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.

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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 Graduate, 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 area 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 residentia, 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 revealed 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
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 revealed 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.

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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.
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, vermicomposting can also be practiced. It involves the stabilization of organic solid waste through earthworm consumption for conversion of the organic material to worm casting.
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.
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.