG vs MIG	2.561 2.419	1.068 0.994	0.111	1.285	NS
LIG vs HIG	2.561 2.800	1.068 0.927	0.220	1.087	NS
MIG vs HIG	2.419 2.800	0.994 0.927	0.197	1.938	NS

It was found from the table 3.28 that the calculated 't' value of 1.285,1.087 and 1.938 at df 398,295 and 141 between LIG vs MIG, LIG vs HIG and MIG vs HIG were less than the table value at .05 level of significance. It indicated that there existed no significant difference in the mean item score of LIG vs MIG, LIG vs HIG and MIG vs HIG on "values and attitudes of people have not changed with regard to Solid Waste Management over the years". A comparison between the mean item scores between LIG, MIG and HIG revealed that the mean item score of HIG (M= 2.800, SD=0.927) was higher than that of LIG (M=2.561, SD=1.068) and MIG (M=2.419, SD=0.994).

Solid Waste Generation and Handling in the Slum Areas:

The emergence of slums in Shillong is mainly due to accelerated high growth rate and unplanned physical development.The pace and magnitude of intra-state migration capitualted with an influx from outside the state has resulted in increase in the number of slum dwellers. There are 23 slum pockets identified with an estimated 76,730 dwellers according to 1991 census. Increased generation and indiscriminate waste disposal is endangering the health, hygiene and environment of the city over a period of years in the slum areas of Shillong. In view of the above, item 29 was framed and analysed at three levels i.e Lower Income Group, Middle Income Group and High Income Group. With the above explanation table 3.29 has been framed which reveals the following trend with respect to 'solid waste generation and handling in the slum areas is alarming'.

Table 3.29
Item 29: Solid waste generation and handling in the slum areas is alarming

Item : 29	M	SD	SED	t	Level of Significance
LIG vs MIG	3.911 4.202	1.067 0.996	0.111	2.631	5%
LIG vs HIG	3.911 3.950	1.067 0.973	0.218	0.179	NS
MIG vs HIG	4.202 3.950	0.996 0.973	0.195	1.295	NS

It was found from the table 3.29 that the calculated 't' value of 2.631 was more than the table value with df 398 at .05 level of significance. Hence the 't' value of 2.631 between LIG vs MIG was significant at .05 level of signifiance. It indicated that there existed significant difference in the mean item score of LIG vs MIG on "Solid waste generation and handling in the slum areas is alarming". Again the table 3.29 showed that

the calculated 't' values of 0.179 and 1.295 between LIG vs HIG and MIG vs HIG respectively at df 295 and 141 were less than the table value at .05 level of significance respectively. It revealed that no significant differences on "solid waste generation and handling in the slum areas is alarming" existed between LIG vs HIG and MIG vs HIG. When compared with the mean item scores of LIG, MIG and HIG, it was found that the mean score of MIG (M=4.202, SD=0.996) was higher than of HIG (M=3.950, SD=0.973) and LIG (M=3.911, SD=1.067).

Payment for the Disposal of Garbage:

Citizens need to be made aware that the more they rely on government to take up any activity which they could otherwise do, the tax burden on the citizens would at least double and service delivery only half. Usually, waste management has a tradition of low cost. The improvements demanded by a concerned public are more costly than past practices. The increased costs must be paid by waste generators. This issue involves changing the manner in which a consumer thinks about paying for waste disposal. Two questions arise in this case. How is the cost of waste disposal presented to the consumer? When is the consumer asked to pay – at the time of product purchase or when the product is discarded? Since solid waste decays very slowly, who pays for long term maintenance of land disposal waste management units – the generator at the time of discard or future users. Priority should be set to establish a relationship of transparency and trust with the community and a strong policy for financial recuperation, through tax reforms. Therefore, the 'polluter pay' principle should be applied and the proceeds may be used to finance waste disposal programs. In view of the above, item 30 was framed and analysed at three

levels i.e Lower Income Group, Middle Income Group and High Income Group. With the above explanation table 3.30 has been framed which reveals the following trend with respect to 'one should pay for the disposal of garbage'.

Table 3.30
Item 30: One should pay for the disposal of garbage

Item: 30	M	SD	SED	t	Level of Significance
LIG	3.211	1.296			
vs			0.133	0.886	NS
MIG	3.329	1.194			
LIG	3.211	1.296			
vs			0.258	0.818	NS
HIG	3.000	1.095			
MIG	3.329	1.194			
vs			0.229	1.440	NS
HIG	3.000	1.095			

It was found from the table 3.30 that the calculated 't' value of 0.886, 0.818 and 1.440 were less than the table value with df 398, 295 and 141 at .05 level of significance respectively. Hence the 't' values of 0.886, 0.313 and 1.440 between LIG vs MIG, LIG vs HIG and MIG vs HIG were insignificant at .05 level of significance.It indicated that there existed no significant differences between the mean scores of LIG vs MIG, LIG vs HIG and MIG vs HIG on "one should pay for the disposal of garbage". When compared with the mean item scores of MIG (M= 3.329, SD=1.194) with that of LIG (M=3.211, SD=1.296) and HIG (M=3.000, SD=1.095), it was found that the mean item score of MIG was higher than that of LIG and HIG.

Recycling of Waste Products after Segregation at the Household Level:

Segregation of recyclable waste is generally not practised in Shillong. Most of the recyclable material is disposed off along with domestic waste on the streets or in the

drains. Recyclable waste is, therefore generally found mixed with garbage on the streets, into the municipal bins and at the dump sites. Waste materials that are separated at the source must be collected or gathered together before they can be recycled. Three recycling containers are to be provided to each residence and residents should be educated to separate newspaper and cardboard, plastics and glass, and aluminium and tin cans. The homeowner is only required to place the separated materials in the appropriate containers and then move the recycling containers to curbside once per week for collection by special recycling vehicles.Segregation at source should be done as early as possible to keep general waste from becoming infectious. In the light of the above item 31 was framed and analysed at three levels i.e Lower Income Group, Middle Income Group and High Income Group. With the above explanation table 3.31 has been framed which reveals the following trend with respect to 'waste products from the household should be collected for recycling after segregation'.

Table 3.31
Item 31: Waste products from the household should be collected for recycling after segregation

Item: 31	M	SD	SED	t	Level of Significance
LIG	3.618	1.040			
vs			0.108	0.129	NS
MIG	3.632	0.977			
LIG	3.618	1.040			
vs			0.217	0.313	NS
HIG	3.550	1.203			
MIG	3.632	0.977			
vs			0.190	0.431	NS
HIG	3.550	1.203			

It was found from the table 3.31 that the calculated 't' values of 0.129, 0.313 and 0.431 were less than the table value with df 398, 295 and 141 at .05 level of significance respectively. Hence the 't' values of 0.129, 1.744 and 0.431 between LIG vs MIG, LIG vs

HIG and MIG vs HIG were insignificant at .05 level of significance.It indicated that there existed no significant differences between the mean scores of LIG vs MIG, LIG vs HIG and MIG vs HIG on "waste products from household should be collected for recycling after segregation". When compared with the mean item scores of MIG with that of LIG and HIG it was found that mean item score of MIG (M=3.632, SD=0.977) was higher than that of LIG (M=3.618, SD=1.040) and HIG (M=3.550, SD=1.203).

Proper System of Garbage in the Locality:

Although many of the localities in Shillong are within the jurisdiction of the traditional Dorbars, they are yet to evolve an effective mechanism for the proper disposal of garbage. It was only in recent times, that some efforts has been made by some of the localities to address the problem posed by indiscriminate disposal of garbage. The initiative taken by MUDA by giving transportation vehicles like trucks and autos to the traditional local bodies has yielded some positive results. Some of the local dorbars have started this same initiative on their own. In many cases, the community bins provided are not sufficient to meet the increasing generation of waste and lack of maintenance of Community bins has become an eyesore. Further, there are only 10 Municipal trucks to cover the entire Municipal area which makes it more difficult to provide adequate collection and services. Inview of the above, item 32 was framed and analysed at three levels i.e Lower Income Group, Middle Income Group and High Income Group. With the above explanation table 3.32 has been framed which reveals the following trend with respect to 'the locality have a proper system of garbage disposal'.

Table 3.32
Item 32: The locality have a proper system of garbage disposal

Item: 32	M	SD	SED	t	Level of Significance
LIG	2.878	1.260			
vs			0.132	0.691	NS
MIG	2.787	1.190			
LIG	2.878	1.260			
vs			0.242	1.744	NS
HIG	3.300	1.005			
MIG	2.787	1.190			
vs			0.220	2.336	5%
HIG	3.300	1.005			

It was found from the table 3.32 that the calculated 't' value of 2.336 was more than the table value with df at 141 at .05 level of significance. Hence the 't' value of 2.336 between MIG vs HIG was significant at .05 level of significance. It indicated that there existed significant difference in the mean item score of MIG vs HIG. Again table 3.32 showed that the calculated 't' values of 0.691 and 1.744 were less than the table value with df at 398 and 295 at .05 level of significance respectively. Hence, the 't' values of 0.691 and 1.744 between LIG vs MIG and LIG vs HIG respectively were not significant at .05 level of significance. It revealed that no significant difference on "the locality having a proper system of garbage disposal existed between LIG vs MIG and LIG vs HIG". When compared with the mean item scores of LIG with that of MIG and HIG, it was found that the mean score of HIG (M=3.300, SD=1.005) was higher than MIG (M=2.787, SD=1.190) and LIG (M=2.878, SD=1.260).

Consumer Lifestyle is responsible for more Generation of Waste:

The pace and development that is taking place around the world and the availability of every kind of food and consumer items has tranformed the culture of many societies. In

1955, Life magazine pictured a happy family in an article 'Throw away living'. A disposable life-style was marketed as the wave of the future and as a way to cut down on household chores. 'Use it once and throw it away' became a very popular advertising slogan in the 1950's.Marketing experts set to work trying new tactics to get consumers to buy and toss or as economists would say, to 'stimulate consumption'. In the mid 1950s, marketing consultant Victor Lebow wrote an emotional plea for 'forced consumption' in the New York Journal of Retailing: "Our enormously productive economy demands that we make consumption a way of life, that we convert the buying and use of goods into rituals, that we seek our spiritual satisfactions in consumption. We need things to be consumed, burned up, worn out, replaced, and discarded at an ever growing rate". Consumers were quick to adapt to the lifestyle that Lebow envisioned. In fact, it was not long until a disposable, throwaway life-style was seen as a consumer's right. The idea was to sell 'convenience' to the prosperous post war consumers. What was initially a convenience was soon to become a necessity. 'Buy what you need and not what you want' is what environmentalist has been echoing from time to time but none is paying heed to this call. In view of the above understanding, item 33 was framed and analysed at three levels i.e Lower Income Group, Middle Income Group and High Income Group. With the above explanation table 3.33 has been framed which reveals the following trend with respect to 'consumer lifestyle is responsible for more generation of waste'.

Table 3.33
Item 33: Consumer lifestyle is responsible for more generation of waste

Item: 33	M	SD	SED	t	Level of Significance
LIG	2.350	0.954			
vs			0.092	4.373	5%
MIG	1.949	0.791			
LIG	2.350	0.954			
vs			0.180	1.666	NS
HIG	2.050	0.740			
MIG	1.949	0.791			
vs			0.145	0.696	NS
HIG	2.050	0.740			

It was found from the table 3.33 that the calculated 't' value of 4.373 was more than the table value with df at 398 at .05 level of significance. Hence the 't' value of 4.373 between LIG vs MIG was significant at .05 level of significance. It indicated that there existed significant difference in the mean item score of LIG vs MIG on item 33. Again table 3.33 showed that the calculated 't' values of 1.666 and 0.696 between LIG vs HIG and MIG vs HIG were less than the table value with df at 295 and 141 at .05 level of significance respectively. Hence, the 't' values of 1.666 and 0.696 were not significant at .05 level of significance. It revealed that no significant difference exist among the opinion of LIG vs HIG and MIG vs HIG on 'the consumer's lifestyle is responsible for more generation of waste'. When compared with the mean item scores of LIG (M=2.350, SD=0.954) with that of HIG (M=2.050, SD=0.740) and MIG (M=1.949, SD=0.791), it was found that the mean score of LIG was higher than that of HiG and MIG on this item.

Concern of Neighbours about Solid Waste Disposal problem in the Locality:

Public apathy towards solid waste management is conspicuous in Shillong. The general feeling is that one looks at the other person as the culprit. Everybody complains

when heaps of garbage are lying on the road, or when unclean water with soiled waste materials from the drains overflows into pathways, or the unsightly picture of Community bins, but no conscious attempt is made to contribute to the solution. Perhaps, the lack of awareness about the threats posed by indiscriminate disposal and the health hazards and environmental pollution associated with it is not really taken seriously by the general population. The local inhabitants, particularly the khasis are known for their cleanliness within their premises but are least bothered about their neigbourhood. This is where community capacitation is essential for collective decision and action with regard to the management of solid waste. In view of the above observation, item 34 was framed and analysed at three levels i.e., Lower Income Group, Middle Income Group and High Income Group. With the above explanation table 3.34 has been framed which reveals the following trend with respect to 'neighbours are very much concern about solid waste disposal problem in your locality'.

Table 3.34
Item 34: Neighbours are very much concern about solid waste disposal problem in your locality

Item : 34	M	SD	SED	t	Level of Significance
LIG	3.236	1.141			
vs			0.117	1.925	NS
MIG	3.462	1.053			
LIG	3.236	1.141			
vs			0.216	0.167	NS
HIG	3.200	0.980			
MIG	3.462	1.053			
vs			0.191	1.375	NS
HIG	3.200	0.980			

It was found from the table 3.34 that the calculated 't' values of 1.925, 0.167 and 1.375 between LIG vs MIG, LIG vs HIG and MIG vs HIG were less than the table value with df at 398, 295 and 141 at .05 level of signifiance respectively. Hence, the 't' values of

1.925, 0.167 and 1.375 between LIG vs MIG, LIG vs HIG and MIG vs HIG were insignificant at .05 level of significance respectively. It indicated that there existed no significant differences between the mean scores of LIG vs MIG, LIG vs HIG and MIG vs HIG on "Neighbours being concerned about Solid Waste Management disposal problem in the locality". When compared with the mean item scores of HIG with that of MIG and LIG, it was found that the mean scores of HIG (M=3.462, SD=1.053) was higher than that of LIG (M=3.236, SD=1.141) and LIG (M=3.200, SD=0.980).

Sufficiency of Community Bins in the Locality:

The community bins placed at selected sites in the different localities are insufficient to cater to the needs of the growing population. It was observed that Community bin facility given to citizens was not sufficient for depositing the waste. In the absence of the facility of door-step collection, inadequacies of collection and disposal services by the municipality, unsightly accumulation of waste around the community bins has become a feature. In many cases, the community bins are not well maintained and many of the structures are either half broken and are open for stray dogs and other rodents. In view of the above explanation, item 35 was framed and analysed in three levels i.e Lower Income Group, Middle Income Group and High Income Group. With the above explanation table 3.35 has been framed which reveals the following trend with respect to 'the community bins provided in your locality is sufficient'.

Table 3.35
Item 35: The community bins provided in your locality is sufficient

Item : 35	M	SD	SED	t	Level of Significance
LIG vs MIG	2.780 2.798	1.130 1.212	0.129	0.140	NS
LIG vs HIG	2.780 3.150	1.130 1.236	0.223	1.662	NS
MIG vs HIG	2.798 3.150	1.212 1.236	0.219	1.610	NS

It was found from the table 3.35 that the calculated 't' values of 0.140, 1.662 and 1.610 with df 398, 295 and 141 at .05 level of significance were less than the table value. Hence, the 't' values of 0.140, 1.662 and 1.610 between LIG vs MIG, LIG vs HIG and MIG vs HIG 'on sufficieny of community bins in the locality' was found to be insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of LIG, MIG and HIG on this item. A comparison between the mean item scores of MIG, HIG and LIG revealed that HIG (M=3.150, SD=1.236) was higher than MIG (M=2.798, SD=1.212) and LIG (M=2.780, SD=1.13).

[PART C]

The present part is framed according to the third objective of the study which states to "to study the Role of Traditional Institutions in Solid Waste Management".

The results obtained for this part have been analysed and interpreted item wise for the third objective of the study which has the following dimensions of Solid Waste Management system.

3.3 Analysis and Interpretation based on Objective-3

Role of traditional Institutions: Solid waste management system and its interface.

All the results obtained from objective-3, i.e. 3.36 to 3.45 have been presented in the form of tables and interpretated subsequently after each table. In the tables, items have been placed according to its significance in a tabular form for easy reference.

Dorbar Shnong steps for Disposal of Household Waste:

The existense of the local traditional institutions or the Dorbar shnongs has been a boon in the governance and administration of a locality. In fact, many of the Governmental schemes, if not all has been implemented by these institutions. It is fortunate that inspite of the expansion of the Shillong city in terms of numbers and the diversification of activities of an urban setting, these traditional institutions have withstood the test of time. By and large, from maintaining law and order in the localities, the Dorbar Shnongs have also engaged themselves actively in developmental activities. As far the disposal and management of solid waste is concern, it was only in recent times that some local dorbars have started taking initiative in this regard. Apart from the annual cleaning day in almost all the localities, it is the local dorbars which is mostly responsible for the construction and management of Community bins with financial assistance either from the Municipality or from the MLA schemes. The sanitation aspect is being well addressed by the Dorbars but proper techniques and approach has to be evolved according to the demand of the situation. In view of the above, item 36 was framed and the data was analysed in terms of respondents educational qualification.

Table 3.36

Item 36: Does the Dorbar shnong take proper steps for disposal of household waste

Item: 36	M	SD	SED	t	Level of Significance
Illiterate	3.643	1.394	0.390	1.046	NS
vs.					
Up to HS	3.235	1.395			
Illiterate	3.643	1.394	0.4105	0.655	NS
vs.					
Graduate	3.374	1.480			
Illiterate	3.643	1.394	0.4647	0.329	NS
vs.					
Post Graduate	3.490	1.540			
Up to HS	3.235	1.395	0.153	0.908	NS
vs.					
Graduate	3.374	1.480			
Up to HS	3.235	1.395	0.2327	1.096	NS
vs.					
Post Graduate	3.490	1.540			
Graduate	3.374	1.480	0.2406	0.482	NS
vs.					
Post Graduate	3.490	1.540			

It was found from the table 3.36 that the calculated 't' values of 1.046, 0.655, 0.329, 0.908, 1.096 and 0.482 between Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post graduate, High School vs Graduate, High school vs Post graduate and Graduate vs Post Graduate were less than the table value with df 182, 199, 61, 355, 217 and 234 at .05 level of significance respectively. Hence, the 't' values of 1.046, 0.655, 0.329, 0.908, 1.096 and 0.482 between Illiterate vs High school, Illiterate vs Graduate, Illiterate vs Post graduate, High School vs Graduate, High School vs Post graduate and Graduate vs Post graduate respectively were insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post graduate, High School vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate on 'Dorbar shnong take proper steps for disposal of household waste'.When compared with the mean

item scores of Illiterate respondents with that of High School, Graduate and Post Graduate respondents, it was found that the mean score of Illiterate respondents (M=3.643, SD=1.394) was higher than Post Graduate respondents (M=3.490, SD=1.540), Graduate respondents (M=3.374, SD=1.480) and high school respondents (M=3.235, SD=1.395)

Appreciability of Strictures, Rules and Regulations of the Dorbar with regard to Solid Waste Management:

The public experience is that anything initiated by the Governmnent takes a longer time to sink into people's mind.The public apathy towards the Government is an indication of the lack of political will and seriousness on the part of the latter. Legislations on important areas and issues have been enacted but in reality strict enforcement are seldom seen. On the other hand, the traditional Dorbar shnongs, although they are not statutory bodies, are more effective as guardians of the public. Though, most of the Dorbar lack the expertise in proper handling and management of wastes, their effort to maintain cleanliness in the localities is appreciable. By and large, citizens are responsive to the initiative taken by local dorbars as far as strictures, rules and regulations are concerned, but a more professional approach is required to sustain the efforts made. In view of the above, item 37 was framed and the data was analysed in terms of educational qualification of the respondents.

Table 3.37
Item 37: Strictures, rules and regulations of the Dorbar with regard to solid waste management is appreciable

Item: 37	M	SD	SED	t	Level of Significance
Illiterate vs. Up to HS	3.214 3.459	1.081 1.123	0.313	0.782	NS
Illiterate vs. Graduate	3.214 3.273	1.081 1.243	0.3432	0.172	NS
Illiterate vs. Post Graduate	3.214 3.020	1.081 1.078	0.3322	0.584	NS
Up to HS vs. Graduate	3.459 3.273	1.123 1.243	0.126	1.474	NS
Up to HS vs. Post Graduate	3.459 3.020	1.123 1.078	0.1813	2.421	5%
Graduate vs. Post Graduate	3.273 3.020	1.243 1.078	0.1951	1.297	NS

It was found from the table 3.37 that the calculated 't' values of 0.782, 0.172, 0.584, 1.474 and 1.297 between Illiterate vs High school, Illiterate vs Graduate, Illiterate vs Post Graduate, High School vs Graduate, and Graduate vs Post Graduate were less than the table value with df at 182, 199, 61, 355 and 234 at .05 level of significance respectively. Hence, the 't' values of 0.782,0.172,0.584,1.474 and 1.297 between Illiterate vs High school, Illiterate vs graduate, Illiterate vs Post graduate, High school vs graduate, High school vs post graduate and Graduate vs post graduate respectively were insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of Illiterate vs High school, Illiterate vs graduate, Illiterate vs Post graduate, High school vs graduate, High school vs Post graduate and Graduate vs Post graduate respondents on 'strictures, rules and regulations of the Dorbar with regard to solid

waste management is appreciable'. The table 3.37 also showed that the calculated 't' value of 2.421 between High school vs Post Graduate was more than the table value with df 217 at .05 level of significance. It indicated that significant difference in perception with respect to 'Strictures, rules and regulations of the Dorbar with regard to solid waste management is appreciable' existed between High school and Post graduate respondents. When compared with the mean item scores of Illiterate respondents with that of High School, Graduate and Post Graduate respondents, it was found that the mean score of High School respondents (M=3.459, SD=1.123) was higher than graduate respondents (M=3.273, SD=1.243), illiterate respondents (M=3.214, SD=1.081) and post graduate respondents (M=3.020, SD=1.078).

Enforcement of Strictures, Rules and Regulations of the Dorbar with regard to Solid Waste Management:

Unlike the Government which is armed with legal machinery and instruments, local Dorbars initiative is based more on voluntary response and acceptability.Generally, citizens comply with the rules and regulations framed by the Dorbars as a collective action and not because of the penalty imposed by the local institutions. The decision of the dorbar may or may not be binding to the public but any violation or defiance on the part of the citizens is seen as a sign of disrespect to the collective consciouness. Certain conventions may not have the rule of law but conformity to the shared decision is considered to be imperative. In view of the above, item 38 was framed and the data was analysed in terms of educational qualification respondents.

Table 3.38

Item 38: Strictures, rules and regulations of the Dorbar with regard to solid waste management is strictly enforced

Item: 38	M	SD	SED	t	Level of Significance
Illiterate vs. Up to HS	2.714 3.306	1.030 1.256	0.347	1.708	NS
Illiterate vs. Graduate	2.714 3.171	1.030 1.162	0.3212	1.423	NS
Illiterate vs. Post Graduate	2.714 2.796	1.03 0.968	0.3025	0.271	NS
Up to HS vs. Graduate	3.306 3.171	1.256 1.162	0.128	1.052	NS
Up to HS vs. Post Graduate	3.306 2.796	1.256 0.968	0.1951	2.614	5%
Graduate vs. Post Graduate	3.171 2.796	1.162 0.968	0.1812	2.070	5%

It was found from the table 3.38 that the calculated 't' values of 1.708,1.423,0.271 and 1.052 between Illiterate vs High school, Illiterate vs graduate, Illiterate vs Post graduate and High school vs Graduate, were less than the table value with df at 182, 199, 61 and 355 at .05 level of significance respectively. Hence, the 't' values of 1.708, 1.423, 0.271 and 1.052 between Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post Graduate and High School vs Graduate respectively were insignificant at .05 level of significance respectively. It indicated that there existed no significant differences between the mean scores of Illiterate vs High school, Illiterate vs graduate, Illiterate vs Post Graduate and High School vs Graduate on 'strictures, rules and regulations of the Dorbar with regard to solid waste management is strictly enforced'. The table 3.38 also showed that the calculated 't' value of 2.614 and 2.070 with df 217 and 234 at .05 level of

significance between High School vs Post Graduate and Graduate vs Post Graduate were significant. It indicated that significant difference in perception with respect to 'Strictures, rules and regulations of the Dorbar with regard to solid waste management is strictly enforced' existed between High School vs Post Graduate and Graduate vs Post Graduate respondents. When compared with the mean item scores of Illiterate respondents with that of High School, Graduate and Post Graduate respondents, it was found that the mean score of High school respondents (M=3.306, SD=1.256) was higher than graduate respondents (M=3.171, SD=1.162), post graduate respondents (M=2.796, SD=0.968) and illiterate respondents (M=2.714, SD=1.030).

Banning of Plastic Bags by Local Dorbars:

The plastic menace has raised many an eye-brow, but their continued use is evident in the absence or limited supply of substituted materials for wrapping and packaging. Some dorbars have made some effort to assist the Government machinery for complete ban of low density polythene bags especially in the market place. This has not been very effective due to a number of reasons. Banning of the use of low density polythene bags by the Dorbar may not be practicable especially in the market place because people are still adverse of wrapping of meat, fish and vegetables in newspaper materials and paper bags. Secondly, alternative materials like banana leaves are of short supply and may involve cost for the seller as well as the buyer and lastly the habit of carrying own shopping bag to the maket place has still not been part of the eco-friendly culture. In view of the above, item 39 was framed and the data was analysed in terms of educational qualification respondents.

Table 3.39

Item 39: Banning of plastic bags by local Dorbars is practicable

Item: 39	M	SD	SED	t	Level of Significance
Illiterate	3.286	1.161			
vs.			0.342	0.799	NS
Up to HS	3.559	1.227			
Illiterate	3.286	1.161			
vs.			0.3065	1.719	NS
Graduate	3.813	1.096			
Illiterate	3.286	1.161			
vs.			0.313	0.585	NS
Post Graduate	3.469	0.971			
Up to HS	3.559	1.227			
vs.			0.123	2.060	5%
Graduate	3.813	1.096			
Up to HS	3.559	1.227			
vs.			0.1913	0.470	NS
Post Graduate	3.469	0.971			
Graduate	3.813	1.096			
vs.			0.1727	1.992	5%
Post Graduate	3.469	0.971			

It was found from the table 3.39 that the calculated 't' values of 0.799, 1.719, 0.585 and 0.470 between Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post Graduate and High School vs post Graduate were less than the table value with df at 182, 199, 61 and 234 at .05 level of significance respectively. Hence, the 't' values of 0.799, 1.719, 0.585 and 0.470 between Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post Graduate and High School vs Post Graduate respectively were insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post Graduate and High School vs Post Graduate on 'banning of plastic bags by local Dorbars is practicable'.The table 3.39 also shows that the calculated 't' value of 2.060 and 1.992 between High school vs graduate and graduate vs postgraduate respectively was more than the table value with df at 355 and 234 at .05 level of significance respectivel. It indicated

that significant difference in perception with respect to 'banning of plastic bags by local Dorbars is practicable' existed between High School vs Graduate and Graduate vs Post Graduate respondents. When compared with the mean item scores of Graduate with that of High School, Post Graduate and Illiterate respondents, it was found that the mean score of graduate respondents (M=3.813, SD=1.096) was higher than High School respondents (M=3.559, SD=1.227), Post Graduate respondents (M=3.469, SD=0.971) and Illiterate respondents (M=3.286, SD=1.161).

Efficiency of Locality Cleaning by Dorbar Shnongs is Satisfactory:

The annual cleaning day of the Dorbar Shnongs is a significant feature as far as people participation is concerned. This is a unique event which is seldom seen in other parts of the country. This is a reflection of collective action where each and every household member takes pride of cleaning the locality. However, this kind of an exercise should be geared in the right perspective for proper aesthetics and ecological considerations. Cleaning should be made more of a regular feature rather than an annual event. In this regard, although the Dorbars must be appreciated for making effort in mobilising public participation on important issues, their effort may just be a tip of the iceberg in addressing the complexity of urban governance and cleanliness. In view of the above, item 40 was framed and the data was analysed in terms of educational qualification respondents.

Table 3.40
Item 40: Efficiency of locality cleaning by Dorbar Shnongs is satisfactory

Item : 40	M	SD	SED	t	Level of Significance
Illiterate	3.643	1.109			
vs.			0.341	1.022	NS
Up to HS	3.294	1.230			
Illiterate	3.643	1.109			
vs.			0.3093	0.799	NS
Graduate	3.396	1.111			
Illiterate	3.643	1.109			
vs.			0.357	0.773	NS
Post Graduate	3.367	1.173			
Up to HS	3.294	1.23			
vs.			0.124	0.821	NS
Graduate	3.396	1.111			
Up to HS	3.294	1.230			
vs.			0.1983	0.368	NS
Post Graduate	3.367	1.173			
Graduate	3.396	1.111			
vs.			0.1812	0.160	NS
Post Graduate	3.367	1.173			

It was found from the table 3.40 that the calculated 't' values of 1.022, 0.799, 0.773, 0.821, 0.368 and 0.160 between Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post graduate, High school vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate were less than the table value with df at 182, 199, 61,355,217 and 234 at .05 level of significance respectively. Hence, the 't' values of 1.022, 0.799, 0.773, 0.821, 0.368 and 0.160 Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post Graduate, High School vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate respectively were insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post Graduate , High School vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate on 'efficiency of locality cleaning by Dorbar Shnongs is satisfactory'. When compared with the mean item scores

of Illiterate respondents with that of High School, Graduate and Post Graduate respondents, it was found that the mean score of Illiterate respondents (M=3.643, SD=1.109) was higher than graduate respondents (M=3.396, SD=1.111), Post Graduate respondents (M=3.367, SD=1.173) and High School respondents (M=3.294, SD=1.230).

Local Dorbars Role in Solid Waste Management:

Solid waste management has many facets encompassing the hierarchical elements of source reduction, waste handling and separation, storage and processing at source, collection, transfer, transport and disposal. This whole process requires the cooperation and networking of both governmental as well as non-governmental bodies and most importantly the participation of the people themselves. This is where the role of the Dorbar Shnongs can be pivotal. The traditional institutions can serve as an important linkage between the different levels of governance for the implementation of various schemes and projects including the management of solid wastes. Whatever may be the shortcomings of the Dorbar shnongs, the acceptability by the general public is undisputed. In view of the above, item 41 was framed and the data was analysed in terms of educational qualification respondents.

Table 3.41

Item 41: Local Dorbars can play a major role in solid waste management

Item: 41	M	SD	SED	t	Level of Significance
Illiterate	4.429	0.821	0.252	1.209	NS
vs.					
Up to HS	4.124	0.909			
Illiterate	4.429	0.821	0.268	0.761	NS
vs.					
Graduate	4.225	0.972			
Illiterate	4.429	0.821	0.271	0.904	NS
vs.					
Post Graduate	4.184	0.896			
Up to HS	4.124	0.909	0.100	1.008	NS
vs.					
Graduate	4.225	0.972			
Up to HS	4.124	0.909	0.1476	0.407	NS
vs.					
Post Graduate	4.184	0.896			
Graduate	4.225	0.972	0.1542	0.266	NS
vs.					
Post Graduate	4.184	0.896			

It was found from the table 3.41 that the calculated 't' values of 1.209, 0.761, 0.904, 1.008, 0.407 and 0.266 between Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post Graduate, High School vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate were less than the table value with df at 182, 199, 61, 355, 217 and 234 at .05 level of significance respectively. Hence, the 't' values of 1.209, 0.761, 0.904, 1.008, 0.407 and 0.266 between Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post Graduate, High School vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate were insignificant at .05 level of significance respectively. It indicated that there existed no significant differences between the mean scores of Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post graduate, High School vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate on 'local Dorbars can play a major role in solid waste management'. When compared with the mean

item scores of Illiterate respondents with that of High School, Graduate and Post Graduate respondents, it was found that the mean score of Illiterate respondents (M=4.429, SD=0.821) was higher than Graduate respondents (M=4.225, SD=0.972), Post Graduate respondents (M=4.184, SD=0.896) and High School respondents (M=4.124, SD=0.909).

Polybag Campaigns by NGOs and Local Dorbars:

In recent years, due to mounting pressure from NGOs, Local Dorbars and other environmentalist groups, the Government has enacted several important legislations which are of public concern. However, in spite of these enactments nothing much is happening at the ground level. It is here that Community based organisations as well as other NGOs can play a vital role. If such groups sustained their efforts in creating awareness and sensitising the people, this will definitely yield positive results. There is a need for mass sensitisation and education on the various aspects of solid waste management. In view of the above, item 42 was framed and the responses from different educational groups were interpreted.

Table 3.42

Item 42: Polybag campaigns by NGOs and local Dorbars have significant effect on solid waste management

Item: 42	M	SD	SED	T	Level of Significance
Illiterate	3.214	1.567	0.309	0.735	NS
vs.					
Up to HS	3.441	1.057			
Illiterate	3.214	1.567	0.2994	1.483	NS
vs.					
Graduate	3.658	1.029			
Illiterate	3.214	1.567	0.3103	1.679	NS
vs.					
Post Graduate	3.735	0.777			
Up to HS	3.441	1.057	0.111	1.958	NS
vs.					
Graduate	3.658	1.029			
Up to HS	3.441	1.057	0.1631	1.803	NS
vs.					
Post Graduate	3.735	0.777			
Graduate	3.658	1.029	0.1583	0.486	NS
vs.					
Post Graduate	3.735	0.777			

It was found from the table 3.42 that the calculated 't' values of 0.735, 1.483, 1.679, 1.958, 1.803 and 0.486 between Illiterate vs High school, Illiterate vs Graduate, Illiterate vs Post Graduate, High School vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate were less than the table value with df at 182, 199, 61,355,217 and 234 at .05 level of significance respectively. Hence, the 't' values of 0.735, 1.483, 1.679, 1.958, 1.803 and 0.486 between Illiterate vs High school, Illiterate vs Graduate, Illiterate vs Post Graduate, High School vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate were insignificant at .05 level of significance respectively. It indicated that there existed no significant differences between the mean scores of Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post Graduate , High School vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate on 'polybag

campaigns by NGOs and local Dorbars have significant effect on solid waste management'. When compared with the mean item scores of post graduate respondents with that of illiterate, High school and graduate respondents, it was found that the mean score of post graduate respondents (M=3.735, SD=0.777) was higher than that of graduate respondents (M=3.658, SD=1.029), high school respondents (M=3.441, SD=1.057) and illiterate respondents (M=3.214, SD=1.567).

Local Dorbar Coordination with the Government and other Agencies:

The local dorbars due to its inherent nature has developed a love-hate relationship with the Government. There is always an element of distrust between the two. In most cases, local Dorbars looked upon the Government as imposing while the latter looked at the former as bodies that obstructs their initiative. The lack of sincerity and commitment on both parties and the absence of regular dialogues infringe the process of the delivery system. In one instance, when the Government offered the local dorbars transport vehicles for collection and disposal of garbage, there were no takers initially. The manner in which the proposal was made is viewed with a lot of suspicion. Instead of looking at the objective of the exercise, there is an apprehension of being marginalised by the other group. In view of the above, item 43 was framed and the data was analysed in terms of educational qualification respondents.

Table 3.43
Item 43: The Local Dorbar should work in close coordination with the Government and other agencies

Item: 43	M	SD	SED	t	Level of Significance
Illiterate	3.071	1.387			
vs.			0.332	0.671	NS
Up to HS	3.294	1.171			
Illiterate	3.071	1.387			
vs.			0.3511	0.330	NS
Graduate	3.187	1.251			
Illiterate	3.071	1.387			
vs.			0.3739	0.300	NS
Post Graduate	2.959	1.160			
Up to HS	3.294	1.171			
vs.			0.129	0.829	NS
Graduate	3.187	1.251			
Up to HS	3.294	1.171			
vs.			0.1903	1.760	NS
Post Graduate	2.959	1.160			
Graduate	3.187	1.251			
vs.			0.1987	1.147	NS
Post Graduate	2.959	1.160			

It was found from the table 3.43 that the calculated 't' values of 0.671, 0.330, 0.300, 0.829, 1.760 and 1.147 between Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post Graduate, High School vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate were less than the table value with df at 182, 199, 61, 355, 217 and 234 at .05 level of significance respectively. Hence, the 't' values of 0.671, 0.330, 0.300, 0.829, 1.760 and 1.147 between Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post Graduate, High School vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate respectively were insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post graduate, High School vs Graduate, High school vs Post graduate and Graduate vs Post graduate on the 'local Dorbar

should work in close coordination with the Government and other agencies'. When compared with the mean item scores of post graduate respondents with that of High School, Graduate and Illiterate respondents, it was found that the mean score of High School respondents (M=3.294, SD=1.171) was higher than that of Graduate respondents (M=3.187, SD=1.160), Illiterate respondents (M=3.071, SD=1.387) and Post Graduate respondents (M=2.959, SD=1.160).

Headman is the Appropriate Person to inform about the Problem of Solid Waste in the Locality:

It has always been the practice that any complaints whether verbal or written, are firstly addressed to the headman of the locality. Depending on the degree of the problem, the issue is looked after by the headman or the office bearers of the Dorbars. However, if the case cannot be rectified, the headman or the Dorbar normally takes the matter with the appropriate authority. In view of the above, item 44 was framed and the data was analysed in terms of educational qualification respondents.

Table 3.44

Item 44: The headman is the appropriate person to inform about the problem of solid waste in the locality

Item: 44	M	SD	SED	t	Level of Significance
Illiterate	3.714	1.623	0.322	0.668	NS
vs.					
Up to HS	3.929	1.104			
Illiterate	3.714	1.623	0.3142	0.824	NS
vs.					
Graduate	3.973	1.082			
Illiterate	3.714	1.623	0.3172	1.545	NS
vs.					
Post Graduate	4.204	0.782			
Up to HS	3.929	1.104	0.116	0.379	NS
vs.					
Graduate	3.973	1.082			
Up to HS	3.929	1.104	0.1695	1.622	NS
vs.					
Post Graduate	4.204	0.782			
Graduate	3.973	1.082	0.1655	1.396	NS
vs.					
Post Graduate	4.204	0.782			

It was found from the table 3.44 that the calculated 't' values of 0.668, 0.824, 1.545, 0.379, 1.622 and 1.396 between Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post Graduate, High School vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate were less than the table value with df at 182, 199, 61,355,217 and 234 at .05 level of significance respectively. Hence, the 't' values of 0.668, 0.824, 1.545, 0.379, 1.622 and 1.396 between Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post graduate, High school vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate were insignificant at .05 level of significance respectively. It indicated that there existed no significant differences between the mean scores of Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post Graduate, High School vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate on 'the headman

is the appropriate person to inform about the problem of solid waste in the locality'. When compared with the mean item scores of Post Graduate respondents with that of Illiterate, High School and Graduate respondents, it was found that the mean score of Post Graduate respondents respondents (M=4.204, SD=0.782) was higher than that of Graduate respondents (M=3.973, SD=1.082), High School (M=3.929, SD=1.104) and Illiterate respondents (M=3.714, SD=1.623).

A Forum at the Community Level to Manage Garbage Problems:

The Dorbar Shnongs as always has been looking at the welfare of the people in general on various aspects – from law and order to developmental activities. However, with chnaging times and situation, increase population and urbanisation, urban related problems are becoming more and more difficult to tackle owing to the complexities associated with them. The compartmentalisation of the functions of the Dorbar Shnongs on important activities is essential for proper and smooth functioning of the various schemes and projects. Prioritisation of important areas of public concern like pollution, sanitation and health should be foremost on the agenda. The proposal of the Government to initiate formation of Community Development societies (CDS) in consonance with other urban places in the country is a right step in this direction. These CDS can function within the jurisdiction of the Local Dorbars so that there will not be overapping of power. CDS can cater to specific needs of the community like undertaking waste management programmes and issues. In view of the above, item 45 was framed and the data was analysed in terms of educational qualification respondents.

Table 3.45

Item 45: A forum at the community level to manage garbage problems at the community level is necessary

Item: 45	M	SD	SED	t	Level of Significance
Illiterate	4.357	0.718	0.233	0.524	NS
vs.					
Up to HS	4.235	0.842			
Illiterate	4.357	0.718	0.2432	0.633	NS
vs.					
Graduate	4.203	0.884			
Illiterate	4.357	0.718	0.1925	0.052	NS
vs.					
Post Graduate	4.367	0.596			
Up to HS	4.235	0.842	0.092	0.349	NS
vs.					
Graduate	4.203	0.884			
Up to HS	4.235	0.842	0.1293	1.021	NS
vs.					
Post Graduate	4.367	0.596			
Graduate	4.203	0.884	0.1342	1.222	NS
vs.					
Post Graduate	4.367	0.596			

It was found from the table 3.45 that the calculated 't' values of 0.524, 0.633, 0.052, 0.349, 1.021 and 1.222 between Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post graduate, High School vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate were less than the table value with df at 182, 199, 61, 355, 217 and 234 at .05 level of significance respectively. Hence, the 't' values of 0.524, 0.633, 0.052, 0.349, 1.021 and 1.222 between Illiterate vs High school, Illiterate vs Graduate, Illiterate vs Post graduate, High School vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate respectively were insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post Graduate, High School vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate on 'a forum at the

community level to manage garbage problems at the community level is necessary'.When compared with the mean item scores of Post Graduate respondents with that of High School, Graduate and Illiterate respondents, it was found that the mean score of Post Graduate respondents (M=4.367, SD=0.596) was higher than that of Illiterate respondents (M=4.357, SD=0.718), High School (M=4.235, SD=0.842) and Graduate respondents (M=4.203, SD=0.884).

[PART D]

The present part is framed according to the fourth objective of the study which states to "to study the method of solid waste management with respect to disposal and utilization pattern by the Municipal Board".

The results obtained for this part have been analysed and interpreted item wise for the fourth objective of the study which has the following dimensions of Solid Waste Management system.

3.4 Analysis and Interpretation based on Objective-4

Municipal Board: Delivery System

All the results obtained from objective-4, i.e. 3.46 to 3.59 have been presented in the form of tables and interpretated subsequently after each table. In the tables, items have been placed according to its significance in a tabular form for easy reference.

Solid Waste Generated at Household Level Collected at Specific Intervals:

The Municipal authority is supposed to notify waste collection schedule and the likely method to be adopted for public benefit. Instant service delivery requires some drastic innovations in the way services were being provided to the citizens. It also meant coming out of the mindset of limiting the Municipality to providing routine services only but to develop a broader vision of the needs of the citizens. This meant not only cleaning the city but also adding the aesthetic values to it. Therefore item 46 was framed and the data obtained was interpreted from the different types of areas, viz. Slum, Commercial, Residential and Hospital areas.

Table 3.46
Item 46: Solid waste generated at household level is collected at specific intervals as fixed by Municipality

Item: 46	M	SD	SED	t	Level of Significance
Slum vs. Commercial	3.730 4.156	1.131 0.905	0.2529	1.684	NS
Slum Vs. Residential	3.730 3.941	1.131 1.082	0.1893	1.115	NS
Slum vs. Hospital	3.730 3.567	1.131 1.383	0.3118	0.523	NS
Commercial vs. Residential	4.156 3.941	0.905 1.082	0.1984	1.084	NS
Commercial vs. Hospital	4.156 3.567	0.905 1.383	0.300	1.963	NS
Residential vs. Hospital	3.941 3.567	1.082 1.383	0.2127	1.758	NS

It was found from the table 3.46 that the calculated 't' values of 1.684, 1.115, 0.523, 1.084, 1.963 and 1.758 between Slum vs Commercial, Slum vs Residential, Slum vs

Hospital, Commercial vs Residential, Commercial vs Hospital and Residential vs Hospital were less than the table value with df at 67, 356, 65, 351, 60 and 349 at .05 level of significance respectively. Hence the 't' values of 1.684, 1.115, 0.523, 1.084, 1.963 and 1.758 between Slum vs Commercial, Slum vs Residential, Slum vs Hospital, Commercial vs Residential, Commercial vs Hospital and Residential vs Hospital were insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of Slum vs Commercial on 'solid waste generated at household level is collected at specific intervals as fixed by Municipality'. When compared with the mean item scores of Slum area with that of Commercial, Residential and Hospital areas, it was found that the mean score of Commercial areas (M=4.156, SD=0.905) was higher than Residential areas (M=3.941, SD=1.082), Slum areas (M=3.730, SD=1.131) and Hospital areas (M=3.567, SD=1.383).

Services of the Municipal Truck for Disposal of Waste:

The transportation and disposal of solid waste should not be only the responsibility of the Municipality alone. As far as possible, civic services should be handled by the citizens themselves. Each tipper truck is supposed to cover specific wards but there is a mismatch between the collection and generation of waste. This is where supervision is needed. Loading the waste into trucks is slow and unhygienic. Waste is scattered around the collection point. Adjacent residents and shop keepers protest about the smell and appearance. If collection service is delayed, waste may not be collected for some time causing considerable nuisance. Collectors sound horn and waits at specific locations for residents to bring wastes to the collection vehicle. Within the Municipal area the

conservancy department of the Meghalaya Board is responsible for regular collection and disposal of waste. The entire job is done with a fleet of 10 trucks, 2 tractors, 257 road sweepers, 5 conservancy sweepers, 6 sanitary Inspectors and a Chief medical and Health officer. Out of the 10 trucks available, 4 trucks are more than 8 years old and needs to be replaced. Out of the 10 vehicles used for collection of garbage, 6 are tippers and 4 are lorries and with each trip, 5 number of helpers are deployed, as the garbage has to be manually removed and dumped at the dumping ground. Hence, instead of making two trips per day, each vehicle makes only one trip. The old trucks should be replaced with hydraulic tippers to reduce cost of collection and transportation. Therefore item 47 was framed and the data obtained was interpreted from the different types of areas, viz. Slum, Commercial, Residential and Hospital areas.

Table 3.47

Item 47: Do you use the services of the Municipal truck for disposal of waste

Item: 47	M	SD	SED	t	Level of Significance
Slum	3.622	1.281			
vs.			0.3596	0.425	NS
Commercial	3.469	1.658			
Slum	3.622	1.281			
Vs.			0.2662	0.162	NS
Residential	3.579	1.555			
Slum	3.622	1.281			
vs.			0.3581	3.320	5%
Hospital	2.433	1.606			
Commercial	3.469	1.658			
vs.			0.2909	0.378	NS
Residential	3.579	1.555			
Commercial	3.469	1.658			
vs.			0.422	2.456	5%
Hospital	2.433	1.606			
Residential	3.579	1.555			
vs.			0.2986	3.838	5%
Hospital	2.433	1.606			

It was found from the table 3.47 that the calculated 't' values of 0.425, 0.162 and 0.378 between Slum vs Commercial, Slum vs Residential and Commercial vs Residential were less than the table value with df at , 356 and 351 at .05 level of significance respectively. Hence the 't' values of 0.425, 0.162 and 0.378 between Slum vs Commercial, Slum vs Residential and Commercial vs Residential were insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of Slum vs Commercial, Slum vs Residential and Commercial vs Residential on 'the services of the Municipal trucks are efficiently used for disposal of waste'. Again it was revealed from the table 3.47 that the calculated 't' values of 3.320, 2.456 and 3.838 between Slum vs Hospital, Commercial vs Hospital and Residential vs Hospital areas of Shillong with df 65, 60 and 349 respectively are more than the table value at .05 level of significance. Hence the 't' values of 3.320, 2.456 and 3.838 were significant at .05 level of significance. It indicated that there existed significant differences between the mean scores of Slum vs Hospital, Commercial vs Hospital and Residential vs Hospital on 'the services of the Municipal trucks are efficiently used for disposal of waste'. When compared with the mean item scores of Slum areas, commercial areas, residential areas and Hospital areas, it was found that the mean item score of Slum areas (M=3.622, SD=1.281) was more than that of Residential areas (M=3.579, SD=1.555), Commercial areas (M=3.469, SD=1.658) and Hospital areas (M=2.433, SD=1.606).

Does the Municipality take Adequate Measures for Collection of Household Waste:

Collection of solid wastes in urban areas is difficult and complex because the generation of residential and commercial solid waste is a diffuse process that takes place in

every home, every apartment building, and every commercial and industrial facility as well as in the streets, parks, and even in the vacant areas of every community. As the generation patterns become more diffuse and the total quantity of waste increases, the logistic problems associated with collection becomes more complex. Although these problems have always existed to some degree, they have now become more critical because of the high cost of fuel and labour. Of the total amount spent for the collection, transportation and disposal of solid wastes, approximately 60%-80% is spent on the collection phase. This fact is important because a small percentage improvement in the collection operation can effect a significant saving in the overall cost. Unloading of the collection vehicle is also considered part of the collection operation. Therefore item 48 was framed and the data obtained was interpreted from the different types of areas, viz. Slum, Commercial, Residential and Hospital areas.

Table 3.48
Item 48: Does the municipality take adequate measures for collection of household waste

Item: 48	M	SD	SED	t	Level of Significance
Slum vs. Commercial	2.730 3.469	1.369 1.414	0.3405	2.170	5%
Slum Vs. Residential	2.730 3.436	1.369 1.465	0.2534	2.786	5%
Slum vs. Hospital	2.730 2.333	1.369 1.680	0.3782	1.050	NS
Commercial vs. Residential	3.469 3.436	1.414 1.465	0.2715	0.122	NS
Commercial vs. Hospital	3.469 2.333	1.414 1.680	0.400	2.840	5%
Residential vs. Hospital	3.436 2.333	1.465 1.680	0.2842	3.881	5%

It was found from the table 3.48 that the calculated 't' values of 2.170, 2.786, 2.840 and 3.881 between between Slum vs Commercial, Slum vs Residential and Commercial vs Hospital and Residential vs Hospital were more than the table value with df at 67, 356, 60 and 349 at .05 level of significance respectively. Hence the 't' values of 2.170, 2.786, 2.840 and 3.881 between Slum vs Commercial, Slum vs Residential and Commercial vs Hospital and Residential vs Hospital were significant at .05 level of significance. It indicated that there existed significant differences between the mean scores of Slum vs Commercial, Slum vs Residential and Commercial vs Hospital and Residential vs Hospital respondents of Shillong on 'the municipality take adequate measures for collection of household waste' Again it was found from the table 6.3 that the calculated 't' values of 1.050 and 0.122 between Slum vs Residential and Commercial vs Residential were less than the table value with df 356 and 351 respectively at .05 level of significance. It indicated that there existed no significant differences in the mean item scores of Slum vs Hospital and Commercial vs Residential respondents on 'the municipality take adequate measures for collection of household waste'. When compared with the mean item scores of Slum areas, commercial areas, residential areas and Hospital areas, it was found that the mean item score of Commercial areas (M=3.469, SD=1.414) was more than that of Residential areas (M=3.436, SD=1.465), Slum areas (M=2.730, SD=1.369) and Hospital areas (M=2.333, SD=1.680).

The Method of Disposal of Waste by Municipal Authority is Satisfactory:

Presently, solid waste collected is disposed into the gorges of the trenching ground situated at Mawlai on Shillong, Guwahati road. This system is highly unhygienic and

detrimental to the eco-system. Leacheates emanating from the dumping site finds its way to the nearby water body. To dump 100 MTS of urban waste daily, the Municipal need a one hectare of land every year. Open dumping pollutes air and sub-soil water heavily. The waste undergoes anaerobic composting producing offensive odours and fostering harmful pathogens. The dumping ground also becomes breeding centres for mosquitoes and other disease carrying vectors. Municipal workers and ragpickers have to work in unhygienic conditions. Recycling of the solid waste in an eco-friendly and economically sustainable way is the only solution to this public health problem. In Shillong enough and adequate area of land without human settlement around is not available for regular disposal, besides open dumping invites criticism and protest, hence a proper waste management process including safe collection, transportation, treatment, processing and safe disposal of refuses rejected from the process will have to be adopted. Therefore item 49 was framed and the data obtained was interpreted from the different types of areas, viz. Slum, Commercial, Residential and Hospital areas.

Table 3.49

Item 49: The method of disposal of waste by Municipal Authority is satisfactory

Item: 49	M	SD	SED	t	Level of Significance
Slum	3.568	1.264			
vs.			0.2733	1.237	NS
Commercial	3.906	0.914			
Slum	3.568	1.264			
Vs.			0.2274	0.840	NS
Residential	3.377	1.311			
Slum	3.568	1.264			
vs.			0.2975	1.348	NS
Hospital	3.167	1.098			
Commercial	3.906	0.914			
vs.			0.238	2.223	5%
Residential	3.377	1.311			
Commercial	3.906	0.914			
vs.			0.260	2.840	5%
Hospital	3.167	1.098			
Residential	3.377	1.311			
vs.			0.2478	0.847	NS
Hospital	3.167	1.098			

It was found from the table 3.49 that the calculated 't' values of 1.237, 0.840, 1.348 and 0.847 between Slum vs Commercial, Slum vs Residential, Slum vs Hospital, Residential vs Hospital areas were less than the table value with df at 67, 356, 65 and 349 respectively at .05 level of significance. Hence the 't' values of 1.237, 0.840, 1.348 and 0.847 were insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of Slum vs Commercial, Slum vs Residential, Slum vs Hospital and Residential vs Hospital areas of Shillong on 'the method of disposal of waste by Municipal Authority is satisfactory'. It was again found from the table 3.49 that the calculated 't' values of 2.223 and 2.840 between Commercial vs Residential and Commercial vs Hospital were more than the table value with df 351 and 60 at .05 level of significance. Hence, the 't' values of 2.223 and 2.840 were significant at .05 level of significance. It indicated that there existed significant differences between the

mean scores of Commercial vs Residential and Commercial vs Hospital areas of Shillong on 'the method of disposal of waste by Municipal Authority is satisfactory'. When compared with that of the mean item score of Commercial , Slum, Residential and Hospital areas of Shillong, it was found that the mean item score of Commercial areas (M=3.906, SD=0.914) was higher than that of Residential (M=3.377, SD=1.311), Slum areas (M=3.568, SD=1.264) and Hospital areas (M=3.167, SD=1.098).

Street Cleaning by Municipality:

Within the Municipal area the conservancy department of the Meghalaya Board is responsible for regular collection and disposal of waste. The entire job is done with a fleet of 10 trucks, 2 tractors, 257 road sweepers, 5 conservancy sweepers, 6 sanitary Inspectors and a Chief medical and Health officer. The main system of primary collection of waste is street cleaning. A number of sweepers are engaged in the localities with only a broom and the traditional conical basket for collection. In many cases, in the absence of dustbins, the wastes are being dumped into the nearest drain or stream. Traditional wheel barrows were also not provided. Therefore item 50 was framed and the data obtained was interpreted from the different types of areas, viz. Slum, Commercial, Residential and Hospital areas.

Table 3.50

Item 50: Efficiency of street cleaning by Municipality is satisfactory

Item: 50	M	SD	SED	t	Level of Significance
Slum	2.892	1.157	0.2715	1.665	NS
vs.					
Commercial	3.344	1.049			
Slum	2.892	1.157	0.3478	1.090	NS
Vs.					
Residential	3.271	2.073			
Slum	2.892	1.157	0.2993	0.251	NS
vs.					
Hospital	2.967	1.251			
Commercial	3.344	1.049	0.3722	0.196	NS
vs.					
Residential	3.271	2.073			
Commercial	3.344	1.049	0.297	1.268	NS
vs.					
Hospital	2.967	1.251			
Residential	3.271	2.073	0.386	0.788	NS
vs.					
Hospital	2.967	1.251			

It was found from the table 3.50 that the calculated 't' values of 1.665, 1.090, 0.251, 0.196, 1.268 and 0.788 between the respondents of slums vs Commercial, Slum vs Residential, Slum vs Hospital, Commercial vs Residential, Commercial vs Hospital and Residential vs Hospital were less than the table value with df at 67, 356, 65, 351, 60 and 349 respectively at .05 level of significance. It indicated that there existed no significant differences in the mean scores of Slum vs Commercial, Slum vs Residential, Slum vs Hospital, Commercial vs Residential, Commercial vs Hospital and Residential vs Hospital on 'efficiency of street cleaning by Municipality is satisfactory'. Hence the't' values of 1.665, 1.090, 0.251, 0.196, 1.268 and 0.788 were insignificant at .05 level of significance. When compared with the mean item scores of Slum, Commercial, Residential and Hospital areas, it was found that mean score of Commercial areas (M=3.344, SD=1.049) was higher

than that of Residential areas (M=3.271, SD=2.073), Hospital areas (M=2.967, SD=1.251) and Slum areas (M=2.892, SD=1.157).

Shillong Municipality should have a proper Sanitary Landfill:

Presently, the open dumping of waste is the most common method for solid waste disposal which causes problems of subsoil water contamination and pollution. A safe and well managed garbage placement is what distinguishes a controlled landfill from an open dump site. There is a dumping ground located nearly 8 Kms away from the town which is maintained by the Board. There is no data available to indicate as to what is the total cost of collection and disposal of solid waste. Sanitary landfilling involves proper planning and application of engineering principles and construction techniques. The three 'Cs' of sanitary landfilling are 'Confine, Compact and Cover'. Solid wastes are spread in thin layers compacting them to the smallest practical volume and covering them with soil at the end of each working day in a manner that protects the environment. Sanitary landfill not only prevents burning of garbage but helps in reclamation of land for valuable use. In North America, almost 80% of municipal solid waste goes into landfill. However, Japan and many western European countries have already moved away from landfilling as the primary method because of land scarcities and related environmental concerns. Sweden, Switzerland and Japan dispose of 15% of their waste in landfills, compared to 80% in North America. Instead, recycling and incineration are the primary methods. Therefore item 51 was framed and the data obtained was interpreted from the different types of areas, viz. Slum, Commercial, Residential and Hospital areas.

Table 3.51

Item 51: The Shillong municipality should have a proper sanitary landfill

Item: 51	M	SD	SED	t	Level of Significance
Slum vs. Commercial	3.297 4.188	1.292 0.982	0.2838	3.140	5%
Slum Vs. Residential	3.297 4.053	1.292 1.062	0.1894	3.992	5%
Slum vs. Hospital	3.297 4.233	1.292 1.116	0.3034	3.085	5%
Commercial vs. Residential	4.188 4.053	0.982 1.062	0.1961	0.688	NS
Commercial vs. Hospital	4.188 4.233	0.982 1.116	0.271	0.166	NS
Residential vs. Hospital	4.053 4.233	1.062 1.116	0.2042	0.881	NS

It was found from the table 3.51 that the calculated 't' values of 3.140,3.992 and 3.085 between respondents of Slum vs Commercial, Slum vs Residential and Slum vs Hospital were more than the table value with df at 67, 356 and 65 at .05 level of significance. Hence the 't' values of 3.140, 3.992 and 3.085 between respondents of Slum vs Commercial, Slum Vs Residential and Slum vs Hospital respondents were significant at .05 level of significance. It indicated that there existed significant differences between the mean scores of Slum vs Commercial, Slum vs Residential and Slum vs Hospital on 'the Shillong municipality should have a proper sanitary landfill'. Again it was found from the table 3.51 that the calculated 't' values of 0.688, 0.166 and 0.881 between respondents of commercial vs Residential, Commercial vs Hospital and Residential vs Hospital were less than the table value with df 351, 60 and 349 at .05 level of significance. Hence the 't' values of 0.668, 0.166 and 0.881 between respondents of Commercial vs Residential,

Commercial vs Hospital and Residential vs Hospital were insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of Commercial vs Residential, Commercial vs Hospital and Residential vs Hospital on 'the Shillong municipality should have a proper sanitary landfill'.. when compared with the mean item scores of respondents from the Slum, Commercial, Residential and Hospital areas of Shillong, it was found that the mean score of Hospital areas (M=4.233, SD=1.116) was higher than that of Commercial areas (M=4.188, SD=0.982), Residential areas (M=4.053, SD=1.062) and Slum areas (M=3.297, SD=1.292).

Construction of Incinerators by Municipality at Selected Sites:

Incineration is a controlled combustion process for burning combustible waste to gases and reducing it to a residue of non-combustible ingredients. Most incinerators are not used just to burn trash. The heat derived from the burning is converted into steam and electricity. Incinerators can drastically reduce the amount of municipal solid waste – upto 90 % by volume and 75 % by weight. Primary risks of incineration, however, involve air-quality problems and the toxicity and disposal of the ash. The cost and siting of new incinerators are also major concerns facing many communities. Incinerator construction is often a municipality's single largest bond issue. Critics have argued that cities and towns have impeded waste reduction and recycling efforts by putting a priority on incinerators and committing resources to them. Proponents of incineration have been known to oppose source reduction. They argue that incinerators need large amounts of municipal solid waste to operate and that reducing the amount of waste generated makes incineration impractical. Many communities that have opposed incineration say that they support a vigorous waste-

reduction and recycling effort. Therefore item 52 was framed and the data obtained was interpreted from the different types of areas, viz. Slum, Commercial, Residential and Hospital areas.

Table 3.52
Item 52: The construction of incinerators by Municipality at selected sites is necessary for disposal of waste

Item: 52	M	SD	SED	t	Level of Significance
Slum vs. Commercial	3.514 3.844	1.348 1.034	0.297	1.111	NS
Slum Vs. Residential	3.514 3.498	1.348 1.150	0.2041	0.078	NS
Slum vs. Hospital	3.514 2.967	1.348 1.197	0.3199	1.710	NS
Commercial vs. Residential	3.844 3.498	1.034 1.150	0.2119	1.633	NS
Commercial vs. Hospital	3.844 2.967	1.034 1.197	0.288	3.042	5%
Residential vs. Hospital	3.498 2.967	1.150 1.197	0.221	2.403	5%

It was found from the table 3.52 that the calculated 't' values of 1.111, 0.078, 1.710 and 1.633 between residents of Slum vs Commercial, Slum vs Residential, Slum vs Hospital and Commercial vs Residential were less than the table value with df at 67, 356, 65 and 351 at .05 level of significance. Hence the 't' values of 1.111, 0.078, 1.710 and 1.633 between residents of Slum vs Commercial, Slum vs Residential, Slum vs Hospital and commercial vs Residential were insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of Slum vs Commercial, Slum vs Residential, Slum vs Hospital and Commercial vs Residential on

'the construction of incinerators by Municipality at selected sites is necessary for disposal of waste'. Again the table 3.52 revealed that the calculated 't' values of 3.042 and 2.403 between residents of Commercial vs Hospital and Residential vs Hospital areas were more than the table value with df at 60 and 349 at .05 level of significance.Hence the 't' values of 3.042 and 2.403 between residents of Commercial vs Hospital and Residential vs Hospital were significant at .05 level of significance. It indicated that there existed significant differences between the mean scores of Commercial vs Hospital and Resifdential vs Hospital on 'the construction of incinerators by Municipality at selected sites is necessary for disposal of waste'. When compared with the mean item scores of residents of slum, commercial, residential and hospital areas of Shillong, it was found that the mean item score of Commercial areas (M=3.844, SD=1.034) was higher than that of Slum (M=3.514, SD=1.348), Residential areas (M=3.498, SD=1.150) and Hospital areas (M=2.967, SD=1.197).

Municipal should have a Common Bio-medical Waste Treatment Facility:

Bio-medical waste has been a growing concern because of recent awareness in public regarding HIV, AIDS and Hepatitis B and exposure to discarded needles, syringes and other medical waste from municipal garbage bins and disposal sites. At the garbage dump sites, ragpickers who are trying to salvage any discarded material to sell and make a living are exposed to the risk of injuries and contaminated needles. Improper practice of hospital medical waste disposal affects not only medical people who come in contact with waste but para-medical staff, labour staff, ragpickers and citizens at large. It is a financial burden to the Municipal administration and indirectly to the society. Proper waste disposal

practices lead to the reduction in medical expenditure, unsightly scenes at various communal disposal bins and dumpsites.Notification of 'bio-medical waste (Management and handling) Rules, 1998 by the Ministry of Environment and Forests, Govt. of India, incorporates comprehensive guidelines for selection of technologies and specifications apart from the rules and regulations to be followed. A common treatment facility for bio-medical waste has recently been established near Hyderabad in the private sector, which is perhaps the first such facility in the country. This facility is providing collection, transportation and treatment facility for bio-medical waste generated in the city. Therefore item 53 was framed and the data obtained was interpreted from the different types of areas, viz. Slum, Commercial, Residential and Hospital areas.

Table 3.53

Item 53: The municipal should have a common bio-medical waste treatment facility

Item: 53	M	SD	SED	t	Level of Significance
Slum vs. Commercial	2.865 3.313	1.166 1.102	0.279	1.609	NS
Slum Vs. Residential	2.865 3.408	1.166 1.178	0.205	2.650	5%
Slum vs. Hospital	2.865 3.500	1.166 0.992	0.272	2.332	5%
Commercial vs. Residential	3.313 3.408	1.102 1.178	0.218	0.436	NS
Commercial vs. Hospital	3.313 3.500	1.102 0.992	0.2713	0.689	NS
Residential vs. Hospital	3.408 3.500	1.178 0.992	0.2227	0.413	NS

It was found from the table 3.53 that the calculated 't' values of 1.609, 0.436, 0.689 and 0.413 between Slum vs Commercial, Commercial vs Residential, Commercial vs

Hospital and Residential vs Hospital were less than the table value with df at 67, 351, 60 and 349 at .05 level of significance. Hence the 't' values of 1.609, 0.436, 0.689 and 0.413 were insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of Slum vs Commercial, Commercial vs Residential, Commercial vs Hospital and Residential vs Hospital on 'the municipal should have a common bio-medical waste treatment facility'. Again it was revealed from the table 3.53 that the calculated 't' values of 2.650 and 2.332 between Slum vs Residential, Slum vs Hospital were more than the table value with df at 356 and 65 respectively at .05 level of significance. Hence, the 't' values of 2.650 and 2.332 were significant at .05 level of significance. It indicated that there existed significant difference between the mean scores of Slum vs Residential and Slum vs Hospital on 'the municipal should have a common bio-medical waste treatment facility'. When compared with the mean item scores of respondents of Slum areas with Commercial, Residential, Hospital areas, it was found that the mean item score of Hospital (M=3.500, SD=0.992) was higher than that of residential (M=3.408, SD=1.178), Commercial (M=3.313, SD=1.102) and Slum areas (M=2.865, SD=1.166)

Municipality should take proper Measures and Steps in Recycling Initiatives:

The Municipality has launched an eco-friendly technology for recycling of solid wastes generated in Shillong. The Shillong Municipal Board used Excels Technology for bio-conversion of solid waste into organic manure. M/s excels Industries Limited, Bombay, the pioneer in Agro Chemicals and Industrial Chemicals, have developed a cost effective technology for solid waste management. This indigenous technology developed

by Excel Industries Limited, Bombay is being adopted by many Municipal Corporations throughout India. The technology is basically for controlled bio conversion of city garbage into organic manure adopting an integrated approach involving (a) waste sanitation treatment at points of generation (b) Controlled aerobic composting and mechanical screening of digested compost to yield good quality organic manure useful for agriculture and horticultural crops. The project on one hand will solve the environmental problem due to solid waste and on the other hand will make available good quality organic manure, which alone can arrest the soil degradation due to indiscriminate use of chemical fertilizers and improper water management methods. Therefore item 54 was framed and the data obtained was interpreted from the different types of areas, viz. Slum, Commercial, Residential and Hospital areas.

Table 3.54

Item 54: Municipality should take proper measures and steps in recycling initiatives

Item: 54	Mean	SD	SED	t	Level of Significance
Slum	3.351	1.071			
vs.			0.246	2.768	5%
Commercial	4.031	0.918			
Slum	3.351	1.071			
Vs.			0.175	1.433	NS
Residential	3.601	0.994			
Slum	3.351	1.071			
vs.			0.262	1.588	NS
Hospital	3.767	1.023			
Commercial	4.031	0.918			
vs.			0.184	2.342	5%
Residential	3.601	0.994			
Commercial	4.031	0.918			
vs.			0.2506	1.053	NS
Hospital	3.767	1.023			
Residential	3.601	0.994			
vs.			0.1908	0.870	NS
Hospital	3.767	1.023			

It was found from the table 3.54 that the calculated 't' values of 2.768 and 1.588 between Slum vs Commercial and Commercial vs Residential were more than the table value with df at 67 and 351 respectively at .05 level of significance. Hence the 't' values of 2.768 and 1.588 were significant at .05 level of significance respectively. It indicated that there existed significant differences between the mean scores of Slum vs Commercial and commercial Vs Residential on 'Municipality should take proper measures and steps in recycling initiatives'. Again it was found from the table 3.54 that the calculated 't' values of 1.433, 1.588, 1.053 and 0.870 were less than the table value with df at 356, 65, 60 and 349 respectively at .05 level of significance. Hence the 't' values of 1.433, 1.588, 1.053 and 0.870 between Slum vs Residential, Slum vs Hospital, Commercial vs Hospital and residential vs Hospital were not significant at .05 level of significance respectively. It indicated that there existed insignificant difference between the mean scores of Slum vs residential, Slum vs Hospital, Commercial vs Hospital and Residential vs Hospital on 'Municipality should take proper measures and steps in recycling initiatives'. When compared with the mean item scores of Slum, Commercial, Hospital and Residential areas, it was found that the mean score of Commercial (M=4.031, SD=0.918) was higher than of Hospital (M=3.767, SD=1.023) Residential (M=3.601, SD=0.994) and Slum (M=3.351, SD=1.071) respondents of Shillong.

Non-Municipal Areas have no proper Mechanism of Waste Disposal:

An organization for solid waste management exists in the area under the Municipal Board. In the other townships no organization exists and its residents either compost their waste into pits or burn it. Sometimes they are also observed to throw their waste in the

nearest watercourse. A comparison between Municipal and non-municipal areas serves to highlight inherent strength of traditional knowledge systems in coping with waste generated in non-municipal areas but also outlines the scope for modern science and technology inputs. The population densities of greater Urban agglomeration is comparatively low compared to the Shillong Municipal area. Due to this , collection and transportation of waste in non-municipal area is not so much a pressing problem. Low overall volumes also do not necessitate institutional structures for its management. However, the existence of local traditional durbars has help to ameliorate the problems of waste disposal in non-municipal areas. It is observed that traditional practices of using wastes by way of fuel, animal feed and farm manure accounts for quite a sizeable of waste utilisation in non-municipal areas. The ever growing influences of urban characteristics in the fringes and non-municipal areas are slowly giving rise to new problems in the non-municipal areas. The traditional knowledge systems primarily evolved for non-municipal areas may not coped well with the increasing densified living conditions and associated need for basic infrastructure and management in these areas. Therefore item 55 was framed and the data obtained was interpreted from the different types of areas, viz. Slum, Commercial, Residential and Hospital areas.

Table 3.55

Item 55: Non-Municipal areas have no proper mechanism of waste disposal

Item: 55	M	SD	SED	T	Level of Significance
Slum	3.946	1.229			
vs.			0.345	0.386	NS
Commercial	3.813	1.590			
Slum	3.946	1.229			
Vs.			0.241	1.687	NS
Residential	3.539	1.403			
Slum	3.946	1.229			NS
vs.			0.330	0.264	
Hospital	4.033	1.426			
Commercial	3.813	1.59			
vs.			0.264	1.037	NS
Residential	3.539	1.403			
Commercial	3.813	1.590			
vs.			0.3908	0.563	NS
Hospital	4.033	1.426			
Residential	3.539	1.403			
vs.			0.269	1.836	NS
Hospital	4.033	1.426			

It was found from the table 3.55 that the calculated't' values of 0.386, 1.687, 0.264, 1.037, 0.563 and 1.836 between Slum vs Commercial, Slum vs Residential, Slum vs Hospital, Commercial vs Residential, Commercial vs Hospital and Residential vs Hospital areas were less than the table value with df 67, 356, 65, 351, 60 and 349 at .05 level of significance respectively. Hence the't' values of 0.386, 1.687, 0.264, 1.037, 0.563 and 1.836 were insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of Slum vs Commercial, Slum vs Residential, Slum vs Hospital, Commercial vs Residential, Commercial vs Hospital and Residential vs Hospital on 'non- Municipal areas have no proper mechanism of waste disposal'. When compared with the mean item scores of Slum areas with that of commercial, residential and hospital areas, it was found that the mean score of Hospital

areas (M=4.033, SD=1.426) was more than that of Slum areas (M=3.946, SD=1.229), Commercial areas (M=3.813, SD=1.590) and Residential areas (M=3.539, SD=1.403).

The Municipality has taken Adequate Initiative for Garbage Disposal in the Locality:

The routine and mechanical handling of solid waste by the Municipality suffered from a number of deficiencies such as institutional weakness, lack of strategic planning, shortage of financial and human resources, inefficient managerial practices, improper choice of technology and so on. The service levels were far from satisfactory. Solid waste management should be geared to bring in decentralisation with accountability. Management of information–for decision support, evolving methods to service and empower the citizens, bring about transparency in various activities through inculcating public awareness and civic participation to prevent outbreak of public health diseases. Therefore item 56 was framed and the data obtained was interpreted from the different types of areas, viz. Slum, Commercial, Residential and Hospital areas.

Table 3.56

Item 56: The Municipality has taken adequate initiative for garbage disposal in the locality

Item: 56	M	SD	SED	t	Level of Significance
Slum vs. Commercial	2.730 2.969	1.500 1.447	0.3615	0.661	NS
Slum Vs. Residential	2.730 3.283	1.500 1.201	0.2151	2.571	5%
Slum vs. Hospital	2.730 3.233	1.500 1.146	0.3375	1.490	NS
Commercial vs. Residential	2.969 3.283	1.447 1.201	0.2278	1.378	NS
Commercial vs. Hospital	2.969 3.233	1.447 1.146	0.338	0.780	NS
Residential vs. Hospital	3.283 3.233	1.201 1.146	0.2291	0.218	NS

It was found from the table 3.56 that the calculated 't' values of 0.661, 1.490, 1.378, 0.780 and 0.218 between Slum vs Commercial, Slum vs Hospital, Commercial vs Residential, Commercial vs Hospital and Residential vs Hospital were less than the table value with df at 67, 65, 351, 60 and 349 respectively at .05 level of significance. Hence the 't' values of 0.661, 1.490, 1.378, 0.780 and 0.218 were not significant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of Slum vs Commercail, Slum vs Hospital, Commercial vs Residential, Commercial vs Hospital and Residential vs Hospital areas of Shillong on 'the Municipality has taken adequate initiative for garbage disposal in the locality'. It was also revealed from the table 3.56 that the calculated't' value of 2.571 between Slum vs Residential was more than the table value with df 356 at .05 level of significance. Hence the 't' value of 2.571 was

significant at .05 level of significance. It indicated that there existed significant difference between the mean item score of Slum vs Residential areas of Shillong on 'the Municipality has taken adequate initiative for garbage disposal in the locality'. When compared with that of the mean item scores of Slum with Commercials, Residential and Hospital areas of Shillong, it was found that the mean item score of Residential (M=3.283, SD=1.201) was higher than that of Hospital (M=3.233, SD=1.146), Commercial (M=2.969, SD=1.447) and Slum (M=2.730, SD=1.500).

Response of Municipal Authority to Complaints about Waste Disposal:

Citizens have every right to lodge complaints with regard to the inadequacies of poor waste handling by the Municipality and corrective measures and action should be taken by the concerned authority. Provisions should be made where citizens can lodge complaints on pagers, complaints to be lodged manually or otherwise during office hours. A grievance officer should be appointed to deal with these complaints. An automated complaint and monitoring system should be developed where complainants will be able to lodge complaint using telephone and special codes. A complaint redressal system will respond accordingly by detailing action taken or to be taken. Therefore item 57 was framed and the data obtained was interpreted from the different types of areas, viz. Slum, Commercial, Residential and Hospital areas.

Table 3.57
Item 57: Response of Municipal Authority to complaints about waste disposal satisfactory

Item: 57	M	SD	SED	t	Level of Significance
Slum vs. Commercial	2.865 2.719	1.044 1.152	0.2684	0.544	NS
Slum Vs. Residential	2.865 2.953	1.044 1.226	0.2104	0.418	NS
Slum vs. Hospital	2.865 2.600	1.044 1.020	0.2577	1.028	NS
Commercial vs. Residential	2.719 2.953	1.152 1.226	0.2267	1.032	NS
Commercial vs. Hospital	2.719 2.600	1.152 1.020	0.282	0.423	NS
Residential vs. Hospital	2.953 2.600	1.226 1.020	0.2316	1.524	NS

It was found from the table 3.57 that the calculated 't' values of 0.544, 0.418, 1.028, 1.032, 0.423 and 1.524 between Slum vs Commercial, Slum vs Residential, Slum vs Hospital, Commercial vs Residential, Commercial vs Hospital and Residential vs Hospital were less than the table value with df 67, 356, 65, 351, 60 and 349 respectively at .05 level of significance.Hence the 't' values of 0.544, 0.418, 1.028, 1.032, 0.423 and 1.524 were insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of Slum vs Commercial, Slum vs Residential, Slum vs Hospital, Commercial vs Residential, Commercial vs Hospital and Residential vs Hospital areas of Shillong on 'response of Municipal Authority to complaints about waste disposal is satisfactory'. When compared with that of the mean item score of Commercial, Slum, Residential and Hospital areas of Shillong, it was found that the mean item score of

Residential areas (M=2.953, SD=1.226), was higher than that of Slum areas (M=2.865, SD=1.044), Commercial areas (M=2.719, SD=1.152) and Hospital areas (M=2.600, SD=1.020) of Shillong.

The Collection and Disposal of Solid Waste by Municipality in Slum Areas:

The emergence of slum in Shillong is mainly due to the accelerated high growth rate and unplanned physical development. There are 23 slum pockets identified within the Master Plan area with an estimate 76730 dwellers during 1991. All the slums cannot be construed under the same category and each of them has its own character. Unlike, in the plains the slums in shillong are less bleak of its societal structure, topographic advantage and absence of manufacturing units. The main problems faced by slum dwellers are lack of basic amenties such as approach lane, water supply, drainage, lighting and sanitary facilities, overcrowding, unliveable units, unemployment, deprivation of educational facilities and health contingencies. These features have compounded the collection, disposal and management of solid wastes in these areas. Therefore item 58 was framed and the data obtained was interpreted from the different types of areas, viz. Slum, Commercial, Residential and Hospital areas.

Table 3.58

Item 58: The collection and disposal of solid waste by Municipality in slum areas is more problematic

Item: 58	M	SD	SED	t	Level of Significance
Slum vs. Commercial	3.270 3.219	0.949 1.023	0.2411	0.212	NS
Slum Vs. Residential	3.270 3.458	0.949 1.127	0.1932	0.973	NS
Slum vs. Hospital	3.270 3.100	0.949 1.075	0.2513	0.676	NS
Commercial vs. Residential	3.219 3.458	1.023 1.127	0.2078	1.150	NS
Commercial vs. Hospital	3.219 3.100	1.023 1.075	0.271	0.439	NS
Residential vs. Hospital	3.458 3.100	1.127 1.075	0.2149	1.666	NS

It was found from the table 3.58 that the calculated 't' values of 0.212, 0.973, 0.676, 1.150, 0.439 and 1.666 between Slum vs Commercial, Slum vs Residential, Slum vs Hospital, Commercial vs Residential, Commercial vs Hospital and Residential vs Hospital area were less than the table value with df at 67, 356, 65, 351, 60 and 349 at .05 level of significance respectively. Hence the 't' values of 0.212, 0.973, 0.676, 1.150, 0.439 and 1.666 were insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of Slum vs Commercial, Slum vs Residence, Slum vs hospital, Commercial vs Residential, Commercial vs Hospital and Residential vs Hospital on 'the collection and disposal of solid waste by Municipality in slum areas is more problematic'. When compared with the mean item scores of slum areas with commercial, residential and hospital areas, it was found that the mean item score of

residential areas (M=3.458, SD1.127) was more than that of Slum areas (M=3.270, SD=0.949), Commercial areas (M=3.219, SD=1.023) and Hospital areas (M=3.100, SD=1.075).

The Shillong Municipality do not have Adequate Provision for Ensuring Appropriate Solid Waste Management:

Solid Waste Management is one of the essential obligatory functions of the urban local bodies in India. Local bodies in the country are governed by various laws enacted by their respective legislatures. The Shillong Municipality do not have adequate provision for ensuring appropriate Solid Waste Management systems with the result outdated systems continue affecting the quality of life of the people. The service is falling too short of the desired level of efficiency and satisfaction resulting in problems of health, sanitation and environmental degradation. Due to lack of serious efforts, garbage and its management has become a tenacious problem and this notwithstanding the fact that the largest part of Municipal expenditure is allotted to it. The Municipality should be equipped with adequate expertise and experience. The local body as a policy should provide adequate training to the staff in Solid Waste Management services and arrange for short term and refresher courses for updating the knowledge of the supervisory staff to maintain the high standard of service. The welfare of the staff engaged in handling of SW need to be given adequate protection and health care facilities. The local body should draw up a citizens charter and create a system to register public grievances in all the wards and set up a mechanism for expeditious redressal of grievances through decentralized municipal administration. While all efforts may be made to build awareness among the community for public participation

in Solid Waste Management services, a mechanism for enforcement should be simultaneously created to discipline the citizens who do not adhere to the directions of the urban local body. Therefore item 59 was framed and the data obtained was interpreted from the different types of areas, viz. Slum, Commercial, Residential and Hospital areas.

Table 3.59
Item 59: The Shillong Municipality do not have adequate provision for ensuring appropriate solid waste management

Item: 59	M	SD	SED	t	Level of Significance
Slum vs. Commercial	4.000 3.563	1.040 0.998	0.2501	1.747	NS
Slum Vs. Residential	4.000 3.439	1.040 1.121	0.1938	2.895	5%
Slum vs. Hospital	4.000 2.767	1.040 1.174	0.2749	4.485	5%
Commercial vs. Residential	3.563 3.439	0.998 1.121	0.2064	0.601	NS
Commercial vs. Hospital	3.563 2.767	0.998 1.174	0.281	2.836	5%
Residential vs. Hospital	3.439 2.767	1.121 1.174	0.2155	3.118	5%

It was found from the table 3.59 that the calculated 't' values of 2.895, 4.485, 2.836 and 3.118 between Slum vs Residential, Slum vs Hospital, Commercial vs Hospital and Residential vs Hospital were more then the table value with df at 356, 65, 60 and 349 respectively at .05 level of significance. Hence the 't' values of 2.895, 4.485, 2.836 and 3.118 were significant at .05 level of significance. It indicated that there existed significant differences between the mean scores of Slum vs Residential, Slum vs Hospital, Commercial vs Hospital and Residential vs Hospital areas of Shillong on 'the timing of

collection by Municipality is appropriate for the locality'. It was also found from the table 3.59 that the calculated 't' values of 1.747 and 0.601 between Slum vs Commercial and commercial vs Residential were less than the table value with df 67 and 351 respectively at .05 level of significance. Hence the 't' values of 1.747 and 0.601 were insignificant at .05 level of significance. It indicated that there existed significant differences between the mean scores of Slum vs Commercial and Commercial vs Residential areas of Shillong on 'the Shillong Municipality do not have adequate provision for ensuring appropriate Solid Waste Management'. When compared with that of the mean item scores of Slum, Commercial, Residential and Hospital areas, it was found that the mean item score of Slum areas (M=4.00, SD=1.040) was more than that of Commercial areas (M=3.563, SD=0.998) residential areas (M=3.439, SD=1.121) and Hospital areas (M=2.767, SD=1.174) respondents of Shillong.

[PART E]

The present part is framed according to the fifth objective of the study which states to "to study the existing strictures, rules, and regulations, environmental planning, coordination, IEC components and other institutional arrangements for solid waste management at the Governmental level.

The results obtained for this part have been analysed and interpreted item wise for the fifth objective of the study which has the following dimensions of Solid Waste Management system.

3.5 Analysis and Interpretation based on Objective-5

Government: Strictures, Rules, Regulations, Legislations and Existing Infrastructural Facilities

All the results obtained from objective-5, i.e. 3.60 to 3.68 have been presented in the form of tables and interpretated subsequently after each table. In the tables, items have been placed according to its significance in a tabular form for easy reference.

Strictures, Rules and Regulations of the Government with regard to Solid Waste Management is Appreciable:

Public laws concerning solid waste are passed to improve solid waste management. Improvements are generally needed when solid waste disposal activity causes problems in public health, the environment and economics. Legislation also impacts many professions involved in solid waste management. The Government may have good intentions, however, the force of law is generally not followed as per the expectations of the people. Policies and rules are framed by following the top-down approach leaving the public out of the purview. The participatory approach for planning and policy framing will be successful only if the articulation of the general public commensurate with the expertise and proper vision of policy makers, planners and administrators. With this concern, item 60 was framed and analysed according to the sex and age group of the respondents.

Table 3.60

Item 60: Strictures, rules and regulations of the government with regard to solid waste management is appreciable

Item: 60	M	SD	SED	t	Level of Significance
Male vs. Female	3.190 3.497	1.315 1.260	0.1263	2.431	5%
Less than 35 yrs vs. 35-55 yrs	3.492 3.241	1.232 1.362	0.1342	1.870	NS
Less than 35 yrs vs. > 55 yrs	3.492 3.095	1.232 1.191	0.210	1.887	NS
35-55 yrs vs. > 55 yrs	3.241 3.095	1.362 1.191	0.228	0.641	NS

It was found from the table 3.60 that the calculated 't' value of 2.431 between Male vs Female respondents was more than the table value with df at 418 at .05 level of significance. Hence, the 't' value of 3.973 was significant at .05 level of significance. It indicated that there existed significant difference between the mean scores of Male vs Female respondents on "Strictures, rules and regulations of the Government with regard to solid waste management is appreciable". Comparison between mean item scores reveal than the mean item score of female respondents (M=3.497, SD=1.260) was higher than that of male respondents (M=3.190, SD=1.315).

It was found from the table 3.60 that the calculated 't' values of 1.870, 1.887 and 0.641 between respondents of less than 35 years vs 35-55 years, less than 35 years vs above 55 years and 35-55 years vs above 55 years were less than the table value with df at 223, 235 and 376 respectively at .05 level of significance. It indicated that there existed no significant differences between the mean scores of less than 35 years vs 35-55 years, less than 35 years vs above 55 years and 35-55 years vs above 55 years on "Stricture, rules and regulations of the Government with regard to solid waste management is appreciable". It

indicated that there existed insignificant differences in the mean scores of respondents of all the three groups on "strictures, rules and regulations of the Government with regard to solid waste management is appreciable". When compared with the mean item scores of respondents of less than 35 years, 35-55 years and above than 55 years, it was found from the mean item score of respondents of all the three age groups that mean score of respondents of less than 35 years (M=3.492, SD=1.232) was higher than that of 35-55 years (M=3.241, SD=1.362) and greater than 55 years (M=3.095, SD=1.191) respondents.

Strictures, Rules and Regulations of the Government with regard to Solid Waste Management is strictly Enforced:

The government has been soft-pedalling with whatever that has been intended. The Meghalaya Waste Management (solid and liquid) Rules and Regulation Act, The Meghalaya Pollution Control Act, The Meghalaya Prohibition of manufacturer, Sale, Use and throwing of Low Density Bags Act 2001' (Act 4 of 2001) clearly states that any person, organisation and agencies who contravenes with the provision under different sections of the Act shall be punishable under the law. Besides the Meghalaya has prescribed the Authority of the concerned Districts for enforcement of the provision of the Act. All these has Acts never been strictly enforced. With the above explanation item 61 was framed and analysed according to the sex and age group of the respondents.

Table 3.61

Item 61: Strictures, rules and regulations of the government with regard to solid waste management is strictly enforced

Item: 61	M	SD	SED	t	Level of Significance
Male	2.742	1.219			
vs.			0.1168	3.973	5%
Female	3.206	1.162			
Less than 35 yrs	3.098	1.211			
vs.			0.1246	2.223	5%
35-55 yrs	2.821	1.204			
Less than 35 yrs	3.098	1.211			
vs.			0.208	0.356	NS
> 55 yrs	3.024	1.205			
35-55 yrs	2.821	1.204			
vs.			0.206	0.987	NS
> 55 yrs	3.024	1.205			

It was found from the table 3.61 that the calculated 't' value of 3.973 between Male vs Female respondents was more than the table value with df at 418 at .05 level of significance. Hence, the 't' value of 3.973 was significant at .05 level of significance. It indicated that there existed significant difference between the mean scores of Male vs Female respondents on 'strictures, rules and regulations of the Government with regard to solid waste management is strictly enforced'. The comparison of mean score items revealed that the mean item score of female respondents (M=3.206, SD=1.162) was higher than that of male respondents (M=2.742, SD=1.219).

It was found from the table 3.61 that the calculated 't' values of 0.356 and 0.987 between respondents of less than 35 years vs above 55 years and less than 35-55 years vs above 55 years were less less than the table value with df at 223 and 235 respectively at .05 level of significance. It indicated that there existed no significant differences between the mean scores of less than 35 years vs above 55 years and less than 35-55 years vs above 55 years on "stricture, rules and regulations of the Government with regard to solid waste

management is strictly enforced". Again it was revealed from the table 3.61 that the calculated 't' value of 2.223 between respondents of less than 35 years vs 35-55 years was more than the table value with df 376 at .o5 level of significance. Hence the 't' value of 2.223 was insignificant at .05 level of significance. It indicated that there existed significant differences in the mean scores of respondents of less than 35 years vs 35 – 55 years respondents on 'Strictures, rules and regulations of the Government with regard to solid waste management is strictly enforced'. When compared with the mean item scores of respondents of less than 35 years, 35-55 years and above than 55 years, it was found that the mean item score of respondents of less than 35 years (M=3.098, SD=1.211) was more than respondents of above 55 years (M=3.024, SD=1.205) and respondents of 35-55 years (M=2.821, SD=1.204).

People should be penalized for Violating Government Rules and Norms with regard to Solid Waste:

Penalty and fines does not seem to work as anticipated. To a certain extent it may be effective but compliance to such actions does not yield positive results in the long run. In much advanced countries where the perception level is much higher, this may act as a deterrent to violators. However, in a place where awareness level is comparatively lower and understanding about the total environment is minimal, the force of law even if applicable does not hold water. Therefore item 62 was framed and analysed on the basis of sex and age group of the respondents.

Table 3.62

Item 62: People should be penalized for violating government rules and norms with regard to solid waste

Item: 62	M	SD	SED	t	Level of Significance
Male	4.086	0.959			
vs.			0.0974	2.485	5%
Female	3.844	1.033			
Less than 35 yrs	3.984	1.021			
vs.			0.1038	0.145	NS
35-55 yrs	3.969	0.992			
Less than 35 yrs	3.984	1.021			
vs.			0.174	0.317	NS
> 55 yrs	3.929	0.961			
35-55 yrs	3.969	0.992			
vs.			0.169	0.237	NS
> 55 yrs	3.929	0.961			

It was found from the table 3.62 that the calculated 't' value of 2.485 between Male vs Female respondents was more than the table value with df at 418 at .05 level of significance. Hence, the 't' value of 2.485 was significant at .05 level of significance. It indicated that there existed significant difference between the mean scores of male vs Female respondents on 'people should be penalized for violating Government rules and norms with regard to solid waste'. The comparison of mean score item values between Male and Female respondents revealed that the mean score of Male respondents (M=4.086, SD=0.959) was higher thanof Female respondents (M=3.844, SD=1.033).

It was found from the table 3.62 that the calculated 't' values of 0.145,0.317 and 0.237 between respondents of less than 35 years vs 35-55 years, less than 35 years vs above 55 years and 35-55 years vs above 55 years were less than the table value with df at 376, 223 and 235 respectively at .05 level of significance. Hence, the 't' values of 0.145, 0.317 and 0.237 were insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of respondents less than 35

years vs 35-55 years, less than 35 years vs above 55 years and 35-55 years vs above 55 years on "people should be penalized for violating Government rules and norms with regard to solid waste".

Banning of Plastic Bags by the Government is Appreciable:

In most cases, solid waste management legislation has not been written to affect manufacturers. In our consumption-oriented society the manufacturer produces saleable goods, leaving the disposal of unwanted, unused, or partly consumed goods and associated packaging to the ingenuity of the solid waste management practioner. The Meghalaya Prohibition of manufacturer, Sale, Use and throwing of Low Density Bags Act 2001' (Act 4 of 2001) came into force from 23rd April 2002. It clearly states that no person shall (a) Manufacture bags made of low density plastic, the thickness of which is less than 20 microns (b) Sell or use of bags or containers made of such low density plastic for storing, carrying, dispensing or packing of food stuff and other articles (c) Throw or discard low density plastic bags in public places including roads, drains and paths. Although the government should be appreciated for this enactment, the truth of the matter is that traders and business establishments are still selling and supplying, the general public still insist on low density plastic bags from shop owners and indiscriminate throwing of plastic bags is still widespread. With the above arguments, item 63 was framed and analysed according to the sex and age group of the respondents.

Table 3.63

Item 63: Banning of plastic bags by the government is appreciable

Item: 63	M	SD	SED	t	Level of Significance
Male	4.190	1.076			
vs.			0.1087	1.288	NS
Female	4.050	1.146			
Less than 35 yrs	4.235	1.011			
vs.			0.1142	1.471	NS
35-55 yrs	4.067	1.190			
Less than 35 yrs	4.235	1.011			
vs.			0.177	1.864	NS
> 55 yrs	3.905	1.109			
35-55 yrs	4.067	1.190			
vs.			0.201	0.806	NS
> 55 yrs	3.905	1.109			

It was found from the table 3.63A that the calculated 't' value of 1.288 between Male vs Female respondents was less than the table value with df 418 at .05 level of significance. Hence the't' value of 1.288 between Male vs Female respondents was insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean score of male vs female respondents on 'banning of plastic bags by the Government is appreciable'. When compared with the mean item scores of male with that of Female, it was found that the mean score of Male (M=4.190,SD=1.076) was higher than that of female (M=4.050,SD=1.146).

Again it was found from the table 3.63 that the calculated 't' values of 1.471, 1.864 and 0.806 between respondents of less than 35 years vs 35-55 years, less than 35 years vs above 55 years and 35-55 years vs above 55 years were less than the table value with df at 376, 223 and 235 at .05 level of significance respectively. Hence the 't' values of 1.471, 1.864 and 0.806 between respondents of all the above mentioned groups were insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of all the above mentioned groups on "banning of plastic bags by

the government is appreciable". When compared with the mean item scores of respondents less than 35 years, 35-55 years and above 55 years, it was found that the mean item scores of respondents of less than 35 years of age (M=4.235, SD=1.011) was higher than that of respondents in the age group of 35-55 years (M=4.067, SD=1.190) and respondents above the age group of above 55 years (M=3.905, SD=1.109).

Government Solid Waste Management Plans is in accordance with its Priorities for *the Environment:*

The City of Shillong which was more than a century ago selected as the sanatorium during the British period has now lost its past glory. The greenery, clean water bodies and salubrious climate coupled with the warm hospitality of the people has brought Shillong into the limelight. However, in the past two decades, the City of Shillong experienced an unprecedented growth both vertically and horizontally. Migration and urbanisation has led to further deterioration of the city environment. The present and past Governments have done little to improve the city environment. Urban town planning and urban local governance lacks the foresight to match the growth of Shillong with providing the basic amenties to the general public. Waste generation has increased manifold but provision of basic community services remains almost the same. The Government solid waste management plans, no doubt, is praiseworthy but the mismatch between the projections for improving the quality of the environment does not coincide with the ground reality. The government should develop a solid waste management plan in accordance with its priorities for the environment and the ability of state residents to contribute to the costs of

management. With the above explanations, item 64 was framed and analysed according to the sex and age group of the respondents.

Table 3.64
Item 64: Government solid waste management plans is in accordance with its priorities for the environment

Item: 64	M	SD	SED	t	Level of Significance
Male	3.376	1.355			
vs.			0.133	0.406	NS
Female	3.322	1.351			
Less than 35 yrs	3.464	1.354			
vs.			0.1379	0.950	NS
35-55 yrs	3.333	1.319			
Less than 35 yrs	3.464	1.354			
vs.			0.235	2.277	5%
> 55 yrs	2.929	1.421			
35-55 yrs	3.333	1.319			
vs.			0.229	1.764	NS
> 55 yrs	2.929	1.421			

It was found from the table 3.64 that the calculated 't' value of 0.406 between Male vs Female respondents was less than the table value with df 418 at .05 level of significance. Hence the 't' value of 0.406 between Male vs Female respondents was insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean score of Male vs Female respondents on 'government Solid waste management plan is in accordance with its priorities for the environment'. When compared with the mean item scores of Male with that of Female respondents, it was found that the mean score of Male (M=3.376, SD=1.355) was higher than that of Female (M=3.322, SD=1.351).

Again it was found from the table 3.64 that the calculated 't' value of 2.277 between respondents of less than 35 years vs above 55 years was more than the table value with df 223 at .05 level of significance respectively. Hence the 't' value of 2.277 between

respondents of less than 35 years vs above 55 years was significant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of respondents of less than 35 years vs 35-55 years and 35-55 years vs above 55 respondents on 'government Solid waste management plans is in accordance with its priorities for the environment'. Again it was found from the table 3.64 that the calculated 't' values of 0.950 and 1.764 with df 376 and 235 were less than the table value at .05 level of significance respectively. Hence the 't' values of 0.950 and 1.764 between respondents of less than 35 years vs 35-55 years and 35-55 years vs above 55 years were insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of respondents less than 35 years vs 35-55 years and 35-55 years vs above 55 years on 'government solid waste management plans is in accordance with its priorities for the environment'. When compared with the mean item scores of respondents less than 35 years, 35-55 years and above 55 years, it was found that the mean item scores of respondents of less than 35 years of age (M=3.464, SD=1.354) was higher than that of respondents in the age group of 35-55 years (M=3.333, SD=1.319) and respondents above the age group of 55 years (M=2.929, SD=1.421).

There is lack of Clear-cut Coordination among different Departments of the Government in Solid Waste Management:

The various laws, regulations, and executive orders have created a divided responsibility among the different line departments of the government. The absence of collective responsibility handicaps the smooth implementation of the defined goals and objectives of the government. Each state in India has a unique structure of agencies to

implement and control solid waste functions. The Shillong Municipal Board alone has been thrust upon to take up solid waste management. The question is whether the Board has the administrative structure, adequate staff and financial health for constructive action and enforced regulations. If solid waste management is not taken up as a priority area and if different line departments of the government do not assist the Municipality, the success of any exercise will not be according to expectations. The Public works Department, the Pollution Control Board, the Meghalaya Urban Development agency (MUDA), the Health Department as well as the District administration should have a close networking and coordination for smooth implementation of solid waste management functions. With the above explanation, item 65 was framed and was analysed according to the Sex and Age group of the respondents.

Table 3.65

Item 65: There is lack of clear-cut coordination among different departments of the government in solid waste management

Item: 65	M	SD	SED	t	Level of Significance
Male	3.081	1.158			
vs.			0.116	1.552	NS
Female	3.261	1.216			
Less than 35 yrs	3.344	1.124			
vs.			0.1202	2.687	5%
35-55 yrs	3.021	1.202			
Less than 35 yrs	3.344	1.124			
vs.			0.199	1.372	NS
> 55 yrs	3.071	1.298			
35-55 yrs	3.021	1.202			
vs.			0.208	0.240	NS
> 55 yrs	3.071	1.298			

It was found from the table 3.65 that the calculated 't' value of 1.552 between Male vs Female respondents was less than the table value with df at .05 level of significance. Hence, the 't' value of 1.552 was insignificant at .05 level of significance. It indicated that

there existed no significant difference between the mean scores of Male vs Female respondents on 'There is lack of clear-cut coordination among different departments of the Government in solid waste management'.

It was found from the table 3.65 that the calculated 't' values of 1.372 and 0.240 between respondents of less than 35 years vs above 55 years and 33-55 years vs above 55 years were less less than the table value with df 223 and 235 respectively at .05 level of significance. Hence, the 't' value of 1.372 and 0.240 were insignificant at .05 level of significance. It indicated that there existed no significant difference between the mean scores of respondents 35 years vs above 55 years and of 33-55 years vs above 55 years Again it was found from the table 3.65 that the calculated 't' value of 2.687 between respondents of less than 35 years vs respondents between 35-55 years was more than the table value with df 376 at .o5 level of significance. Hence the 't' value of 2.687 was significant at .05 level of significance. It indicated that there existed significant difference in the mean scores of respondents of less than 35 years vs respondents between 35 – 55 years of age on 'There is lack of clear-cut coordination among different departments of the Government in solid waste management'. When compared with the mean item scores of respondents of less than 35 years, 35-55 years and above than 55 years, it was found that the mean item score of respondents of less than 35 years (M=3.344, SD=1.124) was higher than respondents of more than 55 years (M=3.071, SD=1.298) and respondents of 35-55 years (M=3.021, SD=1.202).

Government should Educate, Train and Create Awareness on Solid Waste Management:

The State Government has the responsibility to develop appropriate information, education and communication material (IEC) according to the local needs and take up state-wide awareness campaign and help the urban local bodies to build public awareness in the city and promote the principle of 'Reduce, Reuse and Recycle'. Public awareness is an important activity in Solid Waste Management to keep the system sustainable. It is possible to make Solid Waste Management Plan a people's programme by launching comprehensive IEC activities, Audio and Video program, Child education and school education. Print and electronic media can play a vital role in creating awareness and educating the public. News releases, films and films can help develop public awareness and aid in approval of solid waste management plans, policies and programs. Training for Solid Waste Management staff at all levels is also essential. Partnership role for public awareness with NGOs and CBOs is another way of building up collective responsibility. With the above explanation, item 66 was framed and was analysed according to the Sex and Age group of the respondents.

Table 3.66

Item 66: Government should educate, train and create awareness on solid waste management:

Item: 66	M	SD	SED	t	Level of Significance
Male	3.615	0.989			
vs.			0.102	1.049	NS
Female	3.508	1.102			
Less than 35 yrs	3.699	0.993			
vs.			0.1041	1.691	NS
35-55 yrs	3.523	1.024			
Less than 35 yrs	3.699	0.993			
vs.			0.179	2.972	5%
> 55 yrs	3.167	1.233			
35-55 yrs	3.523	1.024			
vs.			0.182	1.956	NS
> 55 yrs	3.167	1.233			

It was found from the table 3.66 that the calculated 't' value of 1.049 between Male vs Female respondents was less than the table value with df 418 at .05 level of significance. Hence, the 't' value of 1.049 was insignificant at .05 level of significance. It indicated that there existed no significant difference between the mean scores of Male vs Female respondents on 'Government should educate, train and create awareness on solid waste management'.

It was found from the table 3.66 that the calculated 't' values of 1.691 and 1.956 between respondents of less than 35 years vs 35-55 years and 33-55 years vs above 55 years were less less than the table value with df 376 and 235 respectively at .05 level of significance. Hence, the 't' values of 1.691 and 1.956 were insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of respondents of less than 35 years vs 35-55 years and 33-55 years vs above 55 years on "Government should educate, train and create awareness on solid waste management". Again it was found from the table 3.66 that the calculated 't' value of 2.972 between respondents of less than 35 years vs respondents above 55 years was more than the table value with df 223 at .o5 level of significance. Hence the 't' value of 2.972 was significant at .05 level of significance. It indicated that there existed significant difference in the mean scores of respondents of less than 35 years vs above 55 years of age on 'Government should educate, train and create awareness on solid waste management'. When compared with the mean item scores of respondents of less than 35 years, 35-55 years and above 55 years, it was found that the mean item score of respondents of less than 35 years (M=3.699, SD=0.993) was higher than respondents of 35-55 years (M=3.523, SD=1.024) and respondents of above 55 years (M=3.167, SD=1.233).

Privatization not a Priority of the Government with regard to Solid Waste Management:

Deficiencies in infrastructure and basic amenities with decline in investment and financial support has not made the Government to work for alternative institutional arrangements. Private sector participation in management of Municipal solid waste is crucial. In many states in India, different forms of participation have been designed with varying levels of responsibility and cost sharing between private and public agencies. The most common form is contracting out management of one or a set of services by the municipal bodies to private companies. This is expected substantially to reduce the costs incurred by local authorities and, at the same time, open up business opportunities for the private sector. A crucial concern for the Government is to ensure that subcontracting does not lead to the dilution of social responsibility and exclusion of the poor and vulnerable sections from the formal delivery system. With the above explanations, item 67 was framed and was analysed according to the Sex and Age group of the respondents.

Table 3.67
Item 67: Privatization not a priority of the Government with regard to solid waste management

Item: 67	M	SD	SED	t	Level of Significance
Male	3.611	1.139			
vs.			0.105	0.028	NS
Female	3.608	1.001			
Less than 35 yrs	3.590	1.020			
vs.			0.1092	0.513	NS
35-55 yrs	3.646	1.092			
Less than 35 yrs	3.590	1.020			
vs.			0.182	0.362	NS
> 55 yrs	3.524	1.220			
35-55 yrs	3.646	1.092			
vs.			0.191	0.640	NS
> 55 yrs	3.524	1.220			

It was found from the table 3.67 that the calculated 't' value of 0.028 between Male vs Female respondents was less than the table value with df 418 at .05 level of significance. Hence the 't' value of 0.028 between Male vs Female respondents was insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean score of Male vs Female respondents on 'Privatization not a priority of the Government with regard to solid waste management'.When compared with the mean item scores of Male with that of Female, it was found that the mean score of Male (M=3.611, SD=1.139) was higher than that of Female (M=3.608, SD=1.001).

Again it was found from the table 3.67 that the calculated 't' values of 0.513,0.362 and 0.640 between respondents of less than 35 years vs 35-55 years, less than 35 years vs above 55 years and 35-55 years vs above 55 years were less than the table value with df 376, 223 and 235 at .05 level of significance respectively. Hence the 't' values of 0.513, 0.362 and 0.640 between respondents of all the age groups were insignificant at .05 level of significance respectively. It indicated that there existed no significant differences between the mean scores of all respondents group on 'Privatization not a priority of the Government with regard to solid waste management'. When compared with the mean item scores of respondents less than 35 years, 35-55 years and above 55 years, it was found that the mean item scores of respondents of 33-55 years age group (M=3.646, SD=1.092) was higher than that of respondents of less than 35 years (M=3.590, SD=1.020) and respondents above the age group of 55 years (M=3.524, SD=1.120).

The State should collect Taxes with regard to Solid Waste Management:

Any proposed solid waste management system will require provision of financial resources for its smooth running. Solid Waste Management as a specific exclusive development project requires a large dose of capital investment and continuously increasing operation and maintenance costs.The desired level of environmental quality can be attained through the imposition of a fiscal instrument – a pollution charge on the generation of waste which involves the levying of a tax equal to the 'marginal waste-disposal cost'. In case of households the cess would be determined by the average per capita generation of waste as calculated by the waste characterisation study in different income classes. The low income earners who stay in slums would pay a nominal token charge, while the gap would be made good by charging progressively higher rates on the middle and higher income groups. The element of 'subsidisation' would have to be worked out carefully so that the marginal revenue recovered is equal to the marginal cost of disposal. The rate of taxation can be based either on (a) the marginal cost of solid waste disposal (b) the ability to pay and (c) willingness to pay. The experience suggests that a new tax instrument should be introduced gradually so that there is no unnecessary resistance or evasion. With the above explanation, item 68 was framed and was analysed according to the Sex and Age group of the respondents.

Table 3.68

Item 68: The State should collect taxes with regard to solid waste management

Item: 68	M	SD	SED	t	Level of Significance
Male	4.299	1.051			
vs.			0.111	1.928	NS
Female	4.085	1.219			
Less than 35 yrs	4.262	1.090			
vs.			0.1158	0.268	NS
35-55 yrs	4.231	1.152			
Less than 35 yrs	4.262	1.090			
vs.			0.191	2.618	5%
> 55 yrs	3.762	1.191			
35-55 yrs	4.231	1.152			
vs.			0.198	2.369	5%
> 55 yrs	3.762	1.191			

It was found from the table 3.68 that the calculated 't' value of 1.928 between Male vs Female respondents was less than the table value with df at 418 at .05 level of significance. Hence, the 't' value of 1.928 was insignificant at .05 level of significance. It indicated that there existed no significant difference between the mean scores of Male vs Female respondents on "The state should collect taxes with regard to solid waste management".

It was found from the table 3.68 that the calculated 't' values of 2.618 and 2.369 between respondents of less than 35 years vs above 55 years and 33-55 years vs above 55 years were more than the table value with df 223 and 235 respectively at .05 level of significance. Hence, the 't' values of 2.618 and 2.369 were significant at .05 level of significance. It indicated that there existed significant differences between the mean scores of respondents of less than 35 years vs above 55 years and of 33-55 years vs above 55 years on 'The state should collect taxes with regard to solid waste management'. Again it was found from the table 3.68 that the calculated 't' value of 0.268 between respondents of less than 35 years vs respondents between 35-55 years was less than the table value with df

376 at .o5 level of significance. Hence the 't' value of 0.268 was insignificant at .05 level of significance. It indicated that there existed no significant difference in the mean scores of respondents of less than 35 years vs respondents between 35–55 years of age on 'The state should collect taxes with regard to solid waste management' When compared with the mean item scores of respondents of less than 35 years, 35-55 years and above 55 years, it was found that the mean item score of respondents of less than 35 years (M=4.262, SD=1.090) was higher than respondents of 35-55 years (M=4.231, SD=1.152) and respondents of greater than 55 years (M=3.762, SD=1.191).

[PART F]

The present part is framed according to the sixth objective of the study which states to "to assess the overall state of environment with respect to sanitation and health of the community".

The results obtained for this part have been analysed and interpreted item wise for the first objective of the study which has the following dimensions of Solid Waste Management system.

3.6 Analysis and Interpretation based on Objective-6

Environment: Sanitation and Health

All the results obtained from objective-1, i.e. 3.69 to 3.79 have been presented in the form of tables and interpretated subsequently after each table. In the tables, items have been placed according to its significance in a tabular form for easy reference.

Control of Pests and Vectors in the Locality:

The principal vectors of concern in Shillong are pests including mosquitoes and flies, rodents such as rats, dogs and other burrowing animals and birds. They can cause serious problems if not contained. To avoid problems with vectors, the solid waste materials should be removed on a daily basis. Although it is known that vector insects and rodents can transmit various pathogenic agents, it is often difficult to trace the effects of such transmission to a specific population. Domestic rats, birds and other scavenging animals act as reservoirs for many organisms transmissible to people including amoebic and bacillary dysentery, typhoid fever, salmonellosis, various parasites, cholera, yellow fever, plague and others. With the above background, item 69 was framed and analysed according to objective six of the study, viz. type of families and occupational group of the respondents.

Table 6.69 A
Item 69: Control of pests and vectors is a problem in your locality

Item: 69	M	SD	SED	t	Level of Significance
Nuclear	2.374	1.212			
vs.			0.1569	1.625	NS
Joint	2.629	1.111			

Table 6.69 B

Item 69: Control of pests and vectors is a problem in your locality

Item: 69	M	SD	SED	t	Level of Significance
Govt vs. Private	2.414 2.464	1.276 1.186	0.1352	0.370	NS
Govt. vs. Professional	2.414 2.000	1.276 0.447	0.288	1.437	NS
Govt. vs. Others	2.414 2.467	1.276 1.046	0.204	0.260	NS
Private vs. Professional	2.464 2.000	1.186 0.447	0.2696	1.721	NS
Private vs. Others	2.464 2.467	1.186 1.046	0.199	0.015	NS
Professional vs. Others	2.000 2.467	0.447 1.046	0.247	1.891	NS

It was found from the table 3.69 A that the calculated 't' value of 1.625 between nuclear vs joint families was less than the table value with df 418 at .05 level of significance. Hence the 't' value of 1.625 between nuclear and joint families was not significant at .05 level of significance. It indicated that there existed no significant difference between the mean score of nuclear vs joint families on 'Control of pests and vectors is a problem in your locality. When compared with the mean item score of nuclear families with that of joint families, it was found that the mean score of nuclear families (M= 2.374, SD= 1.212) was less than that of joint families (M= 2.629, SD= 1.111).

Again it was found from the table 3.69 B that the calculated 't' values of 0.370, 1.437, 0.260, 1.721, 0.015 and 1.891 between Government vs Private, Government vs Professional, Government vs Others, Private vs Professional, Private vs Others and Professional vs Others were less than the table value with df at 353, 233, 258, 158, 183 and

63 respectively at .05 level of significance. Hence the 't' values of 0.370, 1.437, 0.260, 1.721, 0.015 and 1.891 were not significant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of Government vs private, Government vs Professional, Government vs Others, Private vs Professional, Private vs Others and Professional vs others on 'Control of pests and vectors is a problem in your locality'. When compared with the mean item scores of Government, Private, Professional and Other employees, it was found that the mean item score of Others (M=2.467, SD=1.046) was more than that of Private (M=2.464, SD=1.186), Government (M=2.414, SD=1.276) and Professional employees (M=2.000, SD=0.447).

Door-to- Door collection of Garbage is Environmentally Sound:

Door-to-door collection of garbage has been adopted in many cities in India. The people have to be educated about the need to segregate garbage into solid waste, kitchen waste and non-biodegradable waste. Operational problems may be there initially, but this system of collection is environmentally sound. At a nominal fee of Rs.30 a month per household, people can say goodbye to their garbage disposal problem. Even unemployed youths of the locality can get jobs if the door-to-door collection of garbage is introduced. In Bangalore, it is revealed that 88% of the people make use of the facility of door-to-door collection of solid waste while 4.7% depend on waste bins and 7.3% dump garbage on the roadside or vacant sides. However, the segregation of garbage at source is yet to catch up in many cities of India. With the above information, it was pertinent to study the opinion of the people on door to door collection of garbage and its implications on the overall environment in Shillong city. Hence item 70 was framed and was analysed according to

the objective six of the study, viz. type of families and occupational group of the respondents.

Table 3.70 A

Item 70: Door-to- Door collection of garbage is environmentally sound

Item: 70	M	SD	SED	t	Level of Significance
Nuclear	3.249	1.248			
vs.			0.1573	2.416	5%
Joint	3.629	0.913			

Table 3.70 B

Item 70: Door-to- Door collection of garbage is environmentally sound

Item: 70	M	SD	SED	t	Level of Significance
Govt	3.288	1.239			
vs.			0.1325	0.740	NS
Private	3.386	1.181			
Govt.	3.288	1.239			
vs.			0.289	0.477	NS
Professional	3.150	1.152			
Govt.	3.288	1.239			
vs.			0.201	0.104	NS
Others	3.267	1.143			
Private	3.386	1.181			
vs.			0.2832	0.833	NS
Professional	3.150	1.152			
Private	3.386	1.181			
vs.			0.202	0.589	NS
Others	3.267	1.143			
Professional	3.150	1.152			
vs.			0.313	0.374	NS
Others	3.267	1.143			

It was found from the table 3.70 A that the calculated 't' value of 2.416 between nuclear vs joint families was more than the table value with df 418 at .05 level of significance. Hence the 't' value of 2.416 between nuclear vs joint families was significant at 0.05 level of significance. It indicated that there existed significant difference between the mean score of nuclear vs joint families on 'Door-to- Door collection of garbage is environmentally sound.' When compared with the mean item score of nuclear families

with that of joint families, it was found that the mean score of joint families (M= 3.629, SD= 0.913) was higher than that of nuclear families (M= 3.249, SD= 1.248).

It was found from the table 3.70 B that the calculated 't' values of 0.740, 0.477, 0.104, 0.833, 0.589 and 0.374 between Government vs Private, Government vs Professional, Government vs Others, Private vs Professional, Private vs Others and Professional vs Others were less than the table value with df at 353, 233, 258, 158, 183 and 63 respectively at .05 level of significance. Hence the 't' values of 0.740, 0.477, 0.104, 0.833, 0.589 and 0.374 were not significant at .05 level of significance. When compared with the mean item scores of Government, Private, Professional and Other employees, it was found that the mean item score of Private (M=3.386, SD=1.181) was more than that of Government (M=3.288, SD=1.239), Others (M=3.267, SD=1.143) and Professional employees (M=3.150, SD=1.152).

The Community storage system is an Eyesore:

In many of the localities, Community bins are used by the residents. These bins are supposed to be placed at appropriate distances from the neighbourhood to prevent foul smell emitted from the waste thrown in the open. The overburdening of homemakers with their domestic responsibilities discourages the segregation of waste at the household level. Hence, for the sake of convenience but without realising the environmental consequences, most households dump all the commingled wastes in the community bins. Since there is a mismatch between the number of Community bins and the generation of wastes from the households, spilling over of waste in community bins is common. In the absence of regular collection and disposal services, the wastes accumulated in the Community bins becomes

messy and poses threat to the surrounding environment as well as public health. There is a need for creating separate community bins for biodegradable and non-biodegradable wastes. With the above information, it was pertinent to study the opinion of the people on community storage system. Hence item 71 was framed and was analysed according to the objective six of the study viz. type of families and occupational group of the respondents.

Table 3.71 A
Item 71: The community storage system is an eyesore

Item: 71	M	SD	SED	t	Level of Significance
Nuclear	2.606	1.315			
vs.			0.1762	0.289	NS
Joint	2.657	1.472			

Table 3.71 B
Item 71: The community storage system is an eyesore

Item: 71	M	SD	SED	t	Level of Significance
Govt	2.358	1.311			
vs.			0.1439	3.273	5%
Private	2.829	1.336			
Govt.	2.358	1.311			
vs.			0.308	2.082	5%
Professional	3.000	1.342			
Govt.	2.358	1.311			
vs.			0.215	2.993	5%
Others	3.000	1.265			
Private	2.829	1.336			
vs.			0.3216	0.532	NS
Professional	3.000	1.342			
Private	2.829	1.336			
vs.			0.227	0.752	NS
Others	3.000	1.265			
Professional	3.000	1.342			
vs.			0.352	0.000	NS
Others	3.000	1.265			

It was found from the table 3.71 A that the calculated 't' value of 0.289 between nuclear vs joint families was less than the table value with df 418 at .05 level of significance. Hence the 't' value of 0.289 between nuclear vs joint families was not

significant at .05 level of significance. It indicated that there existed insignificant difference between the mean score of nuclear vs joint families on 'The community storage system is an eyesore'. When compared with the mean item score of nuclear families with that of joint families, it was found that the mean score of joint families (M= 2.657, SD= 1.472) was higher than that of nuclear families (M= 2.606, SD= 1.315).

It was found from the table 3.71 B that the calculated 't' values of 3.273, 2.082 and 2.993 between Government vs Private, Government vs Professional and Government vs Others, were more than the table value with df at 353, 233 and 258 respectively at .05 level of significance. Hence the 't' values of 3.273, 2.082 and 2.993 between Government vs Private, Government vs Professional and Government vs Others were significant at .05 level of significance. It indicated that there existed significant differences between the mean scores of Government vs Private, Government vs Professional and Government vs Others on 'The community storage system is an eyesore'. Again it was found from the table 3.71 B that the calculated 't' values of 0.532, 0.752 and 0.000 between Private vs Professional, Private vs Others and Professional vs Others were less than the table value with df at 158, 183 and 63 respectively at .05 level of significance. Hence the 't' values of 0.532, 0.752 and 0.000 between Private vs Professional, Private vs Others and Professional vs Others were not significant at .05 level of significance. It indicated that there existed insignificant differences between the mean scores of Private vs Professional, Private vs Others and Professional vs others.When compared with the mean item scores of Government, Private, Professional and Others, it was found that the mean item score of Professional (M=3.00, SD=1.342) and Others (M=3.00, SD=1.265) was higher than that of Private (M=2.829, SD=1.336), and Government (M=2.358, SD=1.311).

Lack of concern about Overall Quality of the Environment is Conspicuous:

The general perception is that public apathy towards the environment is noticeable. The 'blame culture' is widespread. Community may be classified into three categories: the high income group – the affording, the middle income group – educated, sensitive, less affording and Low income group – un-affording. None of the above categories of people is an exception in apathy towards Solid Waste Management but the level of awareness and sensitivity of each group is different and needs to be tackled differently. Community is in the centre of activities but the atmosphere of apathy that is created, distances people from government initiatives. Public awareness, effective community participation, transparent and clean administration, introduction of citizens charters and accountability at all levels can only bridge this gap. With the above information, it was pertinent to study the opinion of the respondents about their concern for the overall quality of the environment. Hence item 72 was framed and was analysed according to the objective six of the study, viz. type of families and occupational group of the respondents.

Table 3.72 A

Item 72: Lack of concern about overall quality of the environment is conspicuous

Item: 72	M	SD	SED	t	Level of Significance
Nuclear	2.214	0.961			
vs.			0.1253	0.455	NS
Joint	2.271	0.925			

Table 3.72 B

Item 72: Lack of concern about overall quality of the environment is conspicuous

Item: 72	M	SD	SED	t	Level of Significance
Govt	2.191	0.958			
vs.			0.1032	0.775	NS
Private	2.271	0.932			
Govt.	2.191	0.958			
vs.			0.222	0.041	NS
Professional	2.200	0.812			
Govt.	2.191	0.958			
vs.			0.161	0.330	NS
Others	2.244	1.057			
Private	2.271	0.932			
vs.			0.2208	0.322	NS
Professional	2.200	0.812			
Private	2.271	0.932			
vs.			0.166	0.163	NS
Others	2.244	1.057			
Professional	2.200	0.812			
vs.			0.270	0.163	NS
Others	2.244	1.057			

It was found from the table 3.72 A that the calculated 't' value of 0.455 between nuclear vs joint families was less than the table value with df 418 at .05 level of significance. Hence the 't' value of 0.455 between nuclear vs joint families was insignificant at .05 level of significance. It indicated that there existed no significant difference between the mean score of nuclear vs joint families on 'Lack of concern about overall quality of the environment is conspicuous'. When compared with the mean item score of nuclear families with that of joint families, it was found that the mean score of joint families (M= 2.271, SD=0.925) was higher than that of nuclear families (M= 2.214, SD= 0.961).

It was found from the table 3.72 B that the calculated 't' values of 0.775, 0.041, 0.330, 0.322, 0.163 and 0.163 between Government vs Private, Government vs Professional, Government vs Others, Private vs Professional, Private vs Others and

Professional vs Others were less than the table value with df at 353, 233, 258, 158, 183 and 63 respectively at .05 level of significance. Hence the 't' values of 0.775, 0.041, 0.330, 0.322, 0.163 and 0.163 between Government vs Private, Government vs Professional, Government vs Others, Private vs Professional, Private vs Others and Professional vs Others were insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of Government vs Private, Government vs Professional, Government vs Others, Private vs Professional, Private vs Others and Professional vs Others on "Lack of concern about overall quality of the environment is conspicuous". When compared with the mean item scores of Government, Private, Professional and Other employees, it was found that the mean item score of Other employees (M=2.244, SD=1.057) was higher than that of Private employees (M=2.271, SD=0.932) Professional (M=2.200, SD=0.812), and Government (M=2.191, SD=0.958).

Rag picking and Scavenging is a Matter of Concern:

In many places waste recovery is an important unorganised private industry employing many thousands of scavengers who may live or work on refuse dumps. They are referred as human scavengers or ragpickers and are frequently ignored in urban project plans although their activities may be vital to the life of the city. Many consist of abandoned children and destitute families. They live and work under extensive health risks, and suffer exploitation and deprivation. Possible health hazards of rag picking include raised levels of infant mortality, hand and leg injuries, intestinal and respiratory infections, eye infections, lower back pain, malnutrition and skin disorders. Waste collectors may make a substantial contribution to urban waste management. They may

reduce the volume of waste by 10%-20%. Observers agree that the isuue of waste collectors cannot be evaded. Their positive role in the management of Municipal solid waste should be recognised and their lot improved. With the above information, it was pertinent to study the opinion of the respondents on "Rag picking and Scavenging is a matter of concern". Hence item 73 was framed and was analysed according to the objective six of the study, viz. type of families and occupational group of the respondents.

Table 3.73 A
Item 73: Rag picking and scavenging is a matter of concern

Item: 73	M	SD	SED	t	Level of Significance
Nuclear	2.503	1.105			
vs.			0.1451	1.454	NS
Joint	2.714	1.110			

Table 3.73 B
Item 73: Rag picking and scavenging is a matter of concern

Item: 73	M	SD	SED	t	Level of Significance
Govt	2.512	1.112			
vs.			0.122	1.658	NS
Private	2.714	1.129			
Govt.	2.512	1.112			
vs.			0.253	2.021	5%
Professional	2.000	0.632			
Govt.	2.512	1.112			
vs.			0.182	0.857	NS
Others	2.356	1.078			
Private	2.714	1.129			
vs.			0.260	2.749	5%
Professional	2.000	0.632			
Private	2.714	1.129			
vs.			0.192	1.861	NS
Others	2.356	1.078			
Professional	2.000	0.632			
vs.			0.263	1.354	NS
Others	2.356	1.078			

It was found from the table 3.73 A that the calculated 't' value of 1.454 between nuclear vs joint families was less than the table value with df 418 at .05 level of

significance. Hence the 't' value of 1.454 between nuclear vs joint families was insignificant at .05 level of significance. It indicated that there existed no significant difference between the mean score of nuclear vs joint families on 'Rag picking and scavenging is a matter of concern'. When compared with the mean item score of nuclear families with that of joint families, it was found that the mean score of joint families (M= 2.714, SD=1.110) was higher than that of nuclear families (M= 2.503, SD= 1.105).

It was found from the table 3.73 B that the calculated 't' values of 1.658, 0.857, 1.861 and 1.354 between Government vs Private, Government vs Others, Private vs Others, Professional vs Others were less than the table value with df 353, 258, 183 and 63 respectively at .05 level of significance. Hence the 't' values of 1.658, 0.857, 1.861 and 1.354 between Government vs Private, Government vs Others, Private vs Others, Professional vs Others were insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of Government vs Private, Government vs Others and Private vs Others and Professional vs Others on "Rag picking and scavenging is a matter of concern".

Again it was revealed from the table 3.73 B that the calculated 't' values of 2.021 and 2.749 between Government vs Professional and Private vs Professional were more than the table value with df 233 and 158 respectively at .05 level of significance. Hence, the 't' values of 2.021 and 2.749 between Government vs Professionals and Private vs Professionals were significant at .05 level of significance. It indicated that there existed significant differences between the mean scores of Government vs Professional and Private vs Professional. When compared with the mean item scores of Governmentt, Private, Professional and Others, it was found that the mean item score of Private employees

(M=2.714, SD=1.129) was higher than that of Government (M=2.512, SD=1.112), Others (M=2.356, SD=1.078), and Professionals (M=2.000, SD=0.632).

Loading Waste into Trucks is Slow and Unhygienic:

Local bodies are supposed to provide service which is regular and reliable. They should deploy motorised vehicles having unconventional sounding horn for doorstep collection of wastes. Driver of the vehicle should intermittently blow the horn announcing his arrival in different residential localities and on hearing this householders should deposit their domestic waste directly into such vehicle without loss of time. As observed in Shillong the loading of waste into trucks is random and haphazard. In the process, waste is littered all along the route. If this is not accompanied with street sweeping, the remaining wastes are scattered here and there giving rise to all kinds of unhygienic conditions. Similarly, when wastes from community bins are hauled into trucks, the entire process is messy and unhealthy for the workers as well. With the above information, it was pertinent to study the opinion of the respondents on "Loading waste into trucks is slow and unhygienic". Hence item 74 was framed and was analysed according to objective six of the study, viz. type of families and occupational group of the respondents.

Table 3.74 A
Item 74: Loading waste into trucks is slow and unhygienic

Item: 74	M	SD	SED	t	Level of Significance
Nuclear	3.103	1.083			
vs.			0.1422	1.385	NS
Joint	3.300	1.087			

Table 3.74 B

Item 74: Loading waste into trucks is slow and unhygienic

Item: 74	M	SD	SED	t	Level of Significance
Govt vs. Private	3.102 3.121	1.060 1.131	0.119	0.160	NS
Govt. vs. Professional	3.102 3.100	1.060 1.091	0.250	0.008	NS
Govt. vs. Others	3.102 3.356	1.060 1.036	0.174	1.461	NS
Private vs. Professional	3.121 3.100	1.131 1.091	0.271	0.078	NS
Private vs. Others	3.121 3.356	1.131 1.036	0.191	1.230	NS
Professional vs. Others	3.100 3.356	1.091 1.036	0.288	0.890	NS

It was found from the table 3.74 A that the calculated 't' value of 1.385 between nuclear vs joint families was less than the table value with df 418 at .05 level of significance. Hence the 't' value of 1.385 between nuclear vs joint families was insignificant at .05 level of significance. It indicated that there existed no significant difference between the mean score of nuclear vs joint families on 'Loading waste into trucks is slow and unhygienic'. When compared with the mean item score of nuclear families with that of joint families, it was found that the mean score of joint families (M= 3.300, SD=1.087) was higher than that of nuclear families (M= 3.103, SD= 1.083).

It was found from table 3.74 B that the calculated 't' values of 0.160, 0.008, 1.461, 0.078, 1.230 and 0.890 were less than the table value with df 353, 233, 258, 158, 183 and 63 respectively at .05 level of significance. Hence the 't' values of 0.160, 0.008, 1.461, 0.078, 1.230 and 0.890 were insignificant at .05 level of significance. It indicated that there

existed no significant differences between mean scores of Government vs Private employees, Government vs Professional, Government vs Others, Private vs Professional, Private vs Others and Professional vs Others on "Loading of waste into trucks is slow and unhygienic". When compared with the mean item score of all the occupational groups, it was found that the mean score of Other employees (M=3.356, SD=1.036), was higher than that of Private employees (M=3.121, SD=1.131), Government employees (M=3.102, SD=1.060) and Professional employees (M=3.100, SD=1.091).

Indiscriminate Disposal of Waste is a Health Hazard:

There are potential risks to environment and health from indiscriminate disposal of solid wastes. Epidemiological studies have shown that a high percentage of workers who handle refuse, and of individuals who live near or on disposal sites, are infected with gastrointestinal parasites, worms and related organisms. Contamination of this kind is likely at all points where waste is handled. Direct health risks concern mainly the workers in this field, who need to be protected, as far as possible, from contact with wastes. There are also specific risks in handling wastes from hospitals and clinics. For the general public, the main risks to health are indirect and arise from the breeding of disease vectors, primarily flies and rats. During the last decade of the 19th Century as well as during the 5 initial years of the 20th Century, millions of people died due to bubonic plague in India, which had linkages to poor management of solid waste. More recently a study by the United States Public Health Service has demonstrated the relationship of 22 human diseases due to improper solid waste management. So item 75 was framed and analysed

according to the opinion of different occupational groups, viz. type of families and occupational group of the respondents.

Table 3.75 A
Item 75: Indiscriminate disposal of waste has not created any health hazards in the community

Item: 75	M	SD	SED	t	Level of Significance
Nuclear	1.574	0.799			
vs.			0.1034	0.851	NS
Joint	1.486	0.732			

Table 3.75 B
Item 75: Indiscriminate disposal of waste has not created any health hazards in the community

Item: 75	M	SD	SED	t	Level of Significance
Govt	1.433	0.691			
vs.			0.076	2.189	5%
Private	1.600	0.715			
Govt.	1.433	0.691			
vs.			0.171	3.903	5%
Professional	2.100	1.044			
Govt.	1.433	0.691			
vs.			0.127	2.881	5%
Others	1.800	1.087			
Private	1.600	0.715			
vs.			0.184	2.720	5%
Professional	2.100	1.044			
Private	1.600	0.715			
vs.			0.142	1.413	NS
Others	1.800	1.087			
Professional	2.100	1.044			
vs.			0.293	1.023	NS
Others	1.800	1.087			

It was found from the table 3.75 A that the calculated 't' value of 0.851 between nuclear vs joint families was less than the table value with df 418 at .05 level of significance. Hence the 't' value of 0.851 between nuclear vs joint families was insignificant at .05 level of significance. It indicated that there existed no significant difference between the mean score of nuclear vs joint families on "Indiscriminate disposal

of waste has not created any health hazards in the community". When compared with the mean item score of nuclear families with that of joint families, it was found that the mean score of joint families (M= 1.486, SD=0.732) was higher than that of nuclear families (M= 1.574, SD= 0.799).

It was found from table 3.75 B that the calculated 't' values of 2.189, 3.903, 2.881 and 2.720 between Government vs Private employees, Government vs Professional employees, Government vs Other employees and Private vs Professional employees are more than the table value with df 353, 233, 258, and 158 at .05 level of significance. Hence the 't' values of 2.189, 3.903, 2.881 and 2.720 were insignificant at .05 level of significance. It indicated that there existed significant differences between mean scores of Government vs Private employees, Government vs Professional employees, Government vs Other employees, and Private vs Professional employees on "Indiscriminate disposal of waste has not created any health hazards in the community". Again table 3.75 B revealed that the calculated 't' value of 1.413 and 1.023 were less than the table value with df 183 and 63 respectively at .05 level of significance. It indicated that there exist no significant difference in opinion of the Private vs Other employees and Professional vs Other employees on "Indiscriminate disposal of waste has not created any health hazards in the community". The mean item score comparison revealed that Professional employees (M=2.100, SD=1.044) scored higher than than that of Other employees (M=1.800, SD=1.087), Private employees (M=1.600, SD=0.715) and Government employees (M=1.433, SD=0.691).

Protection of the Environment and Health of People in Solid Waste Management is the Responsibility of concerned Authorities:

For protection of environment and health in India several agencies are jointly responsible. The health service is responsible for human health including health data collection, collation, analysis, interpretation, curative and preventive measures. Environmental protection agencies (central and state pollution control boards) regulate, enforce and monitor compliance with waste emissions. Ministries of health and labour are responsible for occupational health and safety regulations. It is observed that although Environmental protection agencies to a certain extent enforce pollution prevention and control regulations, they have little or no experience of regulating communicable, non-communicable diseases, occupational health, injury and safety. Likewise, health agencies also have little regulatory function. Keeping in view serious health risks of Municipal solid wastes, health impact assessment needs a coordinated multi-disciplinary approach and intervention. So item 76 was framed and was analysed according to the opinion of different occupational groups, viz. type of families and occupational group of the respondents.

Table 3.76 A
Item 76: Protection of the environment and health of people in solid waste management is the responsibility of concerned authorities

Item: 76	M	SD	SED	t	Level of Significance
Nuclear	2.283	1.092			
vs.			0.1422	1.322	NS
Joint	2.471	1.038			

Table 3.76 B

Item 76: Protection of the environment and health of people in solid waste management is the responsibility of concerned authorities

Item: 76	M	SD	SED	t	Level of Significance
Govt vs. Private	2.349 2.336	1.076 1.032	0.115	0.113	NS
Govt. vs. Professional	2.349 1.700	1.076 0.954	0.250	2.593	5%
Govt. vs. Others	2.349 2.356	1.076 1.250	0.182	0.038	NS
Private vs. Professional	2.336 1.700	1.032 0.954	0.246	2.585	5%
Private vs. Others	2.336 2.356	1.032 1.250	0.188	0.107	NS
Professional vs. Others	1.700 2.356	0.954 1.250	0.319	2.060	5%

It was found from the table 3.76 A that the calculated 't' value of 1.322 between nuclear vs joint families was less than the table value with df 418 at .05 level of significance. Hence the 't' value of 1.322 between nuclear vs joint families was not significant at .05 level of significance. It indicated that there existed no significant difference between the mean score of nuclear vs joint families on "Protection of the environment and health in solid waste management is the responsibility of concerned authorities". When compared with the mean item score of nuclear families with that of joint families, it was found that the mean score of joint families (M= 2.471, SD= 1.038) was higher than that of nuclear families (M= 2.283, SD= 1.092).

It was found from the table 3.76 B that the calculated 't' values of 0.113,0.038 and 0.107 between Government vs Private, Government vs Others and Private vs Others were

less than the table value with df at 353, 258 and 183 respectively at .05 level of significance. Hence the 't' values of 0.113, 0.038 and 0.107 between Government vs Private, Government vs Others and Private vs Others were not significant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of Government vs Private, Government vs Others and Private vs Others on "Protection of the environment and health in solid waste management is the responsibility of concerned authorities". Again it was found from the table 3.76 B that the calculated 't' values of 2.593, 2.585 and 2.060 between Government vs Professional, Private vs Professional and Professional vs Others were more than the table value with df at 233, 158 and 63 respectively at .05 level of significance. Hence the 't' values of 2.593, 2.585 and 2.060 were significant at .05 level of significance. It indicated that there existed significant differences between the mean scores of Government vs Professional, Private vs Professional and Professional vs Others on "Protection of the environment and health in solid waste management is the responsibility of concerned authorities". When compared with the mean item scores of Government, Private, Professional and Others, it was found that the mean item score of Others (M=2.356, SD=1.250) was higher than that of Government (M=2.349, SD=1.076) Private (M=2.336, SD=1.032), and Professional employees (M=1.700, SD=0.954).

Improper Collection and Disposal of Waste is Affecting the Health of the Family:

Proper management of Municipal solid waste at all stages is expected to be overwhelmingly beneficial to the health and sustainable development as well as economic well-being of families and communities. The vulnerability of the health of family members

cannot be ignored right from the point of source generation, handling, storage, collection and disposal stage. Improper waste management can affect the health of the family of waste generators as well as waste collectors, ragpickers, field staff and other vulnerable communities. So item 77 was framed and was analysed according to the opinion of different occupational groups, viz. type of families and occupational group of the respondents.

Table 3.77 A
Item 77: Improper collection and disposal of waste is affecting the health of the family

Item: 77	M	SD	SED	t	Level of Significance
Nuclear	1.926	0.971			
vs.			0.1354	1.388	NS
Joint	2.114	1.293			

Table 3.77 B
Item 77: Improper collection and disposal of waste is affecting the health of the family

Item: 77	M	SD	SED	t	Level of Significance
Govt	1.833	0.930			
vs.			0.105	2.192	5%
Private	2.064	1.023			
Govt.	1.833	0.930			
vs.			0.223	1.420	NS
Professional	2.150	1.152			
Govt.	1.833	0.930			
vs.			0.167	1.792	NS
Others	2.133	1.360			
Private	2.064	1.023			
vs.			0.250	0.344	NS
Professional	2.150	1.152			
Private	2.064	1.023			
vs.			0.192	0.359	NS
Others	2.133	1.360			
Professional	2.150	1.152			
vs.			0.355	0.048	NS
Others	2.133	1.360			

It was found from the table 3.77 A that the calculated 't' value of 1.388 between nuclear vs joint families was less than the table value with df 418 at .05 level of significance. Hence the 't' value of 1.388 between nuclear vs joint families was not significant at .05 level of significance. It indicated that there existed no significant difference between the mean score of nuclear vs joint families on 'Improper collection and disposal of waste is affecting the health of the family'. When compared with the mean item score of nuclear families with that of joint families, it was found that the mean score of nuclear families (M=1.926, SD=0.971) was higher than that of joint families (M=2.114, SD=1.292).

It was found from the table 3.77 B that the calculated 't' values of 1.420, 1.792, 0.344, 0.359 and 0.048 between Government vs Professional, Government vs Others, Private vs Professional, Private vs Others and Professional vs Others were less than the table value with df at 233, 258, 158, 183 and 63 respectively at .05 level of significance. Hence the 't' values of 1.420, 1.792, 0.344, 0.359 and 0.048 between Government vs Professional, Government vs Others, Private vs Professional, Private vs Others and Professional vs Others were not significant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of Government vs Professional, Government vs Others, Private vs Professional, Private vs Others and Professional vs Others on item 77. Again the table 3.77 B revealed that the calculated 't' value of 2.192 between Government vs Private was more than the table value with df 353 at .05 level of significance. Hence the 't' values of 2.192 was significant at .05 level of significance. It indicated that there existed significant differences between the mean scores of Government vs Private employees on "Improper collection and disposal of waste is

affecting the health of the family". When compared with the mean item scores of Government, Private, Professional and Others, it was found that the mean item score of Professional employees (M=2.150, SD=1.152) was higher than that of Other employees (M=2.133, SD=1.360) Private employees (M=2.064, SD=1.023), and Government employees (M=1.833, SD=0.930).

Solid Waste collected in the Locality gives Foul Smell and Odour:

In many nooks and corners of Shillong, it is not uncommon to come across unsightly spots where waste is accumulated. Foul odour is emitted at the disposal site due to continuous decomposition of organic matter and emission of methane, hydrogen sulphide, and ammonia .The problem is intensified if proper mitigation measures are not adopted. Odour is also emitted at the collection points if quick removal of wastes is not practised. Proper waste management and operation are critical in minimising the production of odours. The tropical climate of our country enhances the process of degeneration of wastes. Therefore, places where there is waste accumulation, a particular stink odour emanates. In order to avoid this stinking odour, proper collection, handling and timely disposal of waste is essential. Chemical control of both houseflies and rodents is not very effective because of widespread resistance. The essential basis of control remains denial of access to food and harbourage, by covered storage and efficient removal. Hence item 78 was framed and analysed on the basis of opinion of type of families and different occupational groups.

Table 3.78 A

Item 78: Solid waste collected in the locality gives foul smell and odour

Item: 78	M	SD	SED	t	Level of Significance
Nuclear	1.954	0.99			
vs.			0.1264	1.559	NS
Joint	1.757	0.818			

Table 3.78 B

Item 78: Solid waste collected in the locality gives foul smell and odour

Item: 78	M	SD	SED	t	Level of Significance
Govt	1.814	0.951			
vs.			0.103	1.383	NS
Private	1.957	0.948			
Govt.	1.814	0.951			
vs.			0.218	0.623	NS
Professional	1.950	0.669			
Govt.	1.814	0.951			
vs.			0.161	3.091	5%
Others	2.311	1.092			
Private	1.957	0.948			
vs.			0.221	0.032	NS
Professional	1.950	0.669			
Private	1.957	0.948			
vs.			0.170	2.086	5%
Others	2.311	1.092			
Professional	1.950	0.669			
vs.			0.268	1.348	NS
Others	2.311	1.092			

It was found from the table 3.78 A that the calculated 't' value of 1.559 between nuclear vs joint families was less than the table value with df 418 at .05 level of significance. Hence the 't' value of 1.559 between nuclear vs joint families was not significant at .05 level of significance. It indicated that there existed no significant difference between the mean score of nuclear vs joint families on 'Solid waste collected in the locality gives foul smell and odour'. When compared with the mean item score of nuclear families with that of joint families, it was found that the mean score of nuclear

families (M=1.954, SD=0.990) was higher than that of joint families (M=1.757, SD=0.818).

It was found from the table 3.78 B that the calculated 't' values of 1.383, 0.623, 0.032 and 1.348 between Government vs Private, Government vs Professional, Private vs Professional and Professional vs Others were less than the table value with df at 353, 233, 158 and 63 respectively at .05 level of significance. Hence the 't' values of 1.383, 0.623, 0.032 and 1.348 between Government vs Private, Govt vs Professional, Private vs Professional and Professional vs others were insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of Government vs Private, Government vs Professional, Private vs Professional and Professional vs others on "Solid waste collected in the locality gives foul smell and odour". Again the table 3.78 B revealed that the calculated 't' values of 3.091 and 2.086 between Government vs Others and Private vs Others were more than the table value with df at 258 and 183 at .05 level of significance. Hence the 't' values of 3.091 and 2.086 between Government vs Others and Private vs Others were significant at .05 level of significance. It indicated that there existed significant differences between the mean scores of Government vs Others and Professional vs Others on "Solid waste collected in the locality gives foul smell and odour". When compared with the mean item scores of Government, Private, Professional and Others, it was found that the mean item score of Other employees (M=2.311, SD=1.092) was more than that of Private employees (M=1.957, SD=0.948) Professional (M=1.950, SD=0.669), and Government employees (M=1.814, SD=0.951).

Open Dumping is Unacceptable from Aesthetic, Environmental and Sanitary Point of View:

The most obvious environmental damage caused by Municipal solid wastes is aesthetic, the ugliness of street litter and degradation of the urban environment and beauty of the city. More serious, however, and often unrecognised is the transfer of pollution to water. Air pollution is also caused from the burning of accumulated wastes. Besides, uncontrolled hazardous wastes mixing up with Municipal wastes create potential risks to human health. In view of this item 79 was framed and analysed according to the opinion of types of families and different occupational groups.

Table 3.79 A
Item 79: Open dumping is unacceptable from aesthetic, environmental and sanitary point of view

Item: 79	M	SD	SED	t	Level of Significance
Nuclear	4.194	0.924			
vs.			0.1163	1.771	NS
Joint	4.400	0.663			

Table 3.79 B
Item 79: Open dumping is unacceptable from aesthetic, environmental and sanitary point of view

Item: 79	M	SD	SED	t	Level of Significance
Govt	4.223	0.822			
vs.			0.098	0.305	NS
Private	4.193	1.013			
Govt.	4.223	0.822			
vs.			0.190	0.121	NS
Professional	4.200	0.678			
Govt.	4.223	0.822			
vs.			0.136	1.139	NS
Others	4.378	0.851			
Private	4.193	1.013			
vs.			0.235	0.030	NS
Professional	4.200	0.678			
Private	4.193	1.013			
vs.			0.168	1.100	NS
Others	4.378	0.851			
Professional	4.200	0.678			
vs.			0.219	0.813	NS
Others	4.378	0.851			

It was found from the table 3.79 A that the calculated 't' value of 1.771 between nuclear vs joint families was less than the table value with df 418 at .05 level of significance. Hence the 't' value of 1.771 between nuclear vs joint families was not significant at .05 level of significance. It indicated that there existed no significant difference between the mean score of nuclear vs joint families on "Open dumping is unacceptable from aesthetic, environmental and sanitary point of view". When compared with the mean item score of nuclear families with that of joint families, it was found that the mean score of joint families (M=4.400, SD=0.663) was higher than that of nuclear families (M=4.194, SD=0.924).

It was found from the table 3.79 B that the calculated 't' values of 0.305, 0.121, 1.139, 0.030, 1.100 and 0.813 between Government vs Private, Government vs Professional, Government vs Others, Private vs Professional, Private vs Others and Professional vs Others were less than the table value with df at 353, 233, 258, 158, 183 and 63 respectively at .05 level of significance. Hence the 't' values of 0.305, 0.121, 1.139, 0.030, 1.100 and 0.813 between Government vs Private, Government vs Professional, Government vs Others, Private vs Professional, Private vs Others and Professional vs Others were insignificant at .05 level of significance. It indicated that there existed no significant differences between the mean scores of Government vs Private, Government vs Professional, Government vs Others, Private vs Professional, Private vs Others and Professional vs Others on "Open dumping is unacceptable from aesthetic, environmental and sanitary point of view". When compared with the mean item scores of Government, Private, Professional and Others, it was found that the mean item score of other employees (M=4.378, SD=0.851) was more than that of Government employees (M=4.223,

SD=0.822) Professional (M=4.200, SD=0.768), and Private employees (M=4.193, SD=1.013).

CHAPTER – IV

MAIN FINDINGS AND DISCUSSION OF THE RESULTS, IMPLICATIONS, LIMITATIONS AND SUGGESTIONS FOR FURTHER STUDY

This chapter is devoted to main findings and discussion of the results, suggestions, implications, and suggestions for further study. After the interpretation of the data, the investigator was in a position to draw certain findings on the basis of analysis and interpretation of the data.

4.0 Main Findings and Discussion of the Results:

According to the objective and hypotheses stated earlier in the present study, the main findings have been discussed according to the objectives of the study. Discussions of the results have been presented in terms of the hypotheses of the study. On the basis of the main findings, the hypotheses were either retained or partially accepted or rejected.

4.1 Main Findings Objective No.1:

The item wise analysis of objective-1 comprising of 19 items for practices of solid waste management at the household and community level reveals the following trends with respect to the differences of respondents viz. North East (NE) vs South West (SW), North East (NE) vs South East (SE), North East (NE) vs North West (NW), South West (SW) vs South East (SE), South West (SW) vs North West (NW), and South East (SE) vs North West (NW) region of Shillong.

Item: 1 Household Solid Waste Stored in Container/Dustbin:

Analysis of item-1 revealed that there exist significant differences between the mean item scores of NE vs SE, SW vs SE and SW vs NW on "household waste being stored in a container or dustbin" whereas no significant differences existed between the mean item scores of NE vs SW, NE vs NW and SE vs NW region of Shillong on this item. It revealed that household waste although are stored in a container or dustbin, significant differences in the practices were found in NE vs SE, SW vs SE and SW vs NW region of Shillong. The mean scores indicated that maximum number of respondents use the container or dustbin from SE region of Shillong followed by NW region, NE region and SW region of Shillong. Since the mean item score ranged from 4.37 to 4.72, it indicated that maximum number of respondents use the container or dustbin for the purpose of solid waste accumulation at the household level. Hence the hypothesis-1 which stated that "there exist no significant differences in the practices of solid waste management in the different regions of Shillong Municipality" was confirmed in case of NE vs SW, NE vs SE and SW vs NW whereas it was not confirmed in case of NE vs SE, SW vs SE and vs NW and SE vs NW region of Shillong indicating the partial acceptance of the hypothesis-1 with respect to item-1 of the Solid Waste Management system.

Item 2: Household Solid Waste stored in Plastic Bag:

Analysis of item-2 revealed that there exist significant differences between the mean item scores of NE vs SW on "solid waste generated at the household level is stored in a plastic bag" whereas there existed no significant difference on this item between NE vs SE, NE vs NW, SW vs SE, SW vs NW and SE vs NW region of Shillong. It revealed

that household waste is also stored in a plastic bag. However, significant differences in the practice of using plastic bags were found only in NE vs SW region of Shillong. The mean scores indicated that a sizeable number of respondents use the Plastic bags along with container or dustbin from SW region of Shillong followed by NW region, SE region and NE region of Shillong. Since the mean item score ranged from 2.54 to 3.06, it indicated that quite a sizeable number of respondents use the plastic bags for the purpose of solid waste accumulation at the household level. As observed from the field, it was seen that usually the plastic bag is placed within the storage container, so that the solid waste generated does not come in direct contact with the dustbin or the container. It also facilitates for easy disposal of the waste. In some of the households the only storage place was a polythene or plastic bag and the bag was thrown along with the household waste. Hence the hypothesis-1 which stated that "there exist no significant differences in the practices of solid waste management in the different regions of Shillong Municipality" was confirmed in case of NE vs SE, NE vs NW, SW vs SE, SW vs NW and SE vs NW region of Shillong whereas it was not confirmed in case of NE vs SW region of Shillong indicating the partial acceptance of the hypothesis-1 with respect to item-2 of the Solid Waste Management system.

Item 3: Disposal of Solid Waste in Drains:

Analysis of item-3 revealed that there exist significant differences between the mean item scores of NE vs SE, NE vs NW, SW vs SE and SW vs NW on the item "solid waste generated is disposed off directly in the nearby drain" whereas there existed no significant difference on this item between NE vs SW and SE vs NW region of Shillong.

The mean scores indicated that maximum number of respondents from NW region disposed off solid waste generated at the household in the nearby drain followed by SE region, NE region and SW region of Shillong. Since the mean item score ranged from 3.01 to 3.83, it indicated that quite a sizeable number of respondents use the most convenient mode of disposing the solid waste generated at the household in the nearby drain. As observed from the field, it was seen that usually the thrown solid waste with or without plastics, blocks the sewerage or the drain causing environmental pollution. The dirty water along with the waste, are often seen flowing with water or accumulated in the roads causing lot of inconvenience to the traffic and the passers by. This often happened when there was incessant rain in Shillong. Hence the hypothesis-1 which stated that "there exist no significant differences in the practices of solid waste management in the different regions of Shillong Municipality" was confirmed in case of NE vs SW and SE vs NW region of Shillong indicating the partial acceptance of the hypothesis-1 with respect to item-3 of the Solid Waste Management system.

Item 4: Disposal of Solid Waste in Streams:

Analysis of item-4 revealed that there exist significant differences between the mean item scores of NE vs SE, NE vs NW, SW vs SE and SW vs NW with respect to the "solid waste generated being disposed off directly in the nearby stream" whereas there existed no significant difference on this item between NE vs SW and SE vs NW region of Shillong. The mean scores indicated that maximum number of respondents from SE region dispose off solid waste generated at the household in the nearby stream followed by NW region, NE region and SW region of Shillong. Since the mean item score ranged from 3.53

to 4.51, it indicated that quite a sizeable number of respondents use streams as the most convenient mode of disposing the solid waste generated at the household. The solid waste disposed of in the streams has serious environmental repercussions. It creates not only pollution of water but acts as a serious threat to the aquatic animals. It also flows directly into the river thus increasing the rate of contamination and also affecting the aquatic flora and fauna of the rivers. It makes the water acidic and unfit for drinking. Hence the hypothesis-1 which stated that "there exist no significant differences in the practices of solid waste management in the different regions of Shillong Municipality" was confirmed in case of NE vs SW and SE vs NW region of Shillong indicating the partial acceptance of the hypothesis-1 with respect to item-4 of the Solid Waste Management system.

Item 5: Collection of Solid Waste directly in Community Bin/Outside Collection Point:

Analysis of item-5 revealed that there exist significant differences between the mean item scores of NE vs SE, NE vs NW, SW vs SE, SW vs NW and SE vs NW on "collection of solid waste directly in Community bin/Outside Collection Point" whereas there existed no significant difference on this item between NE vs SW region of Shillong. The mean scores indicated that maximum number of respondents from SE region use the community bin or the outside collection point for disposal of solid waste generated at the household followed by SW region, NE region and NW region of Shillong. Since the mean item score ranged from 2.79 to 3.99, it indicated that quite a sizeable number of respondents do not use the community bins or the outside collection point for disposal of the household waste. This was evident from the analysis of the previous items which

confirms the habit of the people of throwing the household waste in the nearby drain or in the stream. Further as observed from the field, the people may not find the collection point conveniently situated or the distance of the community bin may be more from the house. Hence the hypothesis-1 which stated that "there exist no significant differences in the practices of solid waste management in the different regions of Shillong Municipality" was confirmed only in case of NE vs SW region of Shillong indicating the partial acceptance of the hypothesis-1 with respect to item-5 of the Solid Waste Management system.

Item 6: Waste Generated is Stored in the House Overnight:

Analysis of item-6 revealed that there exist significant differences between the mean item scores of NE vs SW, NE vs SE, SW vs SE and SW vs NW on "waste generated in the household is stored overnight" whereas there existed no significant difference on this item between NE vs NW, and SE vs NW region of Shillong. The mean scores indicated that maximum number of respondents from SE region store the waste generated in the house overnight followed by NW region, NE region and SW region of Shillong. Since the mean item score ranged from 3.73 to 4.52, it indicated that quite a sizeable number of respondents store the waste generated in the house overnight. As observed from the field, usually the waste generated at the household was accumulated in the dustbin or in a container for the whole night to be thrown away with the convenient mode only in the next day. Hence the hypothesis-1 which stated that "there exist no significant differences in the practices of solid waste management in the different regions of Shillong Municipality" was confirmed only in case of NE vs NW, and SE vs NW region of Shillong indicating the

partial acceptance of the hypothesis-1 with respect to item-6 of the Solid Waste Management system.

Item 7: Waste is Dumped on the Road or Vacant Land:

Analysis of item-7 revealed that there exist significant differences between the mean item scores of NE vs SW, NE vs SE, NE vs NW, SW vs SE and SW vs NW regions of Shillong on "waste is dumped on the road or vacant land" whereas there existed no significant difference on this item between SE vs NW region of Shillong. The mean scores indicated that maximum number of respondents from SE region dumped waste on the road or vacant land followed by NW region, NE region and SW region of Shillong. Since the mean item score ranged from 3.62 to 4.47, it indicated that quite a sizeable number of respondents dumped the waste on the road or vacant land. Again, as usual the waste generated at the household was accumulated in the dustbin or in a container for whole night to be thrown away with the convenient mode only in the next day. Hence the hypothesis-1 which stated that "there exist no significant differences in the practices of solid waste management in the different regions of Shillong Municipality" was confirmed only in case of SE vs NW region of Shillong indicating the partial acceptance of the hypothesis-1 with respect to item-7 of the Solid Waste Management system.

Item 8: The Service of a Hired Labour is Used for Collection of Waste:

Analysis of item-8 revealed that there exist significant differences between the mean item scores of NE vs SW, SW vs SE, and SW vs NW on "the services of a hired labour being used for collection of waste" whereas there existed no significant difference

on this item existed between NE vs SE, NE vs NW and SE vs NW region of Shillong. The mean scores indicated that maximum number of respondents from SW region utilized the services of hired labour for disposal of household waste followed by SE region, NW region and NE region of Shillong. Since the mean item score ranged from 2.03 to 2.73, it indicated that few respondents utilized the service of hired labour for the disposal of household wastes. The data further revealed that people of Shillong have started using hired labourers or engaged sweepers for collection of household waste from individual houses. Hence the hypothesis-1 which stated that "there exist no significant differences in the practices of solid waste management in the different regions of Shillong Municipality" was confirmed only in case of NE vs SE and NE vs NW, and SE vs NW indicating the partial acceptance of the hypothesis-1 with respect to item-8 of the Solid Waste Management system.

Item 9: Usage of Household Waste as Compost or Manure:

Analysis of item-9 revealed that there exist significant differences between the mean item scores of SW vs SE and SE vs NW on "usage of household waste as compost or manure" whereas there existed no significant difference on this item between NE vs SW, NE vs SE, NE vs NW and SW vs NW. The mean scores indicated that quite a number of respondents from NW region make use of the household waste as compost or manure followed by SW region, NE region and SE region of Shillong. Since the mean item score ranged from 2.41 to 2.94, it indicated that only a small number of respondents utilized the solid waste generated from the household as compost or manure. This is because of their love for kitchen garden and floriculture. Hence the hypothesis-1 which stated that "there

exist no significant differences in the practices of solid waste management in the different regions of Shillong Municipality" was confirmed only in case of NE vs SW, NE vs SE, NE vs NW and SW vs NW indicating the partial acceptance of the hypothesis-1 with respect to item-9 of the Solid Waste Management system.

Item 10: Burning and Disposing of Plastic Materials and Polythene Bags along with Household Waste:

Analysis of item-10 revealed that there exist significant differences between the mean item scores of NE vs NW, SW vs SE and SW vs NW region of Shillong with respect to "burning of disposable plastic materials and polythene bags along with household waste" whereas there existed no significant difference on this item between NE vs SW, NE vs SE and SE vs NW region of Shillong. The mean scores indicated that a sizeable number of respondents from NW region burn and dispose plastic materials and polythene bags along with household waste followed by SE region, NE region and SW region of Shillong. Since the mean item score ranged from 1.36 to 3.85, it indicated that a sizeable number of households burn and dispose plastic materials and polythene bags along with household waste. The data further revealed that people of Shillong perhaps adopted this practice because of their lack of knowledge or awareness about the disastrous effects of burning plastics. Hence the hypothesis-1 which stated that "there exist no significant differences in the practices of solid waste management in the different regions of Shillong Municipality" was confirmed only in case of NE vs SW, NE vs SE and SE vs NW region of Shillong indicating the partial acceptance of the hypothesis-1 with respect to item-10 of the solid waste management system

Item 11: Burning and Disposing of Paper Materials and Newspapers along with Household Waste:

Analysis of item-11 revealed that there exist significant differences between the mean item scores of SW vs SE region of Shillong on "burning and disposing of paper and newspapers along with household waste" whereas there existed no significant difference on this item between NE vs SW, NE vs SE, NE vs NW, SW vs NW, and SE vs NW. The mean scores indicated that a sizeable number of respondents from NE region burn and dispose paper and newspaper materials along with household waste followed by SE region, NW region and SW region of Shillong. Since the mean item score ranged from 3.12 to 3.38, it indicated that a sizeable number of households burn and dispose paper and newspaper materials along with household waste. The data further revealed that people of Shillong perhaps adopt this practice because of their lack of knowledge or awareness about the usefulness of recycling used papers. Hence the hypothesis-1 which stated that "there exist no significant differences in the practices of solid waste management in the different regions of Shillong Municipality" was confirmed only in case of NE vs SW, NE vs SE, NE vs NW, SW vs NW, and SE vs NW region of Shillong indicating the partial acceptance of the hypothesis-1 with respect to item-11 of the Solid Waste Management system.

Item 12: Biodegradable and Non biodegradable Wastes are collected Separately:

Analysis of item-12 revealed that there exist significant differences between the mean item scores of NE vs SW and SW vs NW region of Shillong on "biodegradable and Non biodegradable wastes are collected separately" whereas there existed no significant difference on this item between NE vs SE, NE vs NW, SW vs NW, and SE vs NW. The

mean scores indicated that a small number of respondents from SW region separate the biodegradable and non biodegradable wastes before disposing off the waste from the household followed by SE region, NW region and NE region of Shillong. Since the mean item score ranged from 2.60 to 3.02, it indicated that biodegradable and non-biodegradable waste separation is yet to develop in the cultural habits of the people. People usually do not practice this method because of lack of knowledge, awareness and also because of its inconvenience. Hence the hypothesis-1 which stated that "there exist no significant differences in the practices of solid waste management in the different regions of Shillong Municipality" was confirmed only in case of NE vs SE, NE vs NW, SW vs NW, and SE vs NW region of Shillong indicating the partial acceptance of the hypothesis-1 with respect to item-12 of the Solid Waste Management system.

Item 13: Hazardous Waste is kept in Separate Storage Containers at Home:

Analysis of item-13 revealed that there exist significant differences between the mean item scores of NE vs SW, SW vs SE and SW vs NW region of Shillong on "hazardous waste are kept in separate storage containers at home" whereas there existed no significant difference on this item between NE vs SE, NE vs NW and SE vs NW. The mean scores indicated that a few number of respondents from SW region separate hazardous waste and store it in separate storage containers at home before disposing off the waste from the household followed by NW region, NE region and SE region of Shillong. Since the mean item score ranged from 3.22 to 2.34, it indicated that hazardous waste are kept in separate storage containers at home as separation method is yet to develop in the habits of the respondents. People usually do not practice this method because of lack of

knowledge, awareness and also because of its inconvenience of having separate dustbin or container for biodegradable, non biodegradable and hazardous wastes. Hence the hypothesis-1 which stated that "there exist no significant differences in the practices of solid waste management in the different regions of Shillong Municipality" was confirmed only in case of NE vs SE, NE vs NW and SE vs NW region of Shillong indicating the partial acceptance of the hypothesis-1 with respect to item-13 of the Solid Waste Management system.

Item 14: Grass Clippings, Fallen Leaves, Plants, Flowers etc are left for Decay in the Backyard:

Analysis of item-14 revealed that there exist significant differences between the mean item scores of NE vs SW, NE vs NW, SW vs SE and SW vs NW region of Shillong on "grass clippings, fallen leaves, plants, flowers etc are left for decay in the backyard" whereas there existed no significant difference on this item between NE vs SE and SE vs NW region of Shillong. The mean scores indicated that quite a substantial number of respondents from NW region use the grass clippings, fallen leaves, plants, flowers etc for decay in their backyard of their houses. This number is followed by SE region, NE region and SW region of Shillong. Since the mean item score ranged from 2.72 to 3.68, it indicated that grass clippings, fallen leaves, plants, flowers etc are left to decay in the backyard of the respondents was slowly picking up. This may be attributed to the fact that the decayed leaves, grass clippings, plants and flowers are used for manuring the kitchen garden and for floriculture in the individual houses. This also reduces the burden of throwing the waste either in the community bin or at any other place. Hence the

hypothesis-1 which stated that "there exist no significant differences in the practices of solid waste management in the different regions of Shillong Municipality" was confirmed only in case of NE vs SE and SE vs NW region of Shillong indicating the partial acceptance of the hypothesis-1 with respect to item-14 of the solid waste management system.

Item 15: Door to Door Collection of Waste is Practiced in the Neighbourhood:

Analysis of item-15 revealed that there exist significant differences between the mean item scores of NE vs SW region and NE vs SE region of Shillong on "door to door collection of waste is practiced in the neighbourhood" whereas there existed no significant difference on this item between NE vs NW, SW vs SE, SW vs NW and SE vs NW region of Shillong. The mean scores indicated that quite a substantial number of respondents from NE and NW region are of the opinion that door to door collection of waste is practiced in the neighbourhood adequately whereas the respondents of SW region and SE region do not feel about the adequacy of door to door collection of solid waste in the neighbourhood .Since the mean item score ranged from 2.70 to 3.37, it indicated that door to door Collection of waste although practiced in some of the neighborhoods, the respondents were not satisfied with the service delivery system. Hence the hypothesis-1 which stated that "there exist no significant differences in the practices of solid waste management in the different regions of Shillong Municipality" was confirmed only in case of NE vs NW, SW vs SE, SW vs NW and SE vs NW region of Shillong indicating the partial acceptance of the hypothesis-1 with respect to item-15 of the Solid Waste Management system.

Item 16: Throwing of Old Clothes with the Garbage:

Analysis of item-16 revealed that there exist significant differences between the mean item scores of NE vs SW, SW vs SE and SW vs NW region of Shillong on "throwing of old clothes in the garbage" whereas there existed no significant difference on this item between NE vs SE, NE vs NW and SE vs NW region of Shillong. The mean scores indicated that quite a substantial number of respondents from SE region throw old clothes with the garbage and this is followed by NE, NW and SW region of Shillong. Since the mean item score ranged from 3.19 to 3.74, it indicated that throwing of old clothes along with the waste is a usual common practice among the citizens of Shillong. Hence the hypothesis-1 which stated that "there exist no significant differences in the practices of solid waste management in the different regions of Shillong Municipality" was confirmed only in case of NE vs SE, NE vs NW and SE vs NW region of Shillong indicating the partial acceptance of the hypothesis-1 with respect to item-16 of the Solid Waste Management system.

Item 17: Non-biodegradable Waste are Handed Over/Disposed through Rag Pickers:

Analysis of item-17 revealed that there exist no significant differences between the mean item scores of NE vs SW, NE vs SE, NE vs NW, SW vs SE, SW vs NW and SE vs NW region of Shillong on "non-biodegradable waste are handed over / disposed through rag pickers". The mean scores indicated that quite a few number of respondents from all these four regions hand over the non-biodegradable waste to the rag pickers. Since the mean item score ranged from 2.66 to 3.01, it indicated that a marginal number of the respondents hand over the non-biodegradable waste to the rag pickers. It also indicated that

it was not the usual practice to hand over the non biodegradable wastes to the rag pickers as the rag pickers are discouraged to enter into the house premises. The rag pickers picked up the non- biodegradable wastes from the community bin or from the outside collection point. Also they picked up the non-biodegradable waste from roads or from the drains. Hence the hypothesis-1 which stated that "there exist no significant differences in the practices of solid waste management in the different regions of Shillong Municipality" was confirmed in case of NE vs SW, NE vs SE, NE vs NW, SW vs SE, SW vs NW and SE vs NW region of Shillong indicating the acceptance of the hypothesis-1 with respect to item-17 of the Solid Waste Management system.

Item 18: Effort to Reduce Waste Generation at the Household Level:

Analysis of item-18 revealed that there exist no significant differences between the mean item scores of NE vs SW, NE vs SE, NE vs NW, SW vs SE, SW vs NW and SE vs NW region of Shillong with respect to "making an effort to reduce waste generation at the household level". The mean scores indicated that quite a sizeable number of respondents from these entire four regions make an effort to reduce waste generation at the household level. Since the mean item score ranged from 3.53 to 3.84, it indicated that most of the respondents try to reduce waste generation at the household level. It also indicated the civic consciousness of the people of Shillong at the household level. Further the data revealed that the people of Shillong are more conscious about the cleanliness and hygiene in the house. Hence the hypothesis-1 which stated that "there exist no significant differences in the practices of solid waste management in the different regions of Shillong Municipality" was confirmed in case of NE vs SW, NE vs SE, NE vs NW, SW vs SE, SW

vs NW and SE vs NW region of Shillong indicating the acceptance of the hypothesis-1 with respect to item-18 of the Solid Waste Management system.

Item 19: Carrying of Own Shopping Bag to the Market Place:

Analysis of item-19 revealed that there exist significant differences between the mean item scores of NE vs SE, NE vs NW, SW vs SE and SW vs NW on "carrying of own shopping bag to the market place" whereas there existed no significant difference on this item between NE vs SW and SE vs NW region of Shillong. The mean scores indicated that maximum number of respondents from NW region carry their own shopping bags to the market place followed by respondents from SE region, SW region and NE region of Shillong. This indicated that the people of Shillong are aware of the importance of carrying their own shopping bags to the market place. This also lessens their dependence on plastic materials and polythene bags. However, it was observed that sometimes people do venture into the markets without any shopping bags. This is done especially when there is urgency or when less quantity of the items are required to be purchased. Again the shopkeepers are not averse to give polythene bags to their customers as and when required. Since the mean item score ranged from 3.99 to 4.40, it is obvious that people do carry their own jute bag or paper bag to the market. Hence the hypothesis-1 which stated that "there exist no significant differences in the practices of solid waste management in the different regions of Shillong Municipality" was confirmed only in case of NE vs SW and SE vs NW region of Shillong indicating the partial acceptance of the hypothesis-1 with respect to item-19 of the Solid Waste Management system.

4.2 Main Findings Objective No. 2:

The item wise analysis of objective-2 comprising of 16 items that was "to study the perception of people with regard to the management of household solid wastes in terms of generation, collection, segregation and disposal" revealed the following trends with respect to the difference in perception of the respondents viz. Lower Income Group (LIG), Middle Income Group (MIG) and Higher Income Group (HIG) of Shillong. The items have been studied with reference to the income groups of the respondents. For the purpose of the study, all respondents from the four regions were divided into three categories viz. Lower income Group (LIG), Middle Income Group (MIG) and Higher Income Group (HIG)

Item 20: Solid waste disposal is a problem in your household:

Analysis of item-20 revealed that there exist no significant differences in perception of the respondents on "solid waste disposal is a problem in the individual household " between LIG vs MIG, LIG vs HIG, and MIG vs HIG as evident from analysis of the mean item scores of LIG vs MIG, LIG vs HIG, and MIG vs HIG. It revealed that there was no difference in the perception level of the respondents from all the three income groups about the disposal of solid waste as problematic to them. The mean item scores indicated that higher income respondents feel solid waste disposal to be more problematic than middle and lower income group. This was evident from the status of the HIG respondents as compared to that of the middle income group and lower income group. Since the mean item score ranged from 2.16 to 2.50, it indicated the minimum problem the respondents face for solid waste disposal. Hence the hypothesis-2 which stated that "there exist no significant differences in the perception of people with respect to the management

of household solid waste in terms of generation, collection, segregation and disposal" was confirmed in case LIG vs MIG, LIG vs HIG, and MIG vs HIG indicating the acceptance of the hypothesis-2 with respect to item-20 of the Solid Waste Management System.

Item 21: Distance of the Dumping Site for Disposal of Household Waste:

Analysis of item-21 revealed that there exist no significant differences in perception of the respondents on "distance of the dumping site for disposal of household waste" between MIG vs HIG, as evident from analysis of the mean item scores of MIG vs HIG, and LIG vs HIG. It revealed that there was no significant difference in the perception level of the respondents from the above mentioned income groups about the distance of the dumping site for disposal of household wastes for the disposal of solid waste as problematic to them. Further the data revealed that there existed significant differences of perception between LIG vs MIG and LIG vs HIG on this item. This indicated that these two groups were of different opinion about the distance of the dumping site for the generated solid waste. The mean item scores indicated that HIG respondents feel the distance of the dumping site of the household waste is more difficult to reach rather than the MIG and LIG group. Since the mean item score ranged from 2.21 to 2.95, it indicated that the respondents face a minimal problem for Solid waste disposal at the appropriate dumping site in the community. Hence the hypothesis-2 which stated that "there exist no significant differences in the perception of people with respect to the management of household solid waste in terms of generation, collection, segregation and disposal" was confirmed in case of MIG vs HIG, indicating the partial acceptance of the hypothesis-2 with respect to item-21 of the Solid Waste Management System.

Item 22: Segregation of Solid Waste at the Household Level:

Analysis of item-22 revealed that there exist no significant differences in the perception of the respondents on "solid waste should be segregated at the household level" between LIG vs MIG, LIG vs HIG, and MIG vs HIG as evident from analysis of the mean item scores of LIG vs MIG, and LIG vs HIG and MIG vs HIG.. It revealed that there was no significant difference in the perception level of the respondents from the three mentioned income groups about the segregation of solid waste at the household level. Since the mean item score ranged from 3.60 to 3.70, it indicated that people do try to segregate the wastes before its disposal. The mean item scores indicated that people segregate the wastes which are of market value and which are taken by the kabaariwalas. The wastes which are segregated are usually the waste papers and bottles as they have market value. However the wastes which are of no market value are not segregated before disposing off at the dumping site or the community bin. Hence the hypothesis-2 which stated that "there exist no significant differences in the perception of people with respect to the management of household solid waste in terms of generation, collection, segregation and disposal" was confirmed in case of LIG vs MIG, LIG vs HIG, and MIG vs HIG indicating the acceptance of the hypothesis-2 with respect to item-22 of the Solid Waste Management System.

Item 23: Banning of Plastic Bags at Source of Production:

Analysis of item-23 revealed that there exist no significant differences in perception of the respondents on "banning of plastic bags at source of production is practicable" between LIG vs MIG, LIG vs HIG, and MIG vs HIG as evident from analysis

of the mean item scores of LIG vs MIG, and LIG vs HIG and MIG vs HIG. It revealed that there was no significant difference in the perception level of the respondents from the three mentioned income groups about the banning of plastic bags at source of production. Since the mean item score ranged from 3.45 to 3.80, it indicated that people are in favour of banning of plastic bags at source of production rather than enforcing the law on the people not to use the plastic bags. In fact plastic bags when available in the market, people find it more convenient to use them. Hence the hypothesis-2 which stated that "there exist no significant differences in the perception of people with respect to the management of household solid waste in terms of generation, collection, segregation and disposal" was confirmed in case LIG vs MIG, LIG vs HIG, and MIG vs HIG indicating the acceptance of the hypothesis-2 with respect to item-23 of the Solid Waste Management System.

Item 24: Reduction in Generation of Waste at the Household Level:

Analysis of item-24 revealed that there exist no significant differences in perception of the respondents on "generation of waste can be reduced at the household level" between LIG vs MIG, LIG vs HIG, and MIG vs HIG as evident from analysis of the mean item scores of LIG vs MIG, LIG vs HIG and MIG vs HIG. It revealed that there was no significant difference in the perception level of the respondents from the three mentioned income groups about the reduction in generation of waste at the household level. Since the mean item score ranged from 3.91 to 3.95, it indicated that people are in a positive state of mind to reduce the generation of waste at the household level. In fact this is not a real preposition, but once effort is made to segregate the waste into bio-gradable, non biodegradable and toxic wastes at the household level, ultimately the waste generation

would be reduced. Reuse of good quality plastics and papers can also reduce the amount of waste. Waste reduction at source also means the use of biodegradable waste as manure for useful purposes. Hence the hypothesis-2 which stated that "there exist no significant differences in the perception of people with respect to the management of household solid waste in terms of generation, collection, segregation and disposal" was confirmed in case of LIG vs MIG, LIG vs HIG, and MIG vs HIG indicating the acceptance of the hypothesis -2 with respect to item-24 of the Solid Waste Management System.

Item 25:Waste Generation can be Reduced Significantly by Educational Intervention:

Analysis of item-25 revealed that there exist no significant differences in the perception of the respondents on "waste generation can be reduced significantly by educational intervention" between LIG vs HIG and MIG vs HIG, as evident from analysis of the mean item scores of LIG vs HIG and MIG vs HIG. It revealed that there was no significant difference in the perception level of the respondents from the two above mentioned income groups about the Waste generation can be reduced significantly by educational intervention Further the data revealed that there existed significant differences of perception between LIG vs MIG on this item. This indicated that LIG and MIG groups were having different perception on whether waste generation can be reduced significantly by educational intervention than the LIG Group. Since the mean item score ranged from 3.81 to 4.19, it indicated that the people are in favour of educational intervention for reduction of solid waste. Hence the hypothesis-2 which stated that "there exist no significant differences in the perception of people with respect to the management of household solid waste in terms of generation, collection, segregation and disposal" was

confirmed in case of LIG vs HIG and MIG vs HIG indicating the partial acceptance of the hypothesis-2 with respect to item-25 of the Solid Waste Management System.

Item 26: Proper Handling and Collection of Waste require Cooperation from Public:

Analysis of item-26 revealed that there exist no significant differences in the perception of the respondents on "proper handling and collection of waste require extensive cooperation from the public" between the mean scores of LIG vs HIG and MIG vs HIG as evident from analysis of the mean item scores. Again the mean scores revealed that there existed significant differences in the perception of the respondents on "proper handling and collection of waste require extensive cooperation from the public" between the mean scores of LIG vs MIG. The mean item score varied from 4.163 to 4.390 from LIG to MIG. It indicated that MIG respondents feel that proper handling and collection of waste require extensive cooperation from the public than HIG and LIG respondents. Hence, the hypothesis which stated that "there exist no significant differences in the perception of people on solid waste management amongst different income groups" was confirmed in case of LIG vs HIG and MIG vs HIG respondents of Shillong indicating partial acceptance of the hypothesis-2 with respect to item-26 of the Solid Waste Management System.

Item 27: Awareness of the Usefulness of Recycling of Waste Products:

Analysis of item-27 revealed that there exist no significant differences in perception of the respondents on "people are aware of the usefulness of recycling of waste products" between LIG vs HIG and MIG vs HIG, as evident from analysis of the mean

item scores of LIG vs HIG and MIG vs HIG. It revealed that there was no significant difference in the perception level of the respondents from the two above mentioned income groups about the awareness of the usefulness of recycling of waste products. Further the data revealed that there existed significant differences of perception between LIG vs MIG on this item. This indicated that LIG vs MIG groups were having difference in perception about awareness of the usefulness of recycling of waste products than the HIG Group. The mean item score ranged from 3.11 to 3.53, and it is just above the average mean. It indicated that the people are not much aware of the usefulness of recycling of waste products. Hence the hypothesis-2 which stated that "there exist no significant differences in the perception of people with respect to the management of household solid waste in terms of generation, collection, segregation and disposal" was confirmed in case of LIG vs HIG and MIG vs HIG indicating the partial acceptance of the hypothesis-2 with respect to item-27 of the Solid Waste Management system.

Item 28: Values and Attitudes of People with regard to Solid Waste Management:

Analysis of item-28 revealed that there exist no significant differences in perception of the respondents on "values and attitudes of people have not changed with regard to solid waste management over the years" between LIG vs MIG, LIG vs HIG and MIG vs HIG, as evident from the analysis of the mean item scores of LIG vs MIG, LIG vs HIG and MIG vs HIG. It revealed that there was no significant difference in the perception level of the respondents from all the three mentioned income groups about the values and attitudes of people have not changed with regard to SWM. The mean item score ranged from 2.41 to 2.80 which are below the average mean. It indicated that the values and

attitudes of people have not changed with regard to solid waste management over the years. Hence the hypothesis-2 which stated that "there exist no significant differences in the perception of people with respect to the management of household solid waste in terms of generation, collection, segregation and disposal" was confirmed in case of LIG vs MIG, LIG vs HIG and MIG vs HIG indicating the acceptance of the hypothesis-2 with respect to item-28 of the Solid Waste Management system.

Item 29: Solid Waste Generation and Handling in the Slum Areas is Alarming:

Analysis of item-29 revealed that there exist no significant differences in perception of the respondents on "solid waste generation and handling in the slum areas is alarming" between LIG vs HIG and MIG vs HIG, as evident from the analysis of the mean item scores of LIG vs HIG and MIG vs HIG. It revealed that there was no significant difference in the perception level of the respondents from the two mentioned income groups about the solid waste generation and handling in the slum areas is alarming. Also the data revealed that there existed significant differences in the mean item scores between LIG vs MIG. The mean item score ranged from 3.91 to 4.20 which are much above the average mean. It indicated that the solid waste generation and handling in the slum areas has reached an alarming proportion. Hence the hypothesis-2 which stated that "there exist no significant differences in the perception of people with respect to the management of household solid waste in terms of generation, collection, segregation and disposal" was confirmed in case of LIG vs HIG and MIG vs HIG indicating the partial acceptance of the hypothesis-2 with respect to item-29 of the Solid Waste Management system.

Item 30: One should Pay for the Disposal of Garbage:

Analysis of item-30 revealed that there exist no significant differences in perception of the respondents on "One should pay for the disposal of garbage" between LIG vs MIG, LIG vs HIG and MIG vs HIG, as evident from the analysis of the mean item scores of LIG vs MIG, LIG vs HIG and MIG vs HIG. It revealed that there was no significant difference in the perception level of the respondents from all the three mentioned income groups about the willingness for payment for the disposal of garbage. Again, the mean item score ranged from 3.00 to 3.32 which are just above the mean. It indicated that the willingness to pay for the disposal of garbage was more profound in case of MIG rather than the LIG and HIG respondents. Among all the groups the HIG respondents was more reluctant to pay for the disposal of the garbage. Hence the hypothesis-2 which stated that "there exist no significant differences in the perception of people with respect to the management of household solid waste in terms of generation, collection, segregation and disposal" was confirmed in case of LIG vs MIG, LIG vs HIG and MIG vs HIG indicating the acceptance of the hypothesis-2 with respect to item-30 of the Solid Waste Management system.

Item 31: Waste Products from the Household should be collected for Recycling after Segregation:

Analysis of item-31 revealed that there exist no significant differences in the perception of the respondents on "waste products from the household should be collected for recycling after segregation" between LIG vs MIG, LIG vs HIG and MIG vs HIG, as evident from the analysis of the mean item scores of LIG vs MIG, LIG vs HIG and MIG vs

HIG. It revealed that there was no significant difference in the perception level of the respondents from all the three mentioned income groups about the waste products from the household should be collected for recycling after segregation. Again, the mean item score ranged from 3.55 to 3.63. It indicated that MIG group were in favour of "waste products from the household should be collected for recycling after segregation" than LIG and HIG group. Further the awareness level of the MIG was higher than that of LIG and MIG about the recycling of wastes after segregation. Hence the hypothesis-2 which stated that "there exist no significant differences in the perception of people with respect to the management of household solid waste in terms of generation, collection, segregation and disposal" was confirmed in case of LIG vs MIG, LIG vs HIG and MIG vs HIG indicating the acceptance of the hypothesis-2 with respect to item-31 of the Solid Waste Management system.

Item 32: The Locality has a Proper System of Garbage Disposal:

Analysis of item-32 revealed that there exist significant differences in perception of the respondents on "the locality has a proper system of garbage disposal" between MIG vs HIG, as evident from the analysis of the mean item scores of MIG vs HIG. It revealed that there was significant difference in the perception level of the respondents from the two mentioned income groups about the locality has a proper system of garbage disposal. Also the data revealed that there existed no significant differences in the mean item scores between LIG vs MIG and LIG vs HIG. The mean item score ranged from 2.87 to 3.30. It indicated that the locality has yet to develop a proper system of garbage disposal. Hence the hypothesis-2 which stated that "there exist no significant differences in the perception of people with respect to the management of household solid waste in terms of generation,

collection, segregation and disposal" was confirmed in case of LIG vs MIG and LIG vs HIG indicating the partial acceptance of the hypothesis-2 with respect to item-32 of the Solid Waste Management system.

Item 33: Consumer Lifestyle is Responsible for more Generation of Waste:

Analysis of item-33 revealed that there exist significant differences in the perception of the respondents on "consumer lifestyle is responsible for more generation of waste" between LIG vs MIG, as evident from the analysis of the mean item scores of LIG and MIG. It revealed that there was significant difference in the perception level of the respondents from the two mentioned income groups about the consumer lifestyle is responsible for more generation of waste. Also the data revealed that there existed no significant differences in the mean item scores between LIG vs HIG and MIG vs HIG. The mean item score ranged from 1.94 to 3.35. It indicated that the lower income group feels that HIG and MIG were more responsible for the generation of waste because of their lifestyle. Hence the hypothesis-2 which states that "there exist no significant differences in the perception of people with respect to the management of household solid waste in terms of generation, collection, segregation and disposal" was confirmed in case of LIG vs HIG and MIG vs HIG indicating the partial acceptance of the hypothesis-2 with respect to item-33 of the Solid Waste Management system.

Item 34: Neighbours are very much concerned about Solid Waste Disposal Problem in your Locality:

Analysis of item-34 revealed that there exist no significant differences in the perception of the respondents on "neighbours are very much concerned about solid waste disposal problem in your locality" between LIG vs MIG, LIG vs HIG and MIG vs HIG, as evident from the analysis of the mean item scores of LIG vs MIG, LIG vs HIG and MIG vs HIG. It revealed that there was no significant difference in the perception level of the respondents from all the three mentioned income groups about neighbours are very much concerned about solid waste disposal problem in the locality. Again, the mean item score ranged from 3.20 to 3.46. It indicated that the perception level of the respondents vary from MIG to LIG and the perception level of MIG was higher than that of LIG and HIG on 'neighbours are very much concerned about solid waste disposal problem in your locality'. Hence the hypothesis-2 which stated that "there exist no significant differences in the perception of people with respect to the management of household solid waste in terms of generation, collection, segregation and disposal" was confirmed in case of LIG vs MIG, LIG vs HIG and MIG vs HIG indicating the acceptance of the hypothesis-2 with respect to item-34 of the Solid Waste Management system.

Item 35: Sufficiency of Community Bins in the Locality:

Analysis of item-35 revealed that there exist no significant differences in the perception of the respondents on "the community bins provided in your locality is sufficient "between LIG vs MIG, LIG vs HIG and MIG vs HIG, as evident from the analysis of the mean item scores of LIG vs MIG, LIG vs HIG and MIG vs HIG. It revealed

that there were no significant difference in the perception level of the respondents from all the three mentioned income groups about the community bins provided in your locality is sufficient. Again, the mean item score ranged from 2.78 to 3.15. It indicated that the perception level of the respondents vary from HIG to LIG and the perception level of HIG was higher than that of MIG and LIG on the community bins provided in your locality is sufficient. The data revealed that all the three groups feel about the insufficiency of community bins in the community although this was more profound in case of LIG group. Hence the hypothesis-2 which stated that "there exist no significant differences in the perception of people with respect to the management of household solid waste in terms of generation, collection, segregation and disposal" was confirmed in case of LIG vs MIG, LIG vs HIG and MIG vs HIG indicating the acceptance of the hypothesis-2 with respect to item-35 of the Solid Waste Management system.

4.3 Main Findings Objective No. 3:

The item wise analysis of objective-3 comprising of 10 items was "to study the role of traditional Institutions in solid waste management" revealed the following trends with respect to the difference in perception of the respondents viz. Illiterate vs upto High School, Illiterate vs. Graduate, Illiterate vs. Post Graduate, upto High School vs. Graduate, upto High School vs. Post Graduate, Graduate vs. Post Graduate respondents. The items have been studied with reference to educational qualification of the respondents. For the purpose of the study, all the respondents from the four divisions were divided into four categories viz. Illiterate, High School, Graduate, and Post Graduate.

Item 36: The Dorbar Shnong take proper step for Disposal of Household Waste:

Analysis of item-36 revealed that there exist no significant differences in perception of the respondents on "the Dorbar Shnong take proper step for disposal of household waste" between Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post Graduate, High School vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate respondents of Shillong as evident from analysis of the mean item scores. It revealed that there was no difference in the perception level of the respondents from all the four educational groups about the Dorbar Shnong taking proper steps for disposal of household waste. The mean item score varied from 3.23 to 3.64 from High School passed to Illiterate respondents. It indicated that illiterate respondents perceive better than Post Graduate, Graduate and High School passed respondents on "the Dorbar Shnong taking proper steps for disposal of household waste". Hence the hypotheses-3 which stated that "there exist no significant differences in the opinion of educational groups with regard to the role of Traditional Institutions on solid waste management was confirmed in case of Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post Graduate, High School vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate respondents of Shillong indicating the acceptance of the hypothesis-3 with respect to item-36 of the Solid Waste Management system.

Item 37: Strictures, Rules and Regulations of the Dorbar with regard to Solid Waste Management is Appreciable:

Analysis of item-37 revealed that there exist no significant differences in perception of the respondents on "strictures, rules and regulations of the Dorbar with

regard to solid waste management is appreciable" between the mean scores of Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post graduate, High School vs Graduate, and Graduate vs Post Graduate of Shillong as evident from analysis of the mean item scores. It revealed that there were insignificant difference in the perception level of the respondents from the above educational groups about the "strictures, rules and regulations of the Dorbar with regard to solid waste management is appreciable". However, significant differences in the opinion of the respondents was observed in case of High School vs Post Graduate respondents on this item. As seen from the data, the mean item score varied from 3.02 to 3.45 from Post Graduate respondents to High School passed respondents. It indicated that High School passed respondents perceive better than Post Graduate, Graduate and Illiterate respondents on "the Dorbar Shnong taking proper steps for disposal of household waste". Hence the hypotheses-3 which stated that "there exist no significant differences in the opinion of educational groups with regard to the role of Traditional Institutions on solid waste management" was confirmed in case of Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post Graduate, High School vs Graduate, and Graduate vs Post Graduate respondents of Shillong indicating the partial acceptance of the hypothesis-3 with respect to item-37 of the Solid Waste Management system.

Item 38: Strictures, Rules and Regulations of the Dorbar with regard to Solid Waste Management is Strictly Enforced:

Analysis of item-38 revealed that there exist no significant differences in perception of the respondents on "strictures, rules and regulations of the Dorbar with regard to solid waste management is strictly enforced" between the mean scores of

Illiterate vs High school, Illiterate vs Graduate, Illiterate vs Post graduate and High School vs Graduate respondents of Shillong as evident from analysis of their mean item scores . It revealed that there were no difference in the perception level of the respondents of the above mentioned educational groups about the strictures, rules and regulations of the Dorbar with regard to solid waste management is strictly enforced. Again it was found that significant differences in perception with respect to strictures, rules and regulations of the Dorbar with regard to solid waste management is strictly enforced exist between High school vs Post Graduate and Graduate vs Post Graduate respondents. Analysis of mean item score revealed that the mean item score varied from 2.71 to 3.30 from Illiterate respondents to High School passed respondents to. It indicated that High School passed respondents perceive better than Post Graduate, Graduate and Illiterate respondents on "strictures, rules and regulations of the Dorbar with regard to solid waste management is strictly enforced". Hence the hypothesis-3 which stated that "there exist no significant differences in the opinion of educational groups with regard to the role of Traditional Institutions on solid waste management" was confirmed in case of Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post Graduate and High School vs Graduate respondents of Shillong indicating the partial acceptance of the hypothesis-3 with respect to item-38 of the Solid Waste Management system.

Item 39: Banning of Plastic Bags by Local Dorbars are Practicable:

Analysis of item-39 revealed that there exist no significant differences in perception of the respondents on "banning of plastic bags by local Dorbars is practicable " between the mean scores of Illiterate vs High School, Illiterate vs Graduate, Illiterate vs

Post Graduate and High School vs Post Graduate respondents as evident from analysis of the mean item scores . It revealed that there were no significant difference in the perception level of the respondents of the above mentioned educational groups about the practicability of banning of plastic bags by local Dorbars. Again it was found that significant difference in perception with respect to 'banning of plastic bags by local Dorbars are practicable' existed between High School vs Graduate and Graduate vs Post Graduate respondents. Analysis of mean item score revealed that the mean item score varies from 3.28 to 3.81 from Illiterate respondents to Graduate respondents. It indicated that Graduate respondents perceive better than Post Graduate, Graduate and Illiterate respondents on "banning of plastic bags by local Dorbars are practicable'. Hence the hypotheses 3 which states that "there exist no significant differences in the opinion of educational groups with regard to the role of Traditional Institutions on solid waste management" was confirmed in case of Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post Graduate and High School vs Post Graduate respondents of Shillong indicating the partial acceptance of the hypothesis-3 with respect to item-39 of the Solid Waste Management system.

Item 40: Efficiency of Locality Cleaning by Dorbar Shnongs is Satisfactory:

Analysis of item-40 revealed that there exist no significant differences in perception of the respondents on "efficiency of locality cleaning by Dorbar Shnong is satisfactory" between the mean scores of Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post Graduate, High School vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate Shillong as evident from analysis of the mean item scores. It revealed that there were insignificant difference in the perception level of the respondents

from six educational groups about the efficiency of locality cleaning by Dorbar Shnongs is satisfactory. As seen from the data, the mean item score varies from 3.29 to 3.64 from High School passed respondents to Illiterate respondents. It indicated that High School respondents perceive better than Post Graduate, Graduate and Illiterate respondents on "efficiency of locality cleaning by Dorbar Shnongs is satisfactory". Hence the hypotheses-3 which stated that "there exist no significant differences in the opinion of educational groups with regard to the role of Traditional Institutions on solid waste management" was confirmed in case of Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post Graduate, High School vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate respondents of Shillong indicating the acceptance of the hypothesis-3 with respect to item-40 of the Solid Waste Management system.

Item 41: Local Dorbars can play a Major Role in Solid Waste Management:

Analysis of item-41 revealed that there exist no significant differences in perception of the respondents on "local Dorbars can play a major role in solid waste management" between the mean scores of Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post Graduate, High School vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate respondents of Shillong as evident from analysis of the mean item scores. It revealed that there were insignificant difference in the perception level of the respondents from six educational groups about the Local Dorbars can play a major role in solid waste management. As seen from the data, the mean item score varied from 4.12 to 4.22 from high school passed respondents to illiterate respondents. It indicated that Illiterate respondents perceive better than Post Graduate, Graduate and High School passed

respondents on "local Dorbars can play a major role in solid waste management". Hence the hypotheses-3 which stated that "there exist no significant differences in the opinion of educational groups with regard to the role of Traditional Institutions on solid waste management" was confirmed in case of Illiterate vs High school, Illiterate vs Graduate, Illiterate vs Post graduate, High School vs Graduate, High School vs Post Graduate and Graduate vs Post graduate respondents of Shillong indicating the acceptance of the hypothesis-3 with respect to item-41 of the Solid Waste Management system.

Item 42: Polybag Campaigns by NGOs and Local Dorbars have Significant effect on Solid Waste Management:

Analysis of item-42 revealed that there exist no significant differences in perception of the respondents on "polybag campaigns by NGOs and local Dorbars have significant effect on solid waste management" between the mean scores of Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post graduate, High School vs Graduate, High school vs Post Graduate and Graduate vs Post Graduate of Shillong as evident from analysis of the mean item scores. It revealed that there were insignificant difference in the perception level of the respondents from six educational groups about the polybag campaigns by NGOs and local Dorbars have significant effect on solid waste management. As seen from the data, the mean item score varied from 3.21 to 3.73 from Illiterate respondents to Post Graduate respondents. It indicated that Post Graduate respondents perceive better than Graduate, High School passed respondents and Illiterate on "polybag campaigns by NGOs and local Dorbars have significant effect on solid waste management". Hence the hypothesis-3 which states that "there exist no significant

differences in the opinion of educational groups with regard to the role of Traditional Institutions on solid waste management" was confirmed in case of Illiterate vs High school, Illiterate vs Graduate, Illiterate vs Post Graduate, High School vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate respondents of Shillong indicating the acceptance of the hypothesis-3 with respect to item-42 of the Solid Waste Management system.

Item 43: The Local Dorbar should Work in close Coordination with the Government and Other Agencies:

Analysis of item-43 revealed that there exist no significant differences in perception of the respondents on "the Local Dorbar should work in close coordination with the Government and other agencies" between the mean scores of Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post Graduate, High School vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate respondents of Shillong as evident from analysis of the mean item scores. It revealed that there were insignificant difference in the perception level of the respondents from the above six educational groups about the "the Local Dorbar should work in close coordination with the Government and other agencies". As seen from the data, the mean item score varied from 2.95 to 3.29 from Post Graduate respondents to High School passed respondents. It indicated that High School passed respondents perceive better than Illiterate, Graduate, and Post Graduate passed respondents on "the Local Dorbar should work in close coordination with the Government and other agencies". Hence the hypotheses-3 which stated that "there exist no significant differences in the opinion of educational groups with regard to the role of Traditional Institutions on

solid waste management" was confirmed in case of Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post graduate, High School vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate respondents of Shillong indicating the acceptance of the hypothesis-3 with respect to item-43 of the Solid Waste Management system.

Item 44: The Headman is the Appropriate Person to Inform about the Problem of Solid Waste in the Locality:

Analysis of item-44 revealed that there exist no significant differences in perception of the respondents on "the headman is the appropriate person to inform about the problem of solid waste in the locality" between the mean scores of Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post Graduate, High School vs Graduate, High School vs Post Graduate and Graduate vs Post Graduate respondents of Shillong as evident from analysis of the mean item scores. It revealed that there were insignificant difference in the perception level of the respondents from six educational groups about the "the headman is the appropriate person to inform about the problem of solid waste in the locality". As seen from the data, the mean item score varied from 3.71 to 4.20 from Illiterate respondents to Post Graduate respondents. It indicated that Post Graduate respondents perceive better than Graduate, High School passed respondents and Illiterate on "the headman is the appropriate person to inform about the problem of solid waste in the locality". Hence the hypotheses-3 which stated that "there exist no significant differences in the opinion of educational groups with regard to the role of Traditional Institutions on solid waste management" was confirmed in case of Illiterate vs High School, Illiterate vs Graduate, Illiterate vs Post Graduate, High School vs Graduate, High

School vs Post graduate and Graduate vs Post Graduate respondents of Shillong indicating the acceptance of the hypothesis-3 with respect to item-44 of the Solid Waste Management System.

Item 45: A Forum at the Community Level to Manage Garbage Problems:

Analysis of item-45 revealed that there exist no significant differences in the perception of the respondents on "a forum at the community level to manage garbage problems is necessary" between the mean scores of Illiterate vs upto High School, Illiterate vs Graduate, Illiterate vs Post Graduate, upto HS vs Graduate, upto High School vs Post Graduate and Graduate vs Post Graduate respondents of Shillong. This signified that there was no difference in the perception level of the respondents from all the four educational groups about having a forum at the community level to manage garbage problems in the community. The mean item score varied from 4.35 to 4.20. This implied that all the four educational groups are in favour of having a community forum to manage garbage problems. Hence the Hypothesis-3 which stated that "there exist no significant differences in the opinion of educational groups with regard to the role of Traditional Institutions on solid waste management" was confirmed in case of Illiterate vs upto High School, Illiterate vs Gradaute, Illiterate vs Post Graduate, upto HS vs Graduate, upto HS vs Post Gradauate and Graduate vs Post Gradauate respondents indicating the acceptance of hypothesis-3 with respect to item-44 of the Solid Waste Management System.

4.4 Main Findings Objective No. 4

The item wise analysis of objective-4 comprising of 14 items was "to study the method of solid waste management with respect to disposal and utilization pattern by the Municipal Board". The testing of the hypothesis was done on the basis of the responses of the respondents from slum, commercial, residential and hospital areas of Shillong, which revealed the following trends:

Item 46: Solid Waste Generated at Household Level is collected at Specific Intervals as Fixed by the Municipality:

Analysis of item-46 revealed that there exist no significant differences in perception of the respondents on "solid waste generated at household level is collected at specific intervals as fixed by the Municipality" between the mean scores of Slum vs Commercial, Slum vs Residential, Slum vs Hospital, Commercial vs Residential, Commercial vs Hospital and Residential vs Hospital areas of Shillong as evident from analysis of the mean item scores. It revealed that there were insignificant differences in the perception level of the respondents from slum, commercial, residential and hospital areas of Shillong about the solid waste generated at household level is collected at specific intervals as fixed by the Municipality. As seen from the data, the mean item score varied from 3.56 to 4.15 from Hospital area Residents to Commercial areas Residents. It indicated that Municipality takes more care about Commercial areas followed by Residential areas, Slum areas and lastly the Hospital areas. Perhaps Hospital areas accumulate more Hospital wastes which are directly dumped in the drain or in the nearby stream. Hence the hypothesis-4 which stated that "there exist no significant differences in the method of solid

waste management with respect to disposal and utilization pattern by the Municipal Board" was confirmed in case of Slum vs Commercial, Slum vs Residential, Slum vs Hospital, Commercial vs Residential, Commercial vs Hospital and Residential vs Hospital residents of Shillong indicating the acceptance of the hypothesis-4 with respect to item-46 of the Solid Waste Management system.

Item 47: Do you use the Services of the Municipal Truck for Disposal of Waste:

Analysis of item-47 revealed that there exist no significant differences in the opinion of the respondents between Slum vs Commercial, Slum vs Residential and Commercial vs Residential area respondents on using the services of the Municipal truck for the disposal of waste whereas significant differences in this item was found between Slum vs Hospital, Commercial vs Hospital and Residential vs Hospital residents of Shillong. The mean item score varied from 2.43 to 3.62 from Hospital are residents to Slum area residents. It indicated that Slum area residents use the services of Municipal truck for disposal of waste than Commercial, Residential and Hospital area residents. Hence the hypothesis-4 which stated that "there exist no significant differences in the method of solid waste management with respect to disposal and utilization pattern by the Municipal Board" was confirmed in case of Slum vs Commercial, Slum vs Residential and Commercial vs Residential area indicating partial acceptance of hypothesis-4 with respect to item-47 of the Solid Waste Management system.

Item 48: Does the Municipality take Adequate Measures for Collection of Household Waste:

Analysis of item-48 revealed that there exist no significant difference in the perception of the respondents on "the Municipality takes adequate measures for collection of household waste" between the mean scores of Slum vs Hospital and Commercial vs Residential area respondents whereas significant difference was found between Slum vs Commercial, Slum vs Residential, Commercial vs Hospital and residential vs Hospital residents of Shillong on this item. The mean score varied from 2.33 to 3.46 from Hospital to Commercial area respondents. This indicated that the Municipality takes adequate measures for collection of household waste in commercial areas more than that of Residential, Slum and Hospital areas. Hence, the hypothesis-4 which stated that "there exist no significant differences in the method of solid waste management with respect to disposal and utilization pattern by the Municipal Board" was confirmed in case of Slum vs Hospital and Commercial vs Residential areas of Shillong indicating the partial acceptance of hypothesis-4 with respect to item-48 of the Solid Waste Management system.

Item 49: The Method of Disposal of Waste by Municipal Authority is Satisfactory:

Analysis of item-49 revealed that there exist no significant differences in perception of the respondents on "the method of disposal of waste by Municipal Authority is satisfactory" between the mean scores of Slum vs Commercial, Slum vs Residential, Slum vs Hospital and Residential vs Hospital areas of Shillong whereas there exist significant differences between the mean scores of Commercial vs Residential and Commercial vs Hospital areas of Shillong on this item. As seen from the data, the mean

item score varied from 3.16 to 3.90 from Hospital area residents to Commercial areas residents. It indicated that Municipality Commercial area residents are more satisfied with the method of disposal of waste by the municipal authority than Residential, Slum and Hospital areas of Shillong. Hence the hypothesis-4 which stated that "there exist no significant differences in the method of solid waste management with respect to disposal and utilization pattern by the Municipal Board" was confirmed in case of Slum vs Commercial, Slum vs Residential, Slum vs Hospital and Residential vs Hospital areas of Shillong indicating the partial acceptance of the hypothesis-4 with respect to item-49 of the Solid Waste Management system.

Item 50: Efficiency of Street Cleaning by Municipality is Satisfactory:

Analysis of item-50 revealed that there exist no significant differences in the perception of the respondents on "efficiency of street cleaning by Municipality is satisfactory" between the mean scores of Slum vs Commercial, Slum vs Residential, Slum vs Hospital, Commercial vs Residential, Commercial vs Hospital and Residential vs Hospital areas of Shillong as evident from analysis of the mean item scores. It revealed that there were insignificant differences in the perception level of the respondents from Slum, Commercial, Residential and Hospital areas of Shillong about the "efficiency of street cleaning by Municipality is satisfactory". As seen from the data, the mean item score varies from 2.89 to 3.34 from Slum area residents to Commercial areas residents. It indicated that Municipality takes more care about Commercial areas followed by Residential areas, Hospital areas and lastly the Slum areas as for as street cleaning is concerned. Hence the hypothesis-4 which stated that "there exist no significant differences

in the method of solid waste management with respect to disposal and utilization pattern by the Municipal Board" was confirmed in case of Slum vs Commercial, Slum vs Residential, Slum vs Hospital, Commercial vs Residential, Commercial vs Hospital and Residential vs Hospital residents of Shillong indicating the acceptance of the hypothesis-4 with respect to item-50 of the Solid Waste Management system.

Item 51: The Shillong Municipality should have a Proper Sanitary Landfill:

Analysis of item-51 revealed that there exist significant differences in the perception of the respondents on "the Shillong municipality should have a proper sanitary landfill" between the mean scores of Slum vs Commercial, Slum vs Residential and Slum vs Hospital areas of Shillong whereas there existed no significant differences between the mean scores of commercial vs residential, Commercial vs hospital and residential vs hospital of Shillong on this item. As seen from the data, the mean item score varied from 3.29 to 4.23 from Slum area residents to Hospital area residents. It indicated that majority of respondents of all the areas are of the opinion that there exist a proper sanitary landfill by the Shillong municipality. Hence the hypothesis-4 which stated that "there exist no significant differences in the method of solid waste management with respect to disposal and utilization pattern by the Municipal Board" was confirmed in case of commercial vs residential, Commercial vs hospital and residential vs hospital of Shillong indicating the partial acceptance of the hypothesis-4 with respect to item-51 of the Solid Waste Management system.

Item 52: The Construction of Incinerators by Municipality at selected Sites is Necessary for Disposal of Waste:

Analysis of item-52 revealed that there exist no significant differences in opinion of the respondents on "the construction of incinerators by Municipality at selected sites is necessary for disposal of waste" between the mean scores of Slum vs Commercial, Slum vs Residential, Slum vs Hospital and Commercial vs Residential areas of Shillong whereas there existed significant differences the mean scores of Commercial vs Hospital, and Residential, vs Hospital areas of Shillong on this item.. As seen from the data, the mean item score varied from 2.96 to 3.84 from Hospital area residents to Commercial area residents. It indicated that majority of respondents of all the areas are of the opinion that there is a need for construction of incinerators at selected sites for proper disposal of wastes. Hence the hypothesis-4 which stated that "there exist no significant differences in the method of solid waste management with respect to disposal and utilization pattern by the Municipal Board" was confirmed in case of Slum vs Commercial, Slum vs residential, Slum vs Hospital and Commercial vs Residential areas indicating the partial acceptance of the hypothesis-4 with respect to item-52 of the Solid Waste Management system.

Item 53: The Municipal should have a Common Bio-medical Waste Treatment Facility:

Analysis of item-53 revealed that there exist no significant differences in opinion of the respondents on "the Municipal should have a common bio-medical waste treatment facility" between the mean scores of Slum vs Commercial, Commercial vs Residential, Commercial vs Hospital and Residential vs Hospital areas of Shillong whereas significant differences was found in case of Slum vs Residential and Slum vs Hospital areas of

Shillong. The mean item score ranged from 2.86 to 3.50 from Slum area residents to Hospital area residents. It indicated that majority of respondents of all the areas are of the opinion that there is a need for construction of incinerators at selected sites for proper disposal of wastes. Hence the hypothesis-4 which stated that "there exist no significant differences in the method of solid waste management with respect to disposal and utilization pattern by the Municipal Board" was confirmed in case of Slum vs Commercial, Commercial vs Residential, Commercial vs Hospital and Residential vs Hospital areas indicating the partial acceptance of the hypothesis-4 with respect to item-53 of the Solid Waste Management system.

Item 54: Municipality should Take Proper Measures and Steps in Recycling Initiatives:

Analysis of item-54 revealed that there exist significant differences in opinion of the respondents on "Municipality should take proper measures and steps in recycling initiatives between the mean scores of Slum vs Commercial and Commercial Vs Residential whereas no significant difference existed between the mean scores of Slum vs Residential, Slum vs Hospital, Commercial vs Hospital and Residential vs Hospital. Analysis of the mean score revealed that it varied from 3.35 to 4.03. This revealed that majority of the respondents are of the opinion that Municipality should take proper measures and steps in recycling initiatives .This means that people of Shillong are aware of the importance of recycling units. Hence the hypothesis-4 which stated that "there exist no significant differences in the method of solid waste management with respect to disposal and utilization pattern by the Municipal Board" was confirmed in case of Slum vs

Residential, Slum vs Hospital, Commercial vs Hospital and Residential vs Hospital areas indicating the partial acceptance of the hypothesis-4 with respect to item-54 of the Solid Waste Management system.

Item 55: Non-Municipal Areas have no Proper Mechanism of Waste Disposal

Analysis of item-55 revealed that there exist no significant differences in the perception of the respondents on "non- Municipal areas have no proper mechanism of waste disposal" between the mean scores of Slum vs Commercial, Slum vs Residential, Slum vs Hospital, Commercial vs Residential, Commercial vs Hospital and Residential vs Hospital areas of Shillong as evident from analysis of the mean item scores. It revealed that there were insignificant differences in the opinion of the respondents from Slum, Commercial, Residential and Hospital areas of Shillong about the non-Municipal areas have no proper mechanism of waste disposal. As seen from the data, the mean item score varied from 3.53 to 4.03 from residential area residents to hospital areas residents. This revealed that the people of all the areas are in favour of having proper mechanisms for waste disposal. Hence the hypotheses-4 which stated that "there exist no significant differences in the method of solid waste management with respect to disposal and utilization pattern by the Municipal Board" was confirmed in case of Slum vs Commercial, Slum vs Residential, Slum vs Hospital, Commercial vs Residential, Commercial vs Hospital and Residential vs Hospital residents of Shillong indicating the acceptance of the hypothesis-4 with respect to item-55 of the Solid Waste Management system.

Item 56: The Municipality has taken Adequate Initiative for Garbage Disposal in the Locality:

The analysis of item-56 shows that there exist significant differences in the perception of the respondents on 'the municipality has taken adequate initiative for garbage disposal in the locality' between Slum vs Residential area respondents as evident from their mean item scores. The data further reveled that there exists no significant differences in the opinion of the respondents on 'the municipality has taken adequate initiative for garbage disposal in the locality' between Slum vs Commercial, Slum vs Hospital, Commercial vs Residential, Commercial vs Hospital, and Residential vs Hospital residents of Shillong as evident from the analysis of their mean item scores. Further the mean item score varied from 2.73 to 3.28 from Slum areas to Residential areas. This means the municipality takes adequate measures for the disposal of garbage in residential areas than hospital, commercial and slum areas of Shillong. Hence the hypothesis-4 which states that "there exist no significant differences in the opinion of the respondents of Slum, Commercial, Hospital and Residential areas on solid waste management by the Municipality" on item-56 was confirmed in case of Slum vs Commercial, Slum vs Hospital, Commercial vs Residential, Commercial vs Hospital, and Residential vs Hospital residents of Shillong whereas it was rejected in case of Slum vs Residential area respondents of Shillong indicating the partial acceptance of hypothesis-4 with respect to item-56 of the solid waste management system.

Item 57: Response of Municipal Authority to Complaints about Waste Disposal is Satisfactory:

The analysis of item-57 shows that there exist no significant differences in the perception of the respondents on 'response of municipal authority to complaints about waste disposal is satisfactory' between Slum vs Residential, Slum vs Commercial, Slum vs Hospital, Commercial vs Residential, Commercial vs Hospital, and Residential vs Hospital residents of Shillong as evident from the analysis of their mean item scores Further the mean item score varied from 2.60 to 2.95 from Residential areas to Hospital areas. This means that complaints are received more favorably in Hospital areas than Slum, Commercial and Residential areas. Hence the hypothesis 4 which states that "there exist no significant differences in the opinion of the respondents of Slum, Commercial, Hospital and Residential areas on solid waste management by the Municipality" on item-57 was confirmed in case of Slum vs Residential ,Slum vs Commercial, Slum vs Hospital, Commercial vs Residential, Commercial vs Hospital, and Residential vs Hospital residents of Shillong indicating the acceptance of hypothesis-4 with respect to item-57 of the solid waste management system.

Item 58: The Collection and Disposal of Solid Waste by Municipality in Slum Areas is more Problematic:

The analysis of item-58 shows that there exist no significant differences in the perception of the respondents on 'the collection and disposal of solid waste by municipality in slum areas is more problematic' between Slum vs Residential, Slum vs Commercial, Slum vs Hospital, Commercial vs Residential, Commercial vs Hospital, and Residential vs Hospital residents of Shillong as evident from the analysis of their mean

item scores Further the mean item score varied from 3.100 to 3.458 from Hospital areas to Residential areas. This means that collection and disposal of solid waste is more problematic in Slum areas as felt by the residential area respondents than Slum, Commercial and Hospital area residents. Hence the hypothesis 4 which states that "there exist no significant differences in the opinion of the respondents of Slum, Commercial, Hospital and Residential areas on solid waste management by the Municipality" on item-58 was confirmed in case of Slum vs Residential, Slum vs Commercial, Slum vs Hospital, Commercial vs Residential, Commercial vs Hospital, and Residential vs Hospital residents of Shillong indicating the acceptance of hypothesis-4 with respect to item-58 of the solid waste management system.

Item 59: The Shillong Municipality does not have Adequate Provision for Ensuring Appropriate Solid Waste Management:

The analysis of item-59 shows that there exist no significant differences in the perception of the respondents on 'the Shillong municipality does not have adequate provision for ensuring appropriate solid waste management' between Slum vs Commercial, and Commercial vs Residential area respondents of Shillong as evident from the analysis of their mean item scores. The data further reveled that there exists significant differences in the opinion of the respondents on item-59 between 'Slum vs Residential, Slum vs Hospital, Commercial vs Hospital and Residential vs Hospital residents of Shillong as evident from the analysis of their mean item scores. Further the mean item score varied from 2.76 to 4.00 from Hospital areas to slum areas. This means that the respondents of Hospital areas feel that the Shillong municipality does not have adequate

provision for appropriate solid waste management and it was felt more by the Slum area respondents than that of Commercial, Residential and Hospital area respondents of Shillong. Hence the hypothesis 4 which states that "there exist no significant differences in the opinion of the respondents of Slum, Commercial, Hospital and Residential areas on solid waste management by the Municipality" on item-59 was confirmed in case of Slum vs Commercial, and Commercial vs Residential area respondents of Shillong indicating the partial acceptance of hypothesis-4 with respect to item-59 of the solid waste management system.

4.5 Main Findings Objective No. 5

The item wise analysis of objective-5 comprising of 09 items that was "to study the existing strictures, rules, and regulations, environmental planning, coordination, IEC components and other institutional arrangements for solid waste management at the Governmental level" revealed the following trends with respect to the differences of respondents viz. Sex and their Age group.

Item 60: Strictures, Rules and Regulations of the Government with regard to Solid Waste Management is Appreciable:

Analysis of item-60 revealed that there exist significant differences in opinion of the Male and Female respondents on "strictures, rules and regulations of the government with regard to solid waste management is appreciable" as evident from the analysis of mean items scores. Further the mean item scores indicated that Female respondents appreciated the strictures, rules and regulations of the government with regard to solid

waste management more than that of the Male respondents. The mean item score varied from 3.190 to 3.497. It indicated that the appreciability of strictures, rules and regulations are more in case of Females than the Males. Hence the hypothesis-5 which stated that "there exist no significant differences in the opinion of the respondents on the role of the government on solid waste management with respect to the respondent's sex and age group" was rejected in case of Male vs Female respondents with respect to item-60 of the Solid Waste Management system.

Again, analysis of item-60 revealed that there exist no significant differences in the opinion of the respondents on "strictures, rules and regulations of the government with regard to solid waste management is appreciable" as evident from the analysis of mean item scores of respondents of less than 35 years vs 35-55 years, less than 35 years vs above 55 years and 35-55 years vs above 55 years. The mean item scores indicated that the strictures, rules and regulations of the government with regard to solid waste management is appreciated more by the respondents of less than 35 years followed by 35-55 years and above 55 years respectively. However, the mean item scores ranged from 3.241 to 3.492. This indicated that the responds do appreciate the strictures, rules and regulations of the government with regard to solid waste management to an appreciable extent. Hence the hypothesis-5 which stated that "there exist no significant differences in the opinion of the respondents on the role of the government on solid waste management with respect to the respondent's sex and age group", was confirmed in case of respondents of less than 35 years vs 35-55 years, less than 35 years vs above 55 years and 35-55 years vs above 55 years indicating the acceptance of the hypothesis-5 with respect to item-60 of the Solid Waste Management system.

Item 61: Strictures, Rules and Regulations of the Government with regard to Solid Waste Management is Strictly Enforced:

Analysis of item-61 revealed that there existed significant differences in the opinion of the respondents on "strictures, rules and regulations of the government with regard to solid waste management is strictly enforced" between Male vs Female respondents as evident from analysis of the mean item scores. It revealed that there existed difference in opinion of the Male and Female respondents on enforcement of strictures, rules and regulations of the government with regard to solid waste management. Since the mean item score ranged from 2.742 to 3.206, the respondents opinion about enforcement of strictures, rules and regulations of the government is not appropriate. Hence, the hypothesis-5 which stated that "there exist no significant differences in the opinion of the respondents on the role of the government on solid waste management with respect to the respondent's sex and age group" was not confirmed in case of Male vs Female respondents indicating the rejection of the hypothesis-5 with respect to item-61 of the Solid Waste Management system.

Again analysis of item-61 revealed that there existed no significant differences in perception of the respondents on "strictures, rules and regulations of the government with regard to solid waste management is strictly enforced" between respondents of less than 35 years vs above 55 years and 35-55 years vs above 55 years as evident from the analysis of the mean item scores of respondent of less than 35 years vs 35-55 years, less than 35 years vs above 55 years and 35-55 years vs above 55 years. It revealed that there were no differences in the opinion of the respondents on enforcement of strictures, rules and regulations of the government on solid waste management between respondents of less

than 35 years vs above 55 years and respondents of 35-55 years vs above than 55 years. Further analysis revealed that significant differences in opinion existed between respondents of less than 35 years vs 35-55 years age group. The mean item scores ranged from 3.098 to 2.821. This indicated that the enforcement of strictures, rules and regulations are not enforced to the desired extent. Hence, the hypothesis-5 which stated that "strictures, rules and regulations of the government with regard to SWM is strictly enforced" was confirmed in case of respondents of less than 35 years vs above 55 years and 35-55 years vs above 55 years whereas it was not confirmed in case of respondents of less than 35 years vs 35-55 years indicating the partial acceptance of hypothesis-5 with regard to item-61 of the Solid Waste Management system.

Item 62: People should be Penalized for Violating Government Rules and Norms with regard to Solid Waste:

Analysis of item-62 revealed that there exist significant differences between the mean item scores of Male vs Female on "people should be penalized for violating Government rules and norms with regard to solid waste management". The mean item score varied from 3.84 to 4.08 from Female to Male respondents. The analysis of mean item score showed that Male respondents are in favour of penalties rather than the Female respondents. Hence, the hypothesis-5 which stated that "there exist no significant differences in the opinion of the respondents on the role of the government on solid waste management with respect to the respondent's sex and age group" was rejected in case of Male vs Female respondents with respect to item-62 of the Solid Waste Management system.

Again analysis of item-62 revealed that there existed no significant differences in the opinion of the respondents on "people should be penalized for violating Government rules and norms with regard to solid waste management" as evident from the analysis of mean item scores of respondents of less than 35 years vs 35-55 years, less than 35-55 years vs above 55 years and 35-55 years vs above 55 years. The mean item scores ranged from 3.92 to 3.98. This indicated that respondents of different age groups are in favour of impositions of penalties for violating government rules and norms with regard to solid waste management. Hence, the hypothesis-5 which stated that "there exist no significant differences in the opinion of the respondents on the role of the government on solid waste management with respect to the respondent's sex and age group" was accepted in case of respondents of different age groups with respect to item-62 of SWM system.

Item 63: Banning of Plastic Bags by the Government is Appreciable

Analysis of item-63 revealed that there exist no significant differences in the opinion of Male and Female respondents on "banning of plastic bags by the government is appreciable" as evident from the analysis of mean item scores of Male vs Female respondents. The mean item scores indicated that Male respondents are more in favour of banning plastic bags rather than Female employees. Hence the hypothesis-5 which stated that "there exist no significant differences in the opinion of the respondents on the role of the government on solid waste management with respect to the respondent's Sex and Age group" was accepted in case of Male vs Female respondents with respect to item-63 of the Solid Waste Management system.

Again the analysis of item-63 revealed that there exist no significant differences in the opinion of the respondents of different age groups on "banning of plastic bags by the government is appreciable" as evident from the analysis of mean item scores of respondents of less than 35 years vs 35-55 years, less than 35 years vs above 55 years and 35-55 years vs above above than 55 years. The mean item scores revealed that all the age group under the study are in favour of banning plastic bags by the government. Hence, the hypothesis-5 which stated that "there exist no significant differences in the opinion of the respondents on the role of the government on solid waste management with respect to the respondent's sex and age group" was accepted in case of respondents of less than 35 years vs 35-55 years, less than 35 years vs above 55 years and 35-55 years vs above than 55 years with respect to item 63 of the Solid Waste Management system.

Item 64: Government Solid Waste Management Plans is in Accordance with its Priorities for the Environment:

Analysis of item-64 revealed that there exist no significant differences in the opinion of the Male and Female respondents on "government solid waste management plans is in accordance with its priorities for the government" as evident from the analysis of mean item scores of Male vs Female. The mean item scores revealed the Male respondents opine that the government solid waste management plans is in accordance with its priorities for the environment than the Female respondents. Hence, the hypothesis-5 which stated that "there exist no significant differences in the opinion of the respondents on the role of the government on solid waste management with respect to the respondent's

sex and age group" was accepted in case of Male vs Female respondents with respect to item-64 of the Solid Waste Management system.

Again analysis of item-64 revealed that there exist no significant differences in the opinion of respondents of less than 35 years vs 35-55 years and respondents of 35-55 years vs above 55 years on "government solid waste management plans is in accordance with its priorities for the government" whereas significant differences in the opinion existed between respondents of less than 35 years vs above 55 years on this item. The mean item scores ranged from 3.464 to 2.929. This indicated that respondents of less than 35 years see that government solid waste management plans are in accordance with its priorities for the environment than respondents of 35-55 years age group and above 55 years age group. Hence the hypothesis-5 which stated that "there exist no significant differences in the opinion of the respondents on the role of the government on solid waste management with respect to the respondent's sex and age group" was partially accepted with respect to item-64 of the Solid Waste Management system.

Item 65: There is Lack of Clear-cut Coordination among different Departments of the Government in Solid Waste Management:

Analysis of item-65 revealed that there exist no significant differences in the opinion of the respondents on "there is a lack of clear-cut coordination among different departments of the government in solid waste management" as evident from the analysis of mean item scores. The mean item scores revealed that the Female respondents are more conscious about lack of coordination among different departments of the government in solid waste management rather the Male respondents. Hence the hypothesis-5, which

stated that "there exist no significant differences in the opinion of the respondents on the role of the government on solid waste management with respect to the respondent's sex and age group", was accepted with respect to item-65 of the Solid Waste Management system.

Again analysis of item-65 revealed that there exist no significant differences in the opinion of the respondents on "there is a lack of clear-cut coordination among different departments of the government in solid waste management" with respect to respondents of less than 35 years vs above 55 years and respondents of 35-55 years vs above 55 years whereas significant differences in the opinion existed between respondents of less than 35 years vs 35-55 years on this item. The mean item scores ranged from 3.021 to 3.344. This indicated that respondents of less than 35 years feel that there existed lack of coordination among different departments of the government in SWM more than respondents of above 55 years and 35-55 years age group. Hence, the hypothesis-5 which stated that "there exist no significant differences in the opinion of the respondents on the role of the government on solid waste management with respect to the respondent's sex and age group" was partially accepted with respect to item-65 of the Solid Waste Management system.

Item 66: Government should Educate, Train and Create Awareness on Solid Waste Management:

Analysis of item-66 revealed that there exist no significant differences in the opinion of Male vs Female respondents on "government should educate, train and create awareness on solid waste management". The mean item scores revealed that the Male respondents are more in favour of education, training and awareness on solid waste

management rather than Female respondents although there were no significant variations in opinions between them. Hence, the hypothesis-5 which stated that "there exist no significant differences in the opinion of the respondents on the role of the government on solid waste management with respect to the respondent's sex and age group" was accepted with respect to item-66 of the Solid Waste Management system.

Again analysis of item-66 revealed that there exist no significant differences in the opinion of respondents of less than 35 years vs 35-55 years and 35-55 years vs above 55 years on "government should educate, train and create awareness on solid waste management " whereas significant differences in the opinion of the respondents of less than 35 years vs above 55 years was inferred as evident from the mean item scores of different age groups on this item. As the mean item scores ranged from 3.16 to 3.69, all the different age groups are of the opinion that people should be educated, trained and made aware on management of solid wastes. Hence, the hypothesis which stated that "there exist no significant differences in the opinion of the respondents on the role of the government on solid waste management with respect to the respondent's sex and age group" was confirmed in case of respondents of less than 35 years vs 35-55 years and 35-55 years vs above 55 years whereas it was rejected in case of respondents of less than 35 years vs above 35 years indicating the partial acceptance of the hypothesis-5 with respect to item-66 of the Solid Waste Management system.

Item 67: Privatization not a Priority of the Government with regard to Solid Waste Management:

The analysis of item-67 revealed that there exist no significant differences in the opinion of Male vs Female respondents on "privatization not a priority of the government with regard to solid waste management " as evident from the analysis of mean item scores for this item. Further, the Male respondents feel it more in a stronger way than the Female respondents although there were no significant variations in the mean item scores of Male and Female respondents. Hence, the hypothesis-5 which stated that "there exist no significant differences in the opinion of the respondents on the role of the government on solid waste management with respect to the respondent's sex and age group" was accepted with respect to item-67 of the Solid Waste Management system.

Again analysis of item-67 revealed that there exist no significant differences in the opinion of respondents of less than 35 years vs 35-55 years, of less than 35 years vs above 55 years and of 35-55 years vs above 55 years on "privatization not a priority of the government with regard to solid waste management" as evident from the analysis of mean item scores of different age group. Further the mean item scores ranged from 3.52 to 3.64. It indicated that all the different age groups were of the opinion that privatization was not a priority of the government with regard to solid waste management. Hence the hypothesis-5 which stated that "there exist no significant differences in the opinion of the respondents on the role of the government on solid waste management with respect to the respondent's sex and age group" was accepted in case of respondents of less than 35 years vs 35-55 years, less than 35 years vs above 55 years and 35 -55 years vs above 55 years with respect to item-67 of the Solid Waste Management system.

Item 68: The State should collect Taxes with regard to Solid Waste Management:

Analysis of item-68 revealed that there exist no significant differences in the opinion of Male and Female respondents on "the state should collect taxes with regard to solid waste management" as evident from the analysis of mean item scores. As the mean ranged from 4.08 to 4.29, both the category of respondents are in favour of state to collect taxes on management of solid wastes. Hence, the hypothesis-5 which stated that the "there exist no significant differences in the opinion of the respondents on the role of the government on solid waste management with respect to the respondent's sex and age group" was accepted with respect to Male vs Female respondents with respect to item-68 of the Solid Waste Management system.

Again analysis of item-68 revealed that there existed significant differences in the opinion of the respondents of less than 35 years vs above 55 years and 35-55 years vs above 55 years on "the state should collect taxes with regard to solid waste management" as evident from the analysis of the mean item scores whereas there existed no significant differences in the opinion of the respondents of less than 35 years vs 35-55 years on this item. The mean item scores for this item ranged from 3.76 to 4.26. It indicated that respondents of less than 35 years were in a positive frame of mind to pay taxes with respect to solid waste management than respondents of 35-55 years and above 55 years. Hence the hypothesis-5 which stated that "there exist no significant differences in the opinion of the respondents on the role of the government on solid waste management with respect to the respondent's sex and age group" was accepted in case of respondents of less than 35 years vs 35-55 years whereas it was rejected in case of respondents of less than 35

years vs above 55 years and 35-55 years vs above 55 years indicating the partial acceptance of the hypothesis with respect to item-68 on Solid Waste Management system.

4.6 Main Findings Objective No. 6

The item wise analysis of objective-6 comprising of 11 items was "to assess the overall state of environment with respect to sanitation and health of the community". The testing of the hypothesis was done on the basis of the responses of the respondents viz. type of families and occupational groups. The main findings are as under:

Item 69: Control of Pests and Vectors is a Problem in Your Locality:

Analysis of item-69 revealed that there exist no significant differences in the opinion of the respondents of nuclear families and joint families on "control of pests and vectors is a problem in your locality" as evident from the analysis of the mean item scores. Further as the mean score ranged from 2.37 to 2.62, it revealed that the magnitude of the problem of pests and vectors are comparatively less. Hence the hypothesis which stated that "there existed no significant differences in the opinion of different families on solid waste management with respect to the state of environment in Shillong" was confirmed indicating the acceptance of hypothesis-6 with respect to item-69 of the Solid Waste Management system.

Again analysis of item-69 revealed that there exist no significant differences in opinion of the respondents on "control of pests and vectors is a problem in the locality" on analysis of their mean item scores based on different occupational groups viz. Government vs Private employees, Government vs Professional employees, Government vs. Other

employees, Private vs Professional employees, Private vs Other employees and Professional vs Other employees. It revealed that there was no difference of opinion of the different category of employees on control of pest and vectors as a problem in the locality in which they live. Again the mean item scores of the different occupational groups varied from 2.00 to 2.46. This indicated that the problem of vectors and pests are minimal in the different localities of Shillong. Hence the hypothesis-6 which stated that "there exists no significant differences in the opinion of different occupational groups on solid waste management" viz. Government vs Private employees, Government vs Professional employees, Government vs Other employees, Private vs Professional employees, Private vs Other employees and Professional vs Other employees indicated the acceptance of hypothesis-6 with respect to item-69 of the Solid Waste Management system.

Item 70: Door-to-Door Collection of Garbage is Environmentally Sound:

Analysis of item-70 revealed that there exist significant differences in the opinion of the respondents of nuclear families and joint families on "door to door collection of garbage is environmentally sound" as evident from the analysis of the mean item scores. Further as the mean score ranged from 3.24 to 3.62, it revealed that respondents of both nuclear and joint families are in favour of door to door collection of garbage and they feel that it is nevertheless environmentally sound although the variations of mean item scores are significant. Hence the hypothesis which stated that "there existed no significant differences in the opinion of different families on solid waste management with respect to the state of environment in Shillong" was not confirmed indicating the rejection of the hypothesis-6 with respect to item-70 of the Solid Waste Management system.

Again analysis of item-70 revealed that there exist no significant differences in opinion of the respondents on "door to door collection of garbage is environmentally sound" on analysis of their mean item scores based on different occupational groups viz. Government vs Private employees, Government vs Professional employees, Government vs Other employees, Private vs Professional employees, Private vs Other employees and Professional vs Other employees. It revealed that there was no difference of opinion of the different category of employees on "door to door collection of garbage is environmentally sound". Again the mean item scores of the different occupational groups varied from 3.26 to 3.38. This indicated that people of different occupational groups are in favour of door to door collection of garbage and they feel that this would make the environment clean. Hence the hypothesis-6 which stated that "there exists no significant differences in the opinion of different occupational groups on solid waste management" viz. Government vs Private employees, Government vs Professional employees, Government vs Other employees, Private vs Professional employees, Private vs Other employees and Professional vs Other employees indicating the acceptance of hypothesis-6 with respect to item-70 of the Solid Waste Management system.

Item 71: The Community Storage System is an Eyesore:

Analysis of item-71 revealed that there exist no significant differences in the opinion of the respondents of nuclear families and joint families on "the community storage system is an eyesore" as evident from the analysis of the mean item scores. Further as the mean score ranged from 2.60 to 2.65, it revealed that respondents of both nuclear and joint families are of clear opinion that the community storage system is an eyesore.

Hence the hypothesis which stated that "there existed no significant differences in the opinion of different families on solid waste management with respect to the state of environment in Shillong" was confirmed indicating the acceptance of the hypothesis-6 with respect to item-71 of the Solid Waste Management system.

Again analysis of item-71 revealed that there exist significant differences in opinion of the respondents on "the community storage system is an eyesore" on analysis of their mean item scores based on different occupational groups viz. Government vs Private employees, Government vs Professional employees, and Government vs Other employees whereas no significant differences in opinion was found between Private vs Professional employees, Private vs Other employees and Professional vs Other employees. It revealed that there was difference of opinion of the different category of employees on "the community storage system is an eye shore. Again the mean item scores of the different occupational groups varied from 2.35 to 3.00. This indicated that people of different occupational groups are of the unanimous opinion that the community storage system is an eyesore. Hence the hypothesis-6 which stated that "there exists no significant differences in the opinion of different occupational groups on solid waste management" was confirmed in case of Private vs Professional employees, Private vs Other employees and Professional vs Other employees indicating the partial acceptance of hypothesis-6 with respect to item-71 of the Solid Waste Management system.

Item 72: Lack of Concern about Overall Quality of the Environment is Conspicuous:

Analysis of item-72 revealed that there exist no significant differences in the opinion of the respondents of nuclear families and joint families on "lack of concerns

about the quality of the environment is conspicuous" as evident from the analysis of the mean item scores. Further as the mean score ranged from 2.21 to 2.27, it revealed that respondents of both nuclear and joint families are of clear opinion that there is clear-cut lack of concern about the quality of environment in Shillong among the Shillongites. Hence the hypothesis which stated that "there existed no significant differences in the opinion of different families on solid waste management with respect to the state of environment in Shillong" was confirmed indicating the acceptance of the hypothesis-6 with respect to item-72 of the Solid Waste Management system.

Again analysis of item-72 revealed that there exist no significant differences in opinion of the respondents on "lack of concern about overall quality of the environment is conspicuous" on analysis of their mean item scores based on different occupational groups viz. Government vs Private employees, Government vs Professional employees, Government vs Other employees, Private vs Professional employees, Private vs Other employees and Professional vs Other employees. It revealed that there was no difference of opinion of the different category of employees on "lack of concerns about overall quality of the environment is conspicuous". Again the mean item scores of the different occupational groups varied from 2.19 to 2.27. This indicated that people of different occupational groups are least conspicuous about the overall quality of environment of Shillong. Hence the hypothesis-6 which stated that "there exists no significant differences in the opinion of different occupational groups on solid waste management" viz. Government vs Private employees, Government vs Professional employees, Government vs Other employees, Private vs Professional employees, Private vs Other employees and

Professional vs Other employees indicating the acceptance of hypothesis-6 with respect to item-72 of the Solid Waste Management system.

Item 73: Rag Picking and Scavenging is a Matter of Concern:

Analysis of item-73 revealed that there exist no significant differences in the opinion of the respondents of nuclear families and joint families on "rag picking and scavenging is matter of concern" as evident from the analysis of the mean item scores. Further as the mean score ranged from 2.50 to 2.71, it revealed that respondents of both nuclear and joint families are of less concern with respect to rag picking and scavenging. Hence the hypothesis which stated that "there existed no significant differences in the opinion of different families on solid waste management with respect to the state of environment in Shillong" was confirmed indicating the acceptance of the hypothesis-6 with respect to item-73 of the Solid Waste Management system.

Again analysis of item-73 revealed that there exist no significant differences in opinion of the respondents on "rag picking and scavenging is matter of concern' on analysis of their mean item scores based on different occupational groups viz. Government vs Private employees, Government vs Other employees, Private vs Other employees, Professional vs Other employees and Professional vs Other employees whereas significant differences in opinion was found between Government vs Professional employees and Private vs Professional employees. It revealed that there was difference of opinion of the different category of employees on "rag picking and scavenging is matter of concern". Again the mean item scores of the different occupational groups varied from 2.00 to 2.71. This indicated that people of different occupational groups are of less concern about rag

picking and scavenging". Hence the hypothesis-6 which stated that "there exists no significant differences in the opinion of different occupational groups on solid waste management" was confirmed in case of Government vs Private employees, Government vs Other employees, Private vs Other employees and Professional vs Other employees indicating the partial acceptance of hypothesis 6 with respect to item-73 of the Solid Waste Management system.

Item 74: Loading Waste into Trucks is Slow and Unhygienic:

Analysis of item-74 revealed that there exist no significant differences in the opinion of the respondents of nuclear families and joint families on "loading wastes into trucks is slow and unhygienic" as evident from the analysis of the mean item scores. Further as the mean score ranged from 3.10 to 3.30, it revealed that respondents of both nuclear and joint families are concerned about the manner of loading and unhygienic process of loading in the municipal trucks. Hence the hypothesis which stated that "there existed no significant differences in the opinion of different families on solid waste management with respect to the state of environment in Shillong" was confirmed indicating the acceptance of the hypothesis-6 with respect to item-74 of the Solid Waste Management system.

Again analysis of item-74 revealed that there exist no significant differences in opinion of the respondents on "loading wastes into trucks is slow and unhygienic" on analysis of their mean item scores based on different occupational groups viz. Government vs Private employees, Government vs Professional employees, Government vs Other employees, Private vs Professional employees, Private vs Other employees and

Professional vs Other employees. It revealed that there was no difference of opinion of the different category of employees on "loading of wastes into trucks is slow and unhygienic". Again the mean item scores of the different occupational groups varied from 3.10 to 3.35. This indicated that people of different occupational groups are in favour of the preposition that loading of wastes into trucks is slow and also unhygienic. Hence the hypothesis-6 which stated that "there exists no significant differences in the opinion of different occupational groups on solid waste management" viz. Government vs Private employees, Government vs Professional employees, Government vs Other employees, Private vs Professional employees, Private vs Other employees and Professional vs Other employees indicating the acceptance of hypothesis-6 with respect to item-74 of the Solid Waste Management system.

Item 75: Indiscriminate Disposal of Waste has not created any Health Hazards in the Community:

Analysis of item-75 revealed that there exist no significant differences in the opinion of the respondents of nuclear families and joint families on "indiscriminate disposal of waste has not created any health hazards in the community" as evident from the analysis of the mean item scores. Further as the mean score ranged from 1.48 to 1.57, it revealed that respondents of both nuclear and joint families are not concerned about the health hazards of indiscriminate disposal of wastes. Hence the hypothesis which stated that "there existed no significant differences in the opinion of different families on solid waste management with respect to the state of environment in Shillong" was confirmed

indicating the acceptance of the hypothesis-6 with respect to item-75 of the Solid Waste Management system.

Again analysis of item-75 revealed that there exist no significant differences in opinion of the respondents on "indiscriminate disposal of waste has not created any health hazards in the community" on analysis of their mean item scores based on different occupational groups viz. Private vs Others and Professional employees vs Other employees whereas significant differences in opinion was found between Government vs Private employees, Government vs Professional employees, Government vs Other employees and Private vs Professional employees. It revealed that there was difference of opinion of the different category of employees on "indiscriminate disposal of waste is a health hazard". Again the mean item scores of the different occupational groups varied from 2.10 to 1.43. This indicated that people of different occupational groups are not aware of the evil effects of indiscriminate disposal of waste. Hence the hypothesis-6 which stated that "there exists no significant differences in the opinion of different occupational groups on solid waste management" was confirmed in case of Private vs Others and Professional employees vs Other employees indicating the partial acceptance of hypothesis-6 with respect to item-75 of the Solid Waste Management system.

Item 76: Protection of the Environment and Health of People in Solid Waste Management is the responsibility of concerned Authorities:

Analysis of item-76 revealed that there exist no significant differences in the opinion of the respondents of nuclear families and joint families on "protection of the environment and health of the people in solid waste management is the responsibility of

concerned authorities" as evident from the analysis of the mean item scores. Further as the mean score ranged from 2.28 to 2.47, it revealed that respondents of both nuclear and joint families don't blame the authorities of solid waste management system for protection of the health and environment. Hence the hypothesis which stated that "there existed no significant differences in the opinion of different families on solid waste management with respect to the state of environment in Shillong" was confirmed indicating the acceptance of the hypothesis-6 with respect to item-76 of the Solid Waste Management system.

Again analysis of item-76 revealed that there exist no significant differences in opinion of the respondents on "protection of the environment and health of people in solid waste management is the responsibility of concerned authorities" on analysis of their mean item scores based on different occupational groups viz. Government vs Private employees, Government vs Other employees, and Private vs Other employees whereas significant differences in opinion was found between Government vs Professional employees, Private vs Professional employees and Professional vs Other employees. It revealed that there was difference of opinion of the different category of employees on "protection of the environment and health of people in solid waste management is the responsibility of concerned authorities". Again the mean item scores of the different occupational groups varied from 1.70 to 2.35. This indicated that people of different occupational groups don't lay the responsibility on the authorities for the environment and health of the people with reference to solid waste management". Hence the hypothesis-6 which stated that "there exists no significant differences in the opinion of different occupational groups on solid waste management" was confirmed in case of Government vs Private employees, Government vs Other employees, and Private vs Other employees

indicating the partial acceptance of hypothesis-6 with respect to item-76 of the Solid Waste Management system.

Item 77: Improper Collection and Disposal of Waste is affecting the Health of the Family:

Analysis of item-77 revealed that there exist no significant differences in the opinion of the respondents of nuclear families and joint families on "improper collection and disposal of waste is affecting the health of the family" as evident from the analysis of the mean item scores. Further as the mean score ranged from 1.92 to 2.11, it revealed that respondents of both nuclear and joint families don't blame the authorities of solid waste management system for improper collection and disposal of waste and they are of the opinion that it in no way affects the health of the family Hence the hypothesis which stated that "there existed no significant differences in the opinion of different families on solid waste management with respect to the state of environment in Shillong" was confirmed indicating the acceptance of the hypothesis-6 with respect to item-77 of the Solid Waste Management system.

Again analysis of item-77 revealed that there exist no significant differences in opinion of the respondents on "improper collection and disposal of waste is affecting the health of the family" on analysis of their mean item scores based on different occupational groups viz. Government vs Professional employees, Government vs Other employees, Private vs Professional employees, Private vs Other employees and Professional vs Other employees where as significant differences in opinion was found in case of Government vs Private employees. Again the mean item scores of the different occupational groups varied

from 1.83 to 2.15. This indicated that health of the people are not affected due to improper collection and disposal of wastes in Shillong. Hence the hypothesis-6 which stated that "there exists no significant differences in the opinion of different occupational groups on solid waste management" was confirmed in case of Government vs Professional employees, Government vs Other employees, Private vs Professional employees, Private vs Other employees and Professional vs Other employees and was rejected in case of Government vs Private employees, indicating the partial acceptance of hypothesis-6 with respect to item-77 of the Solid Waste Management system.

Item 78: Solid Waste collected in the Locality gives Foul Smell and Odour:

Analysis of item-78 revealed that there exist no significant differences in the opinion of the respondents of nuclear families and joint families on "solid waste collected in the locality gives foul smell and odour" as evident from the analysis of the mean item scores. Further as the mean score ranged from 1.75 to 1.95, it revealed that respondents of both nuclear and joint families don't feel that the solid waste collected in the locality gives foul smell and odour. Hence the hypothesis which stated that "there existed no significant differences in the opinion of different families on solid waste management with respect to the state of environment in Shillong" was confirmed the acceptance of the hypothesis-6 with respect to item-78 of the Solid Waste Management system.

Again analysis of item-78 revealed that there exist no significant differences in opinion of the respondents on "solid waste collected in the locality gives foul smell and odour" on analysis of their mean item scores based on different occupational groups viz. Government vs Private employees, Government vs Professional employees, Private vs

Professional employees, Professional vs Other employees and Professional vs Other employees whereas significant differences in opinion was found between Government vs Other employees and Private vs Other employees. Again the mean item scores of the different occupational groups varied from 1.81 to 2.31. This indicated that there was minimal problem of foul smell and odour of solid waste in the collection process. Hence the hypothesis 6 which stated that "there exists no significant differences in the opinion of different occupational groups on solid waste management" was confirmed in case of Government vs Private employees, Government vs Professional employees, Private vs Professional, Professional vs Other employees and Professional vs Other employees and was rejected in case of Government vs Other employees and Private vs Other employees indicating the partial acceptance of hypothesis-6 with respect to item-78 of the Solid Waste Management system.

Item 79: Open Dumping is Unacceptable from Aesthetic, Environmental and Sanitary Point of View:

Analysis of item-79 revealed that there exist no significant differences in the opinion of the respondents of nuclear families and joint families on "open dumping is unacceptable from aesthetic, environmental and sanitary point of view" as evident from the analysis of the mean item scores. Further as the mean score ranged from 4.19 to 4.40, it revealed that respondents of both nuclear and joint families do feel against open dumping of generated solid waste from aesthetic environment and sanitation point of view. Hence the hypothesis which stated that "there existed no significant differences in the opinion of different families on solid waste management with respect to the state of environment in

Shillong" was confirmed indicating the acceptance of the hypothesis-6 with respect to item-79 of the Solid Waste Management system.

Again analysis of item-79 revealed that there exist no significant differences in opinion of the respondents on "open dumping is unacceptable from aesthetic, environmental and sanitary point of view" on analysis of their mean item scores based on different occupational groups viz. Government vs Private employees, Government vs Professional employees, Government vs Other employees, Private vs Professional employees, Private vs Other employees and Professional vs Other employees. It revealed that there was no difference of opinion of the different category of employees on "open dumping is unacceptable from aesthetic, environmental and sanitary point of view". Again the mean item scores of the different occupational groups varied from 4.19 to 4.37. This indicated that people of different occupational groups are highly conscious about open dumping of wastes from aesthetic, environmental and sanitary point of view". Hence the hypothesis-6 which stated that "there exists no significant differences in the opinion of different occupational groups on solid waste management" viz. Government vs Private employees, Government vs Professional employees, Government vs Other employees, Private vs Professional employees, Private vs Other employees and Professional vs Other employees indicating the acceptance of hypothesis-6 with respect to item-79 of the Solid Waste Management system.

4.7 Discussions of the Results:

4.7.1

The hypothesis-1 of the study with respect to the respondents of various regions (NE, NW, SE and SW) was confirmed with respect to item 17 and 18 of objective-1.

The hypothesis-1 of the study with respect to the respondents of various regions (NE, NW, SE and SW) was partially confirmed with respect to item 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 and 19 of objective-1.

4.7.2

The hypothesis-2 of the study with respect to the respondents of various income groups (LIG, MIG and HIG) was confirmed with respect to item 20, 22, 23, 24, 28, 30, 31, 34 and 35 of objective-2.

The hypothesis-2 of the study with respect to the respondents of various income groups (LIG, MIG and HIG) was partially confirmed with respect to item 21, 25, 26, 27, 29, 32 and 33 of objective-2.

4.7.3

The hypothesis-3 of the study with respect to educational qualification of the respondents was confirmed with respect to item 36, 38, 40, 41, 42, 43, 44 and 45 of objective-3.

The hypothesis-3 of the study with respect to educational qualifications of the respondents was partially confirmed with respect to item 37 and 39 of objective-3.

4.7.4

The hypothesis-4 of the study with respect to the residential areas of the respondents was confirmed with respect to item 46, 47, 48, 50, 55, 57 and 58 of objective-4.

The hypothesis-4 of the study with respect to the residential areas of the respondents was partially confirmed with respect to item 49, 51, 52, 53, 54, 56 and 59 of objective-4.

4.7.5

The hypothesis-5 of the study with respect to sex of the respondents was confirmed with respect to item 64, 65, 66, 67 and 68 and was rejected with respect to item 60, 61, 62 and 63 of objective-5.

The hypothesis-5 of the study with respect to the age group of the respondents was partially confirmed with respect to item 60, 61, 62, 64, 65, 66 and 68 and was confirmed with respect to item 63 and 67 of objective-5.

4.7.6

The hypothesis-6 of the study with respect to the type of families of the respondents was confirmed with respect to item 69, 71, 72, 73, 74, 75, 76, 77, 78 and 79 and was rejected with respect to item 60 of objective-6.

The hypothesis-6 of the study with respect to the occupational group of the respondents was confirmed with respect to item 69, 70, 72, 74 and 79 and was partially confirmed with respect to item 71, 73, 75, 76 and 78 of objective-6.

4.8 Suggestion:

Objective-1 (Practices):

The review of literature revealed that solid waste management systems adopted in Indian cities are highly inefficient, outdated and lacking public participation. Overall public apathy is observed in almost all the cities in the matter of handling and disposal of Municipal waste. A system of throwing garbage in the streets by citizens and local bodies collecting the waste from the streets and disposing it in the most unhygienic manner is in vogue. Solid waste management in the city of Shillong as far as practices are concerned, is viewed from the significant functional elements from the point of generation to final disposal. This comprises of solid waste generation, waste handling and segregation, storage and processing at source, collection, transportation and disposal at the household and community level. The separations of functional elements are important because it allows the development of a framework i.e. to evaluate the impact of existing practices and propose changes for future management. The study has highlighted several inadequacies at all stages and recognizes the need and urgency to evolve a proper mechanism and systems for interaction in the Management of Solid Wastes.

Source Reduction - although not controlled by solid waste managers, is now included in systems evaluations as a method of limiting the quantity of waste generated. Source reduction is the most effective way to reduce the quantity of waste, the cost associated with its handling, and its environmental impact. Waste minimization or reduction at source is the most desirable activity, because the community does not incur expenditure for waste handling, recycling and disposal of waste that is never created and delivered to the waste

management system. To reduce the amount of waste generated at the source, the most practical and promising methods would be:

(1) The adoption of industry standards for product manufacturing and packaging that use less material. Waste reduction may occur through the design, manufacture and packaging of products with minimum toxic content, minimum volume of material, and a longer useful life. It is now well recognized that sustainable development can only be achieved if society in general and industry in particular, produces "more with less" i.e. more goods and services with less use of resources (raw materials and energy) and less pollution and waste. Efforts must be made to reduce the quantity of materials used in both packaging and obsolescent goods and to begin the process of recycling at the source so that fewer materials become part of the disposable solid waste of a community. Source reduction is an alternative that will conserve resources and also has economic viability.

(2) The levying (by community) of cess/fees for waste management services that penalize generators in case of increase of waste quantities.

(3) Waste reduction may also occur at the household level through selective buying patterns and the reuse of products and materials. Product consumption is a natural activity. Society changes a standard of living by changing the quantity and quality of products it consumes. Solid wastes, the discards of product consumption, vary in quantity and quality as changes occur in the standard of living. Consumption habits must be changed if the quantity of SW from consuming activities is to be reduced. The challenge is to change consumption habits that have been established over

many years, as a result of advertising pressure and glamorizes increased consumption.

(4) The passing of laws that minimize the use of virgin materials in consumer products. Modifications in product packaging standards can result in reduction of waste packaging material or use of recyclable materials. Minimization of use of virgin raw materials by the manufacturing industry can promote substitution by recycled materials. Sorting at source, recycling at source and processing at source can help in waste minimization.

Waste Handling, Sorting, Storage and Processing at Source: Waste handling and sorting involves the activities associated with management of wastes until they are placed in storage containers for collection. Handling also encompasses the movement of loaded containers to the point of collection. The waste should normally be stored at the source of waste generation till collected for its disposal. Separation of waste components is an important step in the handling and storage of Solid Waste at source. From the standpoint of materials specifications and revenues from the sale of recovered materials, the best place to separate waste materials for reuse and recycling is at the source of generation. The separation of solid waste components at the source of generation is one of the most positive and effective ways to achieve the recovery and reuse of materials. The effectiveness of residential waste separation depends on the type of system used for the collection of separate wastes. Waste separation at the source is an essential activity in an integrated solid waste management system. The driving force for choosing a source separation option is threefold: improved effectiveness of recycling, improved quality of the

recovered materials and decreased costs of landfills. Material recycling can occur through sorting of waste into different streams at the source or at a centralized facility. Sorting at source is more economical than sorting at a centralized facility. The storage of waste, wherever practiced, should synchronise with primary collection system. Most people store waste in buckets, plastic bins, plastic bags and metal bins. By and large such bins used are without lids. These are unsuitable for storage of food waste for 24 hours as waste starts stinking very fast due to putrefaction. For keeping streets, footpaths, open spaces, public places, rivers and drains clean, it is necessary that waste producers cooperate and effectively participate in the waste management efforts of local bodies. People, therefore, should be educated to form a habit of storing waste at source in their personal bin/bins and deposit such waste into the Municipal system only, at specified times. The waste at source should be stored in 2-3 covered bins/ bags, one for food waste/biodegradable and another for recyclable waste such as papers, plastic, metal, glass, rags etc. Use of a non-corrosive container with lid is advised for the storage of food/biodegradable/wet waste. A container of 15 litre capacity for a family of five members would ordinarily be adequate. However, a household may keep larger containers or more than one container to store the waste produced in 24 hours having a spare capacity of 100% to meet unforeseen extra loads. Wet wastes should preferably not be disposed of in plastic carry bags. In the United States of America a number of communities use a collection system in which three containers are used for recycled materials in addition to one or more containers for non-recyclable materials. In the three container system, newspaper is placed in one container. Aluminium cans, glass and plastics are placed in the second container. The remaining wastes are placed in the third container. In another system, four containers are used. All paper and

cardboard materials are placed in one container. All plastics, glass, tin cans, aluminium and any other metals are placed in a second container. Garden wastes are placed in the third container and all remaining waste materials are placed in the fourth container. Realistically, this practice is totally absent in Shillong Municipal area. Private gardens should as far as possible compost and reuse all plant waste on-site. Where it is not possible to dispose of garden waste within the premises and the waste is required to be disposed of outside the premises, it should be stored in large bags or bins on-site and transferred into a municipal system on a weekly payment basis.

Collection: The functional element of collection includes not only the gathering of solid wastes and recyclable materials, but also the transport of these materials after collection, to the location where the collection vehicle is emptied. There are different practices for waste collection across the world from door-to-door collection to dumping at the nearest dumping site or community collection points. The term collection includes not only the gathering or picking up of solid wastes from the various sources, but also the hauling of those wastes to the location where the contents of the collection vehicles are emptied. Typically, collection is provided under various management arrangements, ranging from Municipal services to franchised private services conducted under various forms of contracts. Collection accounts for almost 50% of the total annual cost of urban solid waste management.

(1) The Municipality should provide daily waste collection service to all households, shops and establishments for collection of putrescible organic waste from the doorstep or from community bins. This service must be regular and reliable. Recyclables can be collected at longer intervals as may be convenient to the waste

producer and the waste collector, as this waste does not normally decay and need not be collected daily. Hazardous waste need not be collected from the doorstep. People should be advised or directed to deposit such waste in special bins created for the purpose.

(2) The size of the community bins should match with the waste generated by the growing number of households. The structures should be systematically constructed to make provisions for segregation. In the absence of covered bins, Public health authorities have shown that rodents, flies and other disease vectors breed in open dumps as well in poorly constructed Community bins.

(3) The system of door-to-door collection which is hardly practiced should be introduced. In the absence of door-step-collection, the disposal of waste is done haphazardly without any concern for health and hygiene. Many cities in India have now initiated the door-to-door collection of garbage. Municipalities across the country have started to invite proposals for door-to-door collection of waste and transportation of the same to designated locations. In door-to- door collection, trolleys have to be purchased, funds have to be allocated for salaries and protective gear such as shoes and gloves. Unemployed youths of the area can get jobs. In door–to–door collection, households should be asked to pay a nominal sum of Rs.20 – Rs. 30 per month for disposal of their garbage. The money collected from the localities should be utilized for payment to drivers, collectors of garbage and for the cost of conveyance.

(4) In slums, because of lack of access or due to narrow lanes, it may not be convenient to introduce house–to-house collection system, community bins of suitable size

should be placed at suitable locations by the Municipality to facilitate the storage generated by them.

(5) The solid waste collected from the doorsteps or from the community bins through the primary collection system needs to be unloaded and stored at convenient places for its onward transportation in a cost-effective manner. Temporary waste storage depots which synchronise with primary collection and transportation system are therefore required to be located at suitable sites.

Transfer and Transport: The functional element of **transfer and transport** involves two steps (1) the transfer of wastes from the smaller collection vehicle to the larger transport equipment and (2) the subsequent transport of the wastes usually over long distances to a processing or disposal site. There should be synchronization between primary collection and transportation of waste. Transportation of waste has to be planned scientifically to bring about a total change in the existing system. Manual loading should be discouraged and phased out expeditiously and replaced by direct lifting of containers through hydraulic system or non-hydraulic devices. Transportation of waste should be done regularly to ensure that the containers/community bins sites are cleared before they start overflowing. The system of transportation of waste must also synchronize with bulk storage of waste at the temporary waste storage depots. Motor vehicles are most commonly used.

Composting: Composting is one of the methods of waste utilization. It is defined as the decomposition of heterogeneous organic matter by a mixed microbial population in the moist, warm and aerobic environment. (1) In case of individual households, vermi-composting can also be practiced. It involves the stabilization of organic solid waste through earthworm consumption for conversion of the organic material to worm casting.

(2) The design and construction of a full scale mechanical compost plant for Municipal solid waste is also appreciable. The compost thus prepared can be sold directly to farmers as raw or green compost.

Separation, Processing and Transformation: The recovery of separated materials, the separation and processing of Solid Waste components and transformation of solid waste that occurs primarily in locations away from the source of waste generation are encompassed by the fourth functional element. The separation and processing of wastes that have been separated at the source and the separation of commingled wastes usually occur at a materials recovery facility, transfer stations, combustion facilities and disposal sites. Centralized sorting is needed wherever recyclable materials are collected in a commingled (mixed) state. Processing often includes the separation of bulky items, separation of waste components by size using screens, manual separation of waste components, size reduction by shredding, separation of ferrous metals using magnets, volume reduction by compaction and combustion. The organic fraction of MSW can be transformed by a variety of chemical and biological processes. The most commonly used chemical transformation process is combustion, which is used in conjunction with the recovery of energy in the form of heat. The most commonly used biological transformation is aerobic composting and anaerobic composting. In the aerobic process the utilizable product is compost. In the anaerobic process, the utilizable product is methane gas (for energy recovery). In India, aerobic composting plants have been used to process up to 500 tons per day of waste. Mechanized sorting facilities using magnetic and electric field separation, density separation, pneumatic separation and other techniques are used in some developed countries. Such facilities are usually prohibitively expensive in comparison to

hand sorting. In India, centralized sorting is not adopted. However, some intermediate sorting does occur after household wastes reach community collection bins through rag pickers. There is a need to formalize this intermediate sorting system or develop a centralized sorting facility to minimize recyclable materials reaching a waste processing facility or a landfill. Home sorting and centralized sorting processes normally recover most of the recyclable materials for reuse.

Energy Recovery: Solid waste contains organic as well as inorganic matter. The latent energy present in its organic fraction can be recovered for gainful utilization through adoption of suitable Waste processing and treatment technologies. Energy can be recovered from the organic fraction of waste basically through two methods – (1) Thermo-chemical conversion process which entails thermal decomposition of organic matter to produce either heat energy or fuel oil or gas. The main technological options under this category include incineration and pyrolysis/gasification. (2) Bio-chemical conversion process based on enzymatic decomposition of organic matter by microbial action to produce methane gas or alcohol. The main technological options under this category is Anaerobic digestion also referred to as Biomethanation.

Recycling: Recycling is an important factor in helping to reduce the demand on resources and the amount of waste requiring disposal by landfilling. Recycling involves (1) the separation and collection of waste materials (2) the preparation of these materials for reuse, reprocessing and remanufacture and (3) the reuse, reprocessing, and remanufacture of these materials.

Disposal: Today the disposal of wastes by landfilling or landspreading is the ultimate fate of all solid wastes, whether they are residential wastes collected and transported directly to

landfill site, residual matters from materials recovery facilities, residue from the combustion of Solid Waste, compost or other substances from various Solid Waste processing facilities. For this reason, every effort must be made to reduce the toxicity of the wastes that will ultimately be placed in landfills. The design of landfills must also improve to provide the safest possible location for the long term storage of waste materials. With an expended data base comes the opportunity to understand how landfills function and how to manage the wastes placed in landfills. Three types of landfills should be adopted. Sanitary landfills in which Municipal waste should be placed, Landfills where only hazardous waste are disposed and Monofills where only a single type of waste is placed e.g. construction waste. In a landfill, sorting may be carried out by ragpickers immediately after spreading of a layer of waste. Wherever manual sorting is adopted, care must be taken to ensure that sorters are protected from all disease pathways and work in hygienic conditions.

Drains: In Shillong there are open surface drains beside the road, into which quite often the sweepers and the public dispose off waste unauthorizedly. These drains need to be cleaned on a regular basis to permit free flow of waste water. Action should be taken to ensure that sweepers and citizens do not dispose off any waste into drains. Necessary tools should be provide to drain cleaners. The periodicity of cleaning such drains should be worked out based on the conditions and frequency of clogging of drains. Strictures should be enforced for random disposal of wastes on drains, streams and vacant land.

Rag Pickers: Rag pickers can play a key role in the management of garbage. They work day and night on the garbage dump sites to collect the recyclable materials. Rag pickers were quite often seen around waste receptacles/ community bins/ rummaging rivers,

streams and drains engaged in picking up waste materials of some use. These rag pickers are exposed to health risks as they use their bare hands in contaminated waste. They sell contaminated waste to the waste purchasers stored in slums creating unhygienic conditions. Quite often they spread the waste at the dustbin site to pick up recyclables. This system can be improved by introducing a system of collecting recyclable waste from the doorsteps changing the role of ragpickers to that of waste collectors. NGOs may be activated to organize the ragpickers and convert them into doorstep waste collectors to improve their quality of life and to reduce their health risks. This will also increase their income levels. The ragpickers may also be given identity cards by the NGOs for increasing their acceptability in society. The NGOs may also support the ragpickers by giving them bags and tools required for collection of recyclable waste from the doorstep.

Objective-2 (Perception):

The perception of the people in general regarding the management of solid waste is low. There has been no major effort to create community awareness on the simple steps that every citizen can take, which will help in reducing waste generation and promote effective ways of disposing the waste generated. The degree of community sensitization and public awareness is low in almost all the urban places in India. This is an indication that education of public representatives and the public is a vital and integral part of any solid waste management plans.

(1) Public awareness is an important activity in solid waste management to keep the system sustainable. The information related to public awareness are necessary for creating a sustainable system. Public awareness and effective community

participation is the key to the success of solid waste management. The agency conducting the planning should initiate information and education program early in the plan formulation stages, and the public information plan should continue through implementation of the entire plan.

(2) People's perception on the various issues of solid waste management from source generation, handling, segregation, collection and disposal can be enhance through proper information, awareness and education programs. Group education through group meetings, workshops, exhibitions, lecture series, panel discussions, Mass education through the use of electronic and print media, street plays, poster campaigns, Pamphlets, hoardings, involvement of religious leaders, NCC, NSS , Scouts and Guides could accelerate the dissemination process on solid waste management.

(3) School curriculum should cover the aspect of solid waste management in the subject of moral science or social studies. Since habit formation at an early age is an established fact, it is therefore necessary to educate young children when they are in primary school to form good habits in managing waste.

(4) The government and local body should select representative samples of the community and go through a consultative process to ascertain the perceptions of the people about the SWM services being given to them, their expectations and extent to which they are willing to support and participate in the process. Their choice of technological options available also needs to be ascertained. The key to success of any public education, awareness and motivation program is to provide

as many ways as possible, with policy makers, to seek clarification of doubts, share ideas or give suggestions which should be constructively followed.

(5) Many NGOs are committed to improve SWM practices and perception in order to protect the environment. Some also have developed good mass communication skills and education programs for the public. Such NGOs may be persuaded to actively support the strategies adopted by the local body and associate in public awareness campaigns.

(6) While all efforts should be made to educate the people to effectively participate in the management of waste, they also need to be told that they can be penalized if they fail to discharge their civic duties. The provision of penalties may be made known to the people and details of those punished should be publicized widely to deter others.

Objective-3 (Role of Dorbars):

The existence of the local traditional institutions or the Dorbar Shnongs has been a boon in the governance and administration of a locality. In fact, many of the Governmental schemes, if not all has been implemented by these institutions.

(1) The traditional Dorbar Shnongs should be given statutory powers to become more effective as guardians of the public. The traditional institutions can serve as an important linkage between the different levels of governance for the implementation of various schemes and projects including the management of solid wastes. The Government as well as Local body should work in close coordination with these traditional institutions. The local dorbars which are institutions of grassroots

democracy has an outreach service at the ward level through which it can interact with the people on almost all important issues.

(2) With suitable amendments of the 74th amendment and the Municipal Act, the current tangle over the Municipal elections could be resolved by electing the headmen of the local dorbars as ward Commissioners. This will not dilute the role and functions of traditional heads which is already in existence with the Shillong Municipal Board.

(3) The government should provide ample scope for the dissemination of IEC programs through the active involvement and participation of the local dorbars. Though, most of the Dorbar lack the expertise in the proper handling and management of wastes, their effort to maintain cleanliness in the localities is appreciable.

(4) The government should support the initiative taken by local dorbars as far as strictures, rules and regulations are concerned. If the dorbars are given more teeth, there will definitely be an improvement in the overall management of solid waste in the community. By and large, the public have been quite responsive to the initiative of the dorbars; therefore, strengthening the functioning of these institutions will pay dividends. **(5)** Owing to the growing population and increased urbanization coupled with the complexity of managing urban problems, the local dorbars should have a body that will cater specifically only to the management of solid wastes.

(5) The annual cleaning day in the different localities of Shillong organized by the local dorbars should be made a more regular feature with the help and support of the Government and the Municipality.

(6) The construction of Community bins should be done under the supervision of the local dorbars to ensure participatory approach in the maintenance of such bins.

(7) The sanitation aspect is should be properly address by the Dorbars by evolving proper techniques and approach according to the demand of the situation. Unlike the Government which is armed with legal machinery and instruments, local Dorbars initiative is based more on voluntary response and acceptability. Generally, citizens comply with the rules and regulations framed by the Dorbars as a collective action and not because of the penalty imposed by the local institutions. The decision of the dorbar may or may not be binding to the public but any violation or defiance on the part of the citizens is seen as a sign of disrespect to the collective consciousness. Certain conventions may not have the rule of law but conformity to the shared decision is considered to be imperative.

Objective-4 (Role of Municipality):

Solid waste management is one of the essential obligatory functions of the urban local bodies in India. Local bodies in the country are governed by various laws enacted by their respective legislatures. The Shillong Municipality do not have adequate provision for ensuring appropriate solid waste management systems with the result outdated systems continue affecting the quality of life of the people. The service is falling too short of the desired level of efficiency and satisfaction resulting in problems of health, sanitation and environmental degradation. The study revealed that local body lack technical, managerial, administrative and adequate institutional arrangements. Due to lack of serious efforts, garbage and its management has become a tenacious problem and this notwithstanding the fact that the largest part of Municipal expenditure is allotted to it.

(1) The Shillong Municipality should have a Municipal Solid Waste Management Plan. The plan should be a written document outlining the activities that the civic body intends to undertake during the life-span of the plan, coupled with a set of directives for achieving the objectives within a given time frame. Planning is the conscious process for meeting future requirement and objectives with full consideration of any likely contingencies. The planning process should recognize the problem that exists, collect and analyze data about these problems, assess the situation in the light of the analyzed data, suggest actions for corrective measures and accomplishment of objectives, evolve suitable strategy for implementation with respect to time frame and evaluate the actions taken in light of their success or failure in achieving the objectives and modification of the plan, if need be, to meet changing conditions.

(2) When developing the solid waste management plan, the Shillong Municipality should take into consideration all sorts of influences that must be considered. Such influences include political, administrative, legal, social, financial factors and available technology. A specialized inter-disciplinary staff engaged in the development of the Plan should play a key role in supplying information and expert evaluation for alternative solutions and implementing the plan.

(3) The essence of planning is coordination. Planning requires resolution of conflicting interests, allocation of available funds and other resources, inter-governmental and inter-departmental cooperation and establishment of priorities.

(4) Prior to conducting the planning, the Municipality should initiate an IEC programme early in the formulation stages and the public information plan should

continue through implementation of the entire plan. Print and electronic media can play a vital role in creating awareness and educating the public.

(5) The local body should formulate and notify a policy that no waste shall be disposed of on the streets, open spaces, drains, water bodies etc and instead the recyclable and other biodegradable shall be stored separately at the source of waste generation and shall be handed over to the waste collectors as per the arrangements that may be notified by the local body from time to time.

(6) The Municipal authority is supposed to notify waste collection schedule and the likely method to be adopted for public benefit. Instant service delivery requires some drastic innovations in the way services were being provided to the citizens. It also meant coming out of the mindset of limiting the Municipality to providing routine services only but to develop a broader vision of the needs of the citizens. This meant not only cleaning the city but also adding the aesthetic values to it. For the maintenance of health and sanitation in Shillong, it is necessary that this service be provided round the year.

(7) The Local body, as a policy, should provide SWM services such as sweeping of streets, primary collection of waste and disposal of waste on all the days of the year including Sundays and Public holidays.

(8) The local bodies must make a policy and make serious endeavour to affect cost recovery for the services being provided at the doorstep to the households.

(9) The local bodies should also frame a policy of providing community bins for the storage of waste or daily door-to-door collection service in the slums to ensure

sanitary conditions in the slums irrespective their legal or illegal status in the city to maintain overall public health and sanitation.

(10) The local body as a policy should provide adequate training to the staff in SWM services and arrange for short term and refresher courses for updating the knowledge of the supervisory staff to maintain the high standard of service. The welfare of the staff engaged in handling of SW need to be given adequate protection and health care facilities.

(11) The local body should draw up a citizens charter and create a system to register public grievances in all the wards and set up a mechanism for expeditious redressal of grievances through decentralized municipal administration.

(12) While all efforts may be made to build awareness among the community for public participation in SWM services, a mechanism for enforcement should be simultaneously created to discipline the citizens who do not adhere to the directions of the urban local body.

Objective-5 (Role of Government):

As per the constitution of India, Solid waste Management is a state subject and it is the primary responsibility of state governments to ensure that appropriate solid waste management practices are introduced. The role of Government of India is broadly to formulate policy guidelines and provide technical assistance to the states whenever needed. It also assists the state governments and local bodies in human resource development and acts as an intermediary in mobilizing external assistance for implementation of solid waste management projects. Though SWM is a state subject, it is basically a Municipal function

and as such urban local bodies are directly responsible for performing this important function.

(1) The state government should frame appropriate policies to guide the local bodies and take a lead role in activating the local bodies to perform their obligatory duties effectively. The state should also support the local bodies through legislative measures to enable the local body to perform better. The state should make suitable legislative changes in the local laws and provide the legal framework of proper management of Solid wastes.

(2) The government should have adequate provision for enforcement of sanitation laws and rules. This will facilitate the enforcement of directions that may be given by the local urban bodies from time to time to the citizens for managing their waste as prescribed and would also compel the local bodies to perform by providing adequate services.

(3) The government should develop a solid waste management plan in accordance with its priorities for the environment and the ability of state residents to contribute to the costs of management.

(4) The government should also promote financial health of the urban local body to meet obligatory duties. Merely giving power to local bodies to impose taxes have not yielded results. Several local bodies are shy of imposing adequate taxes resulting in inadequacy of services in urban areas. The state government may, therefore, prescribe a minimum amount of property tax per square metre of property, the local body shall impose or levy from the property holder or take some percentage of the value of the property or rent derived as property

tax, which may generate adequate income to the urban local body to meet their constitutional obligations. The Urban local body is also required to be directed not to spend their funds on non-essential activities till it adequately meet the demand on obligatory duties. Government may assess the need of the urban local body, its capability, compliance to government directions to raise revenue and then extend financial support to it for procurement of vehicles and equipment to improve solid waste management practices.

(5) Government may also link fiscal incentives with performance and provide facility of long term loans for modernization of solid waste management practices to enable them to repay the loan easily.

(6) Government may also provide technical assistance to local bodies for preparing project proposals for availing loans from World Bank, ADB and other national and international financial institutions.

(7) The state government may declare a policy to promote industries for recycling of Municipal solid waste and also direct government organizations and local bodies to purchased recycled products to encourage such industries. The State government through their agriculture department may propagate use of compost made from municipal solid waste after being satisfied that the products meets the necessary standards for the application on farm lands.

(8) Private sector participation in management of Municipal solid waste is crucial. The state government may permit and encourage private sector participation in SWM services without affecting the interest of existing manpower deployed by the urban local body. In many states in India, different forms of participation

have been designed with varying levels of responsibility and cost sharing between private and public agencies.

(9) The State Government may develop appropriate information, education and communication material (IEC) according to the local needs and take up state-wide awareness campaign and help the urban local bodies to build public awareness in the city and promote the principle of 'Reduce, Reuse and Recycle'.

(10) The government should take initiative in providing suitable waste land for treatment facility and disposal of waste to the urban local body. The land for the disposal could be given for a period till the land so given is reclaimed through sanitary land filling and government may take back the land, after the same is appropriately reclaimed.

(11) The government should promote energy recovery, power generation etc from municipal solid waste. The government may support proven technologies for power generation from MSW by granting licenses and making power purchase agreements at the rates that may be affordable to power producers keeping in view the social benefits derived from such activity besides power generation.

(12) The absence of collective responsibility handicaps the smooth implementation of the defined goals and objectives of the government. The Public works Department, the Pollution Control Board, the Meghalaya Urban Development agency (MUDA), the Health Department as well as the District administration should have a close networking and coordination for smooth implementation of solid waste management functions.

(13) The state government may arrange workshops and seminars on solid waste management and exposure visits to foreign countries and within the country for imparting knowledge and training to the officials handling solid waste management and decision making.

Objective-6 (Health, Sanitation and Environment):

Municipal solid waste management activities have a potential to cause air, water and land pollution besides affecting aesthetics and creating health hazards which again has a potential to cause disease or infirmity.

1. The government should insist on Environmental and Health Impact Assessment at all stages of Solid waste management. EHIA should involve the identification of environmental and health hazards, interpretation of environmental and health risks and also the management of environmental and health risks.
2. Environmental and health risk management should include both health safeguards and mitigation measures. Project monitoring and health surveillance are also required and should be ensured as apart of operation and maintenance of Municipal Solid waste management.
3. Waste identification is an important tool of waste control programme. The necessity of segregation at the point of generation, prior to storage, transportation, treatment and disposal is essential. This would help in easy identification of the various components of health care waste. All containers bearing hazardous material must be adequately labeled and colour coded.

4. The collection containers should be sturdy, leak-proof and of adequate size. There should be no sharp edges or corners, especially in metallic bins. It is preferable that the container and bins used for collection should be of closed type so that the waste is not exposed and thus preventing the spread of disease through flies and mosquitoes. The collection system should be properly supervised so that quick and regular removal of waste from the dustbin is practiced.
5. The Staff of the Shillong Municipality handling solid wastes are continuously at risk during their working hours. Therefore it is essential that adequate protection measures be provided against occupational health hazards. Proper equipments and protection gears should be provided to workers engaged in SWM. Necessary first aid facilities should be provided to the ground staff. The State Health authority should also take the responsibility for health and sanitation aspects of SWM.
6. The Municipality should have sufficient number of vehicles to ensure regular transportation of waste. The waste is generally seen lying in heaps or scattered at the unscientifically designed dust bins giving unsightly appearance besides causing nuisance and unhygienic conditions. Trucks loaded with garbage should be covered properly so as to avoid the emanation of fowl smell and nuisance to public.
7. Open dumping of waste in open spaces within residential areas should be prohibited. Infrequent collection and rapid decomposition of wastes provide an attractive feeding and breeding site for flies, rats and other scavengers. If waste is allowed to accumulate, vectors and pathogens also multiply.
8. Ragpickers or human scavengers should be featured and not ignored in urban project plans as they also form an important segment in the management of solid

waste. These people live and work under extensive health risks, which are largely undocumented and suffer severe exploitation and deprivation. Health and welfare facilities are required for these human scavengers.

9. The soil cover should be applied over the compacted waste at the disposal site. The cover will prevent breeding of disease vectors and escape of gases of decomposition, minimize leaching, suppress foul odour and provide better aesthetics. Continuous monitoring of ground water quality adjoining the landfill site should be carried out.
10. In order to rank environmental and health risks associated with environmental and health hazards it would be appropriate to construct a project profile. The three main sub-components that should be considered are identification of vulnerable communities, identify the environmental pathways by which the exposure to health hazards may occur and identification of health protection agencies whose responsibility is safeguarding the health of those involved in Solid waste management.

Objective-7 (Interplay and Synchronisation of Waste Management):

1. The interrelationship between the functional elements in solid waste management should be identified. By considering each functional element separately it is possible to (a) identify the fundamental aspects and relationships involved in each element and (b) to develop quantifiable relationships for the purpose of making engineering comparisons, analyses and evaluations. The separation of functional elements is important because it allows the development of a framework within

which we can evaluate the impact of existing practices and proposed changes and future technological advancements. The ability to measure the impact of alternative courses of action is vital in the management of these systems.

2. There should be proper measurement of solid waste generated and collected. This is of critical importance because it will greatly help in selecting specific equipments and designing of waste collection routes, materials recovery facilities and disposal facilities. Information on the quantity of Municipal solid waste generated will also be required to establish and assess the performance of mandated recycling programs. The principal reason for measuring the quantities of solid waste generated, separated for recycling and collected for further processing or disposal is to obtain data that can be used to develop and implement effective solid waste management programs. In predicting residential waste generation rates, the measured rate seldom reflects the true rate. Most solid waste generation rates reported are actually based on measurement of waste collected, not the actual amount generated. The following methods which are commonly used can be adopted to assess solid waste quantities are (a) load-count analysis – in this method, the number of individual loads and the corresponding waste characteristics are noted over a specific period (b) weight –volume analysis – is obtained by weighing and measuring each load and (c) materials-balance analysis- by identifying all the activities that affect the generation of wastes, rate of waste generation associated with these activities and by using appropriate mathematical relationships, determine the quantity of wastes generated, collected and stored.

3. The measurement of waste should also take into consideration the amount of solid waste materials which are composted, burned in fireplaces, discharged to sewers, given to charitable agencies, sold at market, recycled directly.
4. The handling and separation of waste at source is a critical step and one of the most effective ways to achieve the recovery and reuse of materials. The residents should be responsible for placing the segregated solid wastes components –both recyclable and non-recyclable in three containers and transporting the same to the community collection system. The number and types of components separated will depend on the waste diversion goals established for the programme. The reuse and recycling opportunities and the options available for the separation of materials will affect the type of waste management programme implemented. Processing at source may take place at any time before collection (before, during, or after storage). Home or backyard composting is an effective way of reducing the volume and altering the physical composition of solid wastes while at the same time producing a useful by-product.
5. An appropriate system should be in place for the collection of solid wastes. This should take into consideration the type of collection service, the type of equipments used and the associated labour requirements. Door-to-door collection which is environmentally sound is highly preferable as the benefits for waste recovery and recycling is multi-productive. The wastes collected should then be emptied into collection vehicles. Satellite vehicle collection system may be introduced before the wastes is emptied into trucks by mechanical means.

6. Depending on the mode of operation, the collection system could be in two categories (a) Hauled Container System (HCS) and (b) Stationary Container System (SCS). In the former, the containers used for the storage of wastes are hauled to the disposal site, emptied, and returned to their original location. In the latter, the containers used for the storage of wastes remain at the point of generation. Hauled containers are ideally suited for the removal of wastes from sources where the rate of generation is high. The use of large containers reduces handling time as well as the unsightly accumulations and unsanitary conditions associated with the use of numerous smaller containers. The three main types of hauled container systems that can be used are (a) hoist truck (b) tilt-frame container and (c) trash trailer.
7. Manual loading methods should be employed in residential areas where the pickup points are inaccessible to mechanized self-loading collection vehicles.
8. The transfer and transport of wastes should satisfy the following requirements (a) wastes must be transported at minimum cost (b) Waste must be covered during the haul operation (c) vehicles must be designed for highway traffic (d) vehicle capacity must be such that the allowable weight limits are not exceeded and (e) methods used for unloading must be simple and dependable.
9. Once equipment and labour requirements have been determined, collection routes must be laid out so that both the collectors and equipment are used effectively. Some heuristic guidelines that should be taken into consideration are – wastes generated in traffic congested locations should be collected as early in the day as possible, sources with extremely large quantities should be collected first, in hilly

areas like Shillong routes should start at the top of the grade and proceed downhill as the vehicle becomes loaded and existing system characteristics such as crew size and vehicle types must be coordinated.

10. For safe and reliable long term disposal of waste residues, the use of sanitary landfills with application of a variety of scientific, engineering and economic principles is significant. Landfills should be designed to minimize public health and environmental impacts. Landfill management incorporates planning, design, operation, closure and post-closure controls.

Objective-8 (Organisational Networking):

1. There is a need to coordinate the activities of the different agencies of the government. There are many agencies and local institutions who are responsible for providing civic amenities to the citizens of Shillong. Apparently within the same city at least seven agencies of the government are operating and implementing various developmental programmes viz. Meghalaya Urban Development Authority (MUDA), Meghalaya Urban Development Agency (MUDA), Public Works Department (PWD), Public Health Engineering (PHE), Urban Affairs Department (UAD), Meghalaya State Electricity Board (MeSEB) and the Shillong Municipal Board (SMB). Most of them do not know the programmes of the other agency. The result is uncoordinated development of infrastructural facilities.
2. The Meghalaya Urban Development Authority should be the Umbrella body of the different agencies and departments. The MUDA should take on these functions as all schemes have to be implemented within the framework of Master Plans and

Zonal Plans. If this is so, then provisions should be made for the above department and agencies to be represented in the Authority. Necessary amendments should be made in the Meghalaya Town and Country Planning Act, 1973 so that the government agencies including Syiemship and District Council are represented and contribute in the development process of the city including health and sanitation.

3. The Rangbah Shnongs (Headmen) representing the traditional Dorbars which are grassroots institutions should be given the opportunity to function as Ward Commissioners since they can articulate better the felt needs of the people.
4. There should be a forum comprising of both governmental and non-governmental actors who should be shouldered with the responsibility to specifically involve with the management of solid waste not only within the jurisdiction of the Municipal limits but should extend their accountability even to other localities of Shillong Urban agglomeration.
5. There is a need for setting up a civic body having jurisdiction over the entire Master Plan area of Shillong of 174 sq. km. as the present Municipal Board's boundary is limited to only 10.36 sq. km. The absence of Municipal Board and Town Committees in other units of Urban Agglomeration has made civic services unsatisfactory and shoddy.
6. There should be a special committee to coordinate with the different agencies and departments for overall development of the slum pockets and their improvement. Efforts has to be made to tackle the problems in a coordinated manner and this requires an integrated approach to be adopted in providing the urban basic services.

4.9 Implications of the Study:

Any research must have some bearing on the theory and practice to which it belongs. The results of the present study have therefore, to be viewed from this angle as to how much do they contribute to the existing knowledge. It should be admitted at the very outset that SWM has some natural implications on environment and sanitation, health and hygiene of the people. The present study has far reaching implications for bringing out suitable changes in the minds of the people, the Municipality Authority, the traditional institutions and the government in terms of practice, strictures, rules and regulations.

The implications of the present study are therefore not difficult to concern. There is a growing awareness on the part of the respondents and traditional institutions to keep Shillong neat and clean. Therefore an effective solid waste management system is the most important element from aesthetic point of view. While every resource like capital assets and technology can be brought in the arena of solid waste management, the only resource which cannot be brought is motivated human resource. Motivated human resource is required to keep not only their houses clean but also have to clean their own surrounding and neighbourhood. This is the first step in solid waste management. This is where Adult Education intervention is necessary to make people aware about the scientific practices of the household wastes. If this problem is tackled at the first level of intervention, the magnitude of solid waste and the problems thereof would be lessened than half. Therefore there is a great need to take a fresh look at solid waste management in the light of revelations made in the study.

1. Solid waste management is closely related to the practices adopted by the people at their household. An improvement in the practices by adopting the simple method of

collection, segregation and disposal can create a better environment in Shillong city.

2. Adult educators must believe that solid waste management is an important area of intervention and therefore they should communicate this message through appropriate information, education and awareness campaigns.
3. Although positive feeling about the problem and management of solid wastes exist among the policy makers, Municipality and traditional institutions, the solid waste managers must play the role of motivator, enabler, activist and social therapist for organizational effectiveness. Any investment in solid waste management should be viewed as a long term investment for bringing out the civic awareness among the people of Shillong.
4. There is a need to integrate the role of Municipality, policy makers and planners, government and traditional institutions in strategic planning process of solid waste management in order to perform a meaningful role in key activities of solid waste management.
5. A good solid waste management must address itself in evolving a system where developmental aspect of solid waste management could be brought into focus. Evolving a suitable monitoring mechanism, delegating different responsibilities to different personnel and periodically reviewing the system would bring about the desired changes in solid waste management system of the city.
6. Evolving a comprehensive training programme aimed at the development of various competencies in solid waste management like technical and managerial should be one of the major focus of solid waste management. In addition of

evolving a training plan, operationalising and reviewing the plan in a periodic basis should be an integral part of solid waste management programme.

7. The solid waste management process should aim at creating an environment for recycling the waste products and production of natural bio-fertilizers.
8. The organizational strategy should be to enable the people to perceive the need for change, work in collaboration with the different stakeholders of solid waste management and manage the change as a practice measure. It calls for a high level sensibility, conviction and faith in the policy, strictures, rules and regulation so as to bring out changes in the attitude and perception of the people with regard to solid waste management.
9. Effective system of participation in the solid waste management is the key to success. There should be improvement in the contextual understanding of the stakeholders and their role in arising the civicness culture through appropriate Adult Education intervention measures.
10. Manpower planning should be ensured for optimum utilization of solid waste generated. It should not only involve systematic assessment of manpower requirements in terms of number, but also the requirements in terms of skills and efforts to manage the changing technology in the arena of solid waste management.
11. There is a need to integrate the various sub-systems of SWM and not to treat these sub-systems in isolation. Solid waste management should also aim at strengthening each of these processes by developing competence among the solid waste managers and providing a conducive atmosphere for scientific management of solid waste effectively.

12. For a successful implementation of solid waste management, a well-designed solid waste management programme and an implementation strategy is important.
13. Lack of formal communication system at the Municipal and Government level with the various levels of solid waste management contributes to the gap and realizing the objectives of solid waste management and create hindrances in implementation of solid waste management strategies. Therefore, prior importance should be given to the communication system so as to enable free flow of communication among the stakeholders of solid waste management.
14. More emphasis should be placed on team-work rather than individual efforts in the strategic planning process of solid waste management.

Taking into consideration the above points, the findings of the present study has significant implications for researches, adult educators, administrators, management personnel working in the area of SWM, policy planner, traditional institutions and other stakeholders in solid waste management system.

4.10 Limitations of the Present Study:

In social science research, the investigator has to delimit the problem under investigation to a certain possible extent, for it is quite impossible either to control or include all the factors involved in it.

In view of the Research on SWM, the limitations of the present study are presented as under:

1. The study is restricted to the existing Municipal limits of Shillong.
2. The selection of the sample has been limited to one of the adults from one of the households, each household being treated as one unit.
3. The study is restricted to the practices of solid waste generation, accumulation and disposal of garbage at the household and community level.
4. The study is limited to the perception of the people on roles of traditional institutions, Municipality and the Government with respect to solid waste management.
5. The study is limited to four localities from each region viz. Northeast, Northwest, Southeast and Southwest falling under the jurisdiction of Shillong Municipality.
6. The study is limited to the Slum, Residential, Hospital and market areas of Shillong.

4.11 Suggestions for Further Study:

The investigator was now in a position to make suggestions for further study. The following suggestions could be made by the investigator for further study:

1. The present study can be undertaken on the management personnel involved in Solid Waste Management.
2. The present study can be undertaken on traditional institutions and Community Based Organizations (CBOs) involved in Solid Waste Management activities.

3. The present study can be undertaken on the Municipality which is directly involved in Solid Waste Management and the practices can be compared with other hilly regions of India.
4. The present study can be undertaken exclusively on Slum areas, residential areas, hospital areas and market areas.
5. The present study can be undertaken on scientific processes of Solid Waste Management adopted in Shillong.
6. Similar studies can be undertaken to study the environmental implications of Solid Waste Management.
7. Similar studies can be undertaken on the effect of solid waste generated and disposed by the hospitals.
8. Similar studies can be undertaken on recovery process of solid wastes.
9. The present study can be undertaken to study the civicness of the people living in cities.
10. Similar studies can be conducted to study the impact of solid wastes on health of the people.

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QUESTIONAIRE

Read each statement of an item very carefully and put a tick mark (√) under the category which, in your opinion, best expresses your feelings about the statement. Each statement is followed by five alternatives (Always, Frequently, Sometimes, Rarely, Never) indicated in the five boxes. In the subsequent pages the alternatives are (Fully agree, Agree, Undecided, Disagree, Strongly Disagree)

		Always	Frequently	Sometimes	Rarely	Never
1	Solid waste generated at the household level is stored in a container/ dustbin	☐	☐	☐	☐	☐
2	Solid waste generated at the household level is stored in a plastic bag	☐	☐	☐	☐	☐
3	Solid waste generated is disposed directly in the nearby drain	☐	☐	☐	☐	☐
4	Solid waste generated is disposed directly in the nearby stream	☐	☐	☐	☐	☐
5	Solid waste generated is collected directly in the community bin/ Outside collection point	☐	☐	☐	☐	☐
6	The waste generated is stored in the house overnight	☐	☐	☐	☐	☐
7	Waste is dumped on the road or vacant land	☐	☐	☐	☐	☐
8	The services of a hired labour is used for disposal of waste	☐	☐	☐	☐	☐
9	Do you make use of your household waste as compost or manure	☐	☐	☐	☐	☐
10	Do you burn /dispose plastic materials and polythene bags along with household waste	☐	☐	☐	☐	☐
11	Do you burn /dispose waste paper materials and newspapers along with household waste	☐	☐	☐	☐	☐
12	Biodegradable and non-biodegradable wastes are collected separately	☐	☐	☐	☐	☐
13	Hazardous waste are kept in separate storage containers at home	☐	☐	☐	☐	☐
14	Grass clippings, fallen leaves, plants, flowers etc are left for decay in the backyard	☐	☐	☐	☐	☐
15	Door to Door Collection of waste is practiced in the neighbourhood	☐	☐	☐	☐	☐
16	Do you throw old clothes in the garbage	☐	☐	☐	☐	☐

17	Non-biodegradable waste are handed over /disposed through rag pickers	☐	☐	☐	☐	☐
18	Effort is made to limit/reduce the generation of waste at the household level	☐	☐	☐	☐	☐
19	Do you carry your own shopping bag / jute bag / paper bag to the market place	☐	☐	☐	☐	☐

		Fully agree	**Agree**	**Undecided**	**Disagree**	**Fully disagree**
20	Solid waste handling is a problem in your household	☐	☐	☐	☐	☐
21	The distance to the dumping site is a problem for disposal of your household waste	☐	☐	☐	☐	☐
22	Solid waste should be segregated at the household level	☐	☐	☐	☐	☐
23	Banning of plastic bags at source of production is practicable	☐	☐	☐	☐	☐
24	Generation of waste can be reduced at the household level	☐	☐	☐	☐	☐
25	Waste generation can be reduced significantly by educational intervention	☐	☐	☐	☐	☐
26	Proper (handling and) collection of waste require extensive cooperation from the public	☐	☐	☐	☐	☐
27	People are aware of the usefulness of recycling of waste products	☐	☐	☐	☐	☐
28	Values and attitudes of people have not changed with regard to solid waste management over the years	☐	☐	☐	☐	☐
29	Solid waste generation and handling in the slum areas is alarming	☐	☐	☐	☐	☐
30	One should pay for the(disposal) collection of garbage	☐	☐	☐	☐	☐
31	Waste products from your household should be collected for recycling after segregation – Recycling	☐	☐	☐	☐	☐
32	The locality have a proper system of garbage disposal	☐	☐	☐	☐	☐
33	Consumer lifestyle is responsible	☐	☐	☐	☐	☐
34	Neighbours are very much concern about solid waste disposal problem in your locality	☐	☐	☐	☐	☐

35	The community bins provided in your locality is sufficient	☐	☐	☐	☐	☐
36	Does the Dorbar Shnong take proper steps for disposal of household waste	☐	☐	☐	☐	☐
37	Strictures, rules and regulations of the Dorbar with regard to solid waste management is appreciable	☐	☐	☐	☐	☐
38	Strictures, rules and regulations of the Dorbar with regard to solid waste management is strictly enforced	☐	☐	☐	☐	☐
39	Banning of plastic bags by local Dorbars is practicable	☐	☐	☐	☐	☐
40	Efficiency of locality cleaning by Dorbar Shnongs is satisfactory	☐	☐	☐	☐	☐
41	Local Dorbars can play a major role in solid waste management	☐	☐	☐	☐	☐
42	Polybag campaigns by NGOs and local Dorbars have significant effect on solid waste management	☐	☐	☐	☐	☐
43	The Local Dorbar should work in close coordination with the Government and other agencies	☐	☐	☐	☐	☐
44	The headman is the appropriate person to inform about the problem of solid waste in the locality	☐	☐	☐	☐	☐
45	A forum at the community level to manage garbage problems at the community level is necessary	☐	☐	☐	☐	☐
46	Solid waste generated at household level is collected at specific intervals by Municipality	☐	☐	☐	☐	☐
47	Do you use the services of the Municipal truck for disposal of waste	☐	☐	☐	☐	☐
48	Does the municipality take adequate measures for collection of household waste	☐	☐	☐	☐	☐
49	The method of disposal of waste by Municipal Authority is satisfactory	☐	☐	☐	☐	☐
50	Efficiency of street cleaning by Municipality is satisfactory	☐	☐	☐	☐	☐
51	The Shillong municipality should have a proper sanitary landfill	☐	☐	☐	☐	☐
52	The construction of incinerators by Municipality at selected sites is necessary for disposal of waste	☐	☐	☐	☐	☐

53	The municipal should have a common bio-medical waste treatment facility	☐	☐	☐	☐	☐
54	The Municipality should take proper measures and steps in recycling initiatives – change	☐	☐	☐	☐	☐
55	Non- Municipal areas have no proper mechanism of waste disposal	☐	☐	☐	☐	☐
56	The Municipality has taken adequate initiative for garbage disposal in the locality	☐	☐	☐	☐	☐
57	The response of Municipal Authority to complaints about waste disposal is satisfactory	☐	☐	☐	☐	☐
58	The collection and disposal of solid waste by Municipality in slum areas is more problematic	☐	☐	☐	☐	☐
59	The Shillong Municipality do not have adequate provision for ensuring appropriate SWM	☐	☐	☐	☐	☐
60	Strictures, rules and regulations of the Government with regard to solid waste management is appreciable	☐	☐	☐	☐	☐
61	Strictures, rules and regulations of the Government with regard to solid waste management is strictly enforced	☐	☐	☐	☐	☐
62	People should be penalized for violating Government rules and norms with regard to solid waste	☐	☐	☐	☐	☐
63	Banning of plastic bags by the Government is appreciable	☐	☐	☐	☐	☐
64	Government Solid waste management plans is in accordance with its priorities for the environment	☐	☐	☐	☐	☐
65	There is lack of clear-cut coordination among different departments of the Government in solid waste management	☐	☐	☐	☐	☐
66	Government should educate, train and create awareness on solid waste management	☐	☐	☐	☐	☐
67	Privatization not a priority of the Government with regard to solid waste management	☐	☐	☐	☐	☐
68	The state should collect taxes with regard to solid waste management	☐	☐	☐	☐	☐
69	Control of pests and vectors is a problem in your locality	☐	☐	☐	☐	☐
70	Door-to- Door collection of garbage is environmentally sound	☐	☐	☐	☐	☐

71	The community storage system is an eyesore	☐	☐	☐	☐	☐
72	Lack of concern about overall quality of the environment is conspicuous	☐	☐	☐	☐	☐
73	Rag picking and scavenging is a matter of concern	☐	☐	☐	☐	☐
74	Loading waste into trucks is slow and unhygienic	☐	☐	☐	☐	☐
75	Indiscriminate disposal of waste is a health hazard	☐	☐	☐	☐	☐
76	Protection of the environment and health in solid waste management is the responsibility of concerned authorities.	☐	☐	☐	☐	☐
77	Improper collection and disposal of waste is affecting the health of the family	☐	☐	☐	☐	☐
78	Solid waste collected in the locality gives foul smell and odour	☐	☐	☐	☐	☐
79	Open dumping is unacceptable from aesthetic, environmental and sanitary point of view	☐	☐	☐	☐	☐

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