Environment and Health

Dr. N. Sofia

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I dedicate this book to my Research Supervisor Dr. T. Rajendran, Professor of Sociology, The Gandhigram Rural Institute Deemed to be University, Dindigul District and my Former Guide Dr.R.Selvaraju, Assistant Professor, Department of Education (DDE&CE), Manonmaniam Sundaranar University, Tirunelveli District, Tamil Nadu.

PREFACE

Waste is an unavoidable byproduct of human society. Industrialization, density of population and urbanization have greatly increased the generation of household solid waste in rural and urban areas. In developing countries, open dumping is the only common method followed by the people for disposing of household solid waste. It leads to health and environmental problems like waterborne diseases, pollution in air and water also. Uncollected household solid waste can also block rain water runoff, resulting in the forming of stagnant water bodies that become the breeding ground of diseases. Direct dumping of untreated household solid waste in the nearby water bodies resulted in the accumulation of toxic substances in the food chain through the plants and animals that feed on it. It is also a big challenge for the sustainable development of the nation.

This circumstance necessitates to study the impact of solid waste on environment and health with specific reference to Tirunelveli district of Tamil Nadu. The present study is confined to studying the household solid waste collection and disposal taking into account the socio-economic conditions of respondents selected for the study and their influence on solid waste generation and disposal, awareness of rural women about solid waste and environmental degradation, impact of solid waste on environment and health and perceptions of women respondents about the efforts taken by the government bodies on collection and disposal of solid waste. One of the revenue blocks in Tirunelveli District namely Cheranmahadevi block has been selected randomly and 439 rural women are selected by using proportionate sampling from 12 village panchayats. Rural women are interviewed by using interview schedule for the collection of required data and information. Tabular

analysis has been done with application of percentage and chi-square test in the analysis of primary data. Likert scale has also been applied for assessing the awareness of rural women about the household solid waste and environmental degradation.

The results reveal that fifty three per cent of the children of women respondents are affected by cough, skin allergy, injuries and throat infection due to the proximity of the dumpsite. Regarding the disposal of the collected household solid waste, majority (64%) of the women respondents have stated that the village panchayats road and purampokku land (waste land of village) are used as the dumpsite by the sanitary workers. The findings of the study depict that the social life of the villagers get affected due to burning of household solid waste, which creates smog and ashes thereby affecting the environment and health of the village people in the study area.

The study reveals that the level of awareness on environmental degradation is low for 45 per cent, medium for 32 per cent and high for 23 per cent of the women respondents. The chi-square analysis shows that age and marital status are not significantly associated with the awareness level on household solid waste. It also indicates that community and marital status are not significantly associated with the awareness on environmental degradation.

In the concluding remarks, the study suggests that the measures such as regular door to door collection, increasing the number of vehicles for waste collection services, proper maintenance of dumpsites, providing separate street bins for degradable and non-degradable household solid wastes, conducting short term social survey on collection and disposal practices of household solid waste, organizing outreach programmes for sanitary workers, promoting tree plantation, motivating the people for using cloth bags instead of plastic carry bags and distributing pamphlets about water borne diseases are to be made for rendering proper household solid waste collection and disposal services thereby paving the way for minimizing environmental degradation, promoting and maintaining personal hygiene and environmental sanitation in the rural areas for which, the study recommends that proper monitoring cell is required to be created in order to supervise the practices of municipal solid waste collection and disposal concurrently in every district in course of time.

CONTENTS

ABOUT THE AUTHOR

Dr. N. Sofia, Assistant Professor in Sociology, St. Joseph University, Nagaland. She has completed her post graduation and Master of Philosophy in Sociology, Manonmaniam Sundaranar University, Tirunelveli. She passed M.Phil with distinction and gold medal in university level. She has completed her Doctoral degree in Solid Waste under the guidance of Dr. T. Rajendran, Professor of Sociology, Gandhigram Rural Institute – Deemed to be University, Dindigul district, Tamil Nadu. She received Rajiv Gandhi National Fellowship for SC/ST Ph.D Research Scholars sponsored by University Grants Commission, New Delhi. She has worked as a Assistant Professor in the Department of Sociology, Auxilium College, Vellore from 2017 to 2018. She worked as a Research Investigator on "Trafficking and HIV: Vulnerabilities, Linkages and Responses" and part time casual announcer in All India Radio-Tirunelveli from 2009 to 2013 and in Gyan Vani FM (Sponsored by IGNOU, New Delhi) in Manonmaniam Sundaranar University from 2011 to 2013. She cleared Tamil Nadu State Eligibility Test (TNSET) in Sociology. She is one of the editorial board members in the edited book on "Trends of Health care in Modern Era". She has presented fourteen papers in National level Seminars and Conferences. She has participated in twenty seven National and International workshop in and around Tamil Nadu. She has published ten articles on topics related Environment and Marginalized areas.

Chapter-1

INTRODUCTION

The solid waste is defined as any solid or semi solid substance or material resulting from human activities, discarded as useless or unwanted. It is generated in the form of vegetables/ fruits peels and remaining, food waste, used plastic bags, bottles, broken buckets and glass from residential areas. Density of Population and urbanization in developing countries have led to people generating enormous quantities of household solid waste and consequent environmental degradation. Waste from building constructive activities, commercial shops, unauthorized and local markets also generate large quantity of solid waste. Local authorities do not have adequate financial support to handle waste generation properly. The household solid waste is normally disposed in open places creating sanitation problems and environmental degradation. Improper dumping and burning of household solid waste cause a major threat to public health, animal health and the environment.

INFLUENCES OF SOCIO-ECONOMIC FACTORS ON HOUSEHOLD SOLID WASTE GENERATION

Rapid urbanization, population growth, consumption pattern and migration are the main factors to accelerate the huge rate of solid waste around the world. The density of population has direct effect on available resources and contributes to the large quantity of household solid waste generation. People migrate from rural areas to urban town and metro cities for education, employment opportunities and better needs. It is estimated that nearly 100000 people move from rural areas to urban dwelling in India (Dhongde, 2007).

Family income and size of the households have also contributed in increasing household solid waste. Many studies (Afon (2007),

Benitez et al., (2008), Jadoon et al.,(2014), Gonzalez et al., (2010), Kamran et al., (2015) and Sujauddin et. al.,(2008) have proved that there is a significant correlation between the socio-economic conditions (family size, income and education) of the people and the generation of household solid waste. Generally, we can observe that wealthy people consume more packaged items, which results in accumulation of large quantity of inorganic materials in waste stream.

Industries are one of the major sources for generating waste. It generates the waste from materials packaging, transportation and indisposed product etc. Moreover, offices, educational institutions, commercial complexes, residential complexes generate waste in remarkable quantities.

Garbage generation and minimization is closely related to the attitude of human society. In developed countries, people are aware of as to how to minimize the generation of domestic waste. But in the developing countries, they do not bother about waste minimization and they are not taking any efforts to dispose of their household solid waste properly.

According to Dave and Katewa (2013), commercialism and consumerism have involved in the typical modern life. They create a culture of waste, a culture in which people are eager to make choices that are fundamentally at livelihood with our need to conserve natural resources and care for the environment. In the twenty first century, we are living in the highly consumptive lifestyle; we use more resources thereby also creating pollution. The environmental degradation is closely tied to our rate of consumption of materials and thus of natural resources. Tahir et al., (2015) also prove that a positive correlation tends to exist between the high income and the amount of household solid waste generation. They state that rich individuals or rich class people consume more products than the lower income group of people.

The consumerism culture has brought a drastic change in our social life because of the increased desire of the ordinary man to get all goods and products available in the market. This new culture is spreading gradually among the poverty stricken countries of Asia and Africa where people try to get as many gadgets and appliances as possible, apart from their poor economic status. India is slowly moving

into this unsustainable pattern of economic growth and development. Moreover, the consumerism has taken devastating toll on earth's water supplies, natural resources and eco systems due to disposal of plastic carry bags, cameras and other cheaply made materials with built-in product obsolescence and use of cheaply made manufactured goods that lead to a throw away attitude.

Solid waste generation in world wide

The solid waste generation is also increased in global level due to urbanization and technological progress**.** According to World Bank Organization, the solid waste generation is approximately 1.3 billion tonnes per year and it is expected to increase to around 2.2 billion tonnes per year by 2025 in global level. It also states that a per capita household solid waste generation rate is from 1.2 kilo grams to 1.42 kilo grams per person/ per day in the next fifteen years. The generation of solid waste is varied from region to region and country to country. The annual household solid waste in East Asian countries and the pacific regions is around 270 million tonnes per year. Moreover, the waste generations in Eastern and Central Asian countries are around 93 million tonnes per year. OECD (Organizations for Economic Co-operation and Development) nations produce 572 million tonnes of solid waste per year. In south Asia, approximately 70 million of household solid waste is generated per year. The solid waste generation is very high in china for the past two decades due to the urban growth, density of population and economic development.

Solid waste generation in Indian cities

India is the second most populous country in the world. The census of 2011 reports that the population rate of Uttar Pradesh, one among the 28 Indian states is higher than the population rate of Brazil. Brazil is the fifth most populous country in the world. The urban population rate of India was 285 million in 2001 and increased to 377 million in the year of 2011. Moreover, the population rate of Indian urban is greater than the total population of USA (308.7 million). In 2001, the urban areas of India produced 31.6 million tonnes of solid waste and increased to 65 million tonnes in 2011. (Source: http://swmindia.blogspot.in).

Solid waste generation in Indian cities

S. No	Name of the City	Municipal Solid Waste (Tonnes per day)		
		1999-2000 (a)	2004-2005 (b)	2010-2011©
1	Agarthala	NA	77	102
2	Agra	NA	654	520
3	Ahmedabad	1683	1302	2300
4	Aizwal	NA	57	107
5	Allahabad	NA	509	350
6	Amritsar	NA	438	550
7	Asansol	NA	207	210
8	Bangalore	2000	1669	3700
9	Bhopal	546	574	350
10	Bhuaneswar	NA	234	400
11	Chandigar	NA	326	264
12	Chennai	3124	3036	4500
13	Ciombatore	350	530	700
14	Daman	NA	15	25
15	Dehradun	NA	131	220
16	Delhi	4000	5922	6800
17	Dhanbad	NA	77	150
18	Faridabad	NA	448	700
19	Gandhi Nagar	NA	44	97
20	Gangtok	NA	13	26
21	Guwahati	NA	166	204
22	Hyderabad	1566	2187	4200
23	Impal	NA	43	120
24	Indore	350	557	720
25	Itanagar	NA	12	102
26	Jabalpur	NA	216	400

S. No	Name of the City	Municipal Solid Waste (Tonnes per day)		
		1999-2000 (a)	2004-2005 (b)	2010-2011©
27	Jaipur	580	904	310
28	Jammu	NA	215	300
29	Jamshedpur	NA	338	28
30	Kanpur	1200	1100	1600
31	Kavaratti	NA	3	2
32	Kochi	347	400	150
33	Kohima	NA	13	45
34	Kolkata	3692	2653	3670
35	Lucknow	1010	475	1200
36	Ludhina	400	735	850
37	Madurai	370	275	450
38	Meerut	NA	490	52
39	Mumbai	5355	5320	S
40	Nagpur	443	504	650
41	Nashik	NA	200	350
42	Panjim	NA	32	25
43	Patna	330	511	220
44	Pondicherry	NA	130	250
45	Port Blair	NA	76	45
46	Pune	770	1175	1300
47	Raipur	NA	184	224
48	Rajkot	NA	207	230
49	Ranchi	NA	208	140
50	Shilong	NA	45	97
51	Slimla	NA	39	50
52	Silvassa	NA	16	35
53	Srinagar	NA	428	550
54	Surat	NA	1000	1200

S. No	Name of the City	Municipal Solid Waste (Tonnes per day)		
		1999-2000 (a)	2004-2005 (b)	2010-2011©
55	Thiruvananthapuram	NA	171	250
56	Vadodara	400	357	600
57	Varanasi	412	425	450
58	Vijayawada	NA	374	600
59	Vishakpattnam	300	584	334
	Total	**30058**	**39031**	**50592**

(Source: Central Pollution control board-2011) * NA- Not Available

The six metro cities of India (Kolkata, Mumbai, Delhi, Chennai, Hyderabad and Bangalore) have generated 17.5 million tonnes of waste per year (TPY). And also, India having fifty nine cities with high population has generated 31.5 million tonnes of household solid waste per year, which is about 46 per cent of the total solid waste generated in urban India ((Parvathamma, 2014).

IMPORTANT ISSUES RELATED TO THE GENERATION OF SOLID WASTE IN TAMIL NADU

Tamil Nadu is the most urbanized state in India. According to the 2011 census, the state has seven crore population. The total quantum of household solid waste generated in urban local bodies of Tamil Nadu during 2013-14 is estimated at 14,090 tonnes per day. The Chennai Corporation has two landfills namely kodungaiyur and perungudi. The Tamil Nadu has taken severe action for setting up waste processing facilities at Minjur- vallur and Kuthankulam for processing of waste generated at north and south Chennai respectively. Regarding the household waste disposal, 25 per cent of the urban households in the state have disposed of their domestic garbage in open areas. It leads to high health and environmental risk to the inhabitants.

According to A.G.Murugasen (Professor of Environmental science), who has been working on the environmental quality of the Tamirabarani river for more than two decades, states that the pathological condition of the river water is in an alarming status and in general the water quality of Tamirabarani river is worsening mainly by the organic input through direct discharge of household garbage, hotels sewage, dumping of

municipal garbage and interruption of cattle and stray animals waste. (Retrieved from www.hindu.com, 2012).

IMPACT OF IMPROPER SOLID WASTE ON ENVIRONMENT AND HEALTH

The earth is gradually being changed into dumping ground of solid waste. Open dumping and burning of household solid waste and hazardous waste are common issues in developing countries. Improper collection and disposal of household solid waste lead to water pollution, fire hazardous, odour nuisance, aesthetic problems and transmission of diseases. Indiscriminate dumping of household solid waste also contaminates surface and ground water sources. These environmental issues are only a result of improper handling of household solid waste.

The health and sanitation issues arise due to the improper collection and disposal of solid waste. The uncontrolled hazardous waste from industries and factories mixing up with household solid waste poses high risks to human health. During the 19th century as well as in the beginning of 20th century, millions of people died due to bubonic plague diseases in India, which have linked with inadequate collection and disposal of solid waste. Insects and rodent vectors are attracted to the dumpsite and spread risky diseases such as dengue fever and chickengunia. Using the polluted water also creates skin allergy and itching problems to the human beings.

The household solid waste is simply collected, transported and dumped without proper segregation or process. The household waste is dumped on riverbanks and road sides or edge of the residential areas. Moreover, the people throw their garbage near home and streets, which destroy the beauty of the city. The cattle and stray animals feed on waste dumped in these places. The united nations of public health service has identified 22 human diseases that are closely related to the improper collection and disposal of solid waste. Exhaustive smell from waste collection vehicles, dust and smoke emanating from waste disposal practices and open burning of household and hazardous waste pave the way for overall health issues. Thus, the overall problems contribute lasting damage to the environment and have serious implications for the health of the local people and wild animals.

The government of India has framed various Acts and Rules for ensuring the proper solid waste collection and disposal services in the cities and Municipal Corporations. (The details of Acts are shown in Annexure)

Acts and Rules	Year
Water (Prevention and control of pollution) act	1974
Air (Prevention and control of pollution) Act	1981
Environment (Protection) Act	1986
Hazardous Wastes (Management and Handling) Rules	1989
National environment Tribunal Act	1995
Bio-medical waste (Management and Handling)Rules	1998
Municipal solid waste (Management and Handling)Rules	2000

(Source: Reddy,M., Joseph & Nagendran,R., Suganthi,G & Anitha,G.)

Generally, in India, lack of awareness and practices on proper household solid waste collection and disposal are prevalent particularly among women in rural areas. The government of India has enacted rules and acts for proper solid waste service, even though, the local bodies do not have adequate provision to deal with the rising issues of solid waste. In this context, the researcher concentrates on the impact of solid waste on environment and health: A sociological study is conducted in Tirunelveli District of Tamil Nadu with special reference to socio-economic influences of people on household solid waste generation, awareness towards solid waste and environmental degradation, impact of solid waste on environment and health and the perception of the women respondents about the efforts taken by the government bodies on collection and disposal of solid waste.

THEORETICAL PERSPECTIVE

Anomie Theory

For the purpose of the study, anomie and planned behaviour theory have been applied since they bear relevant to the analysis of impact of solid waste on environment and health. The French sociologist Emile Durkheim introduced the term "Anomie" in his study of suicide (1897). He has also borrowed the word from the french philosopher Jean-Marie Guyau. According to Emile Durkheim, anomie is an absence of social values and norms. The anomie theory explains various forms of deviance. It is also called strain theory. When a social structure or system is in the state of abnormal or deviant, the common values, norms and meanings are no longer understood or accepted and the

new values, norms and meanings have not emerged or developed. According to Emile Durkheim, social facts are the subject issues of sociology. It is also defined as the patterns of behaviour that are capable of exercising some power upon individuals. The social facts guide and control of conducts and external to the individual in the form of norms, folkways and mores. Emile Durkheim has described the modern individuals as insufficiently integrated into human society. Because of these weakening bonds, social regulations or rules break down and the controlling influence of human society on the aspirations and interests of the individual is rendered ineffective; individuals are left to their own devices. Because of the dual nature of human beings, this breakdown of moral guidance results in rising rates of deviance, social unrest, unhappiness and strain. So, Emile Durkheim felt that this lack of norms led to deviant behaviour.

Robert K.Merton has published the anomie theory in his article on "Social structure and Anomie". The influence of human perception or view, which shows how a person perceived himself and the world around him and how it tends to manage behaviour is described in Anomie (Merton, 1968). And also, he has explained that the deviance behaviour can arise by accepting culturally determined goals without the acceptability of cultural norms.

Theory of planned behaviour

The planned behaviour theory is formulated by Icek Ajzen in 1980. It explains the behaviour of human beings. According to the theory, the human behaviour is guided by three kinds of consideration i.e. behavioural beliefs, normative beliefs and control beliefs. The theory states that attitude toward behaviour, subjective norms and perceived behavioural control, together shape an individual's intention and behaviour. The behavioural beliefs create a favourable or unfavourable attitude towards the behaviour. Normative beliefs result in perceiving social pressure or subjective norm and also control beliefs to increase perceived behavioural control. Attitudes lead to the formation of behavioural intention. According to Ajzen, an individual likelihood of disposition of behaviour depends upon the extent of availability of linking resources and existing prospects to behave in that manner. He has also stated that it is the sensitivity of the behavioural control, which is more important than the actual control.

Chapter-2

REVIEW OF LITERATURE

The review of literature instigates the need to the researcher for realizing and imbibing the problems selected for this research and then formulating the research design also. In the light of the factual observations and evidences of the related literature review of the present study, besides in terms of the findings of the previous studies, considering different variables, various methodologies and systems adapted and the research breach in long gap identified by considering and scrutinizing the available reports and different studies carried out by the researchers in multifaceted avenues should be taken into account for drawing positive impact and meaningful implication for the promising better tomorrow.

SOCIO- ECONOMIC CONDITIONS OF THE PEOPLE AND THEIR INFLUENCE ON HOUSEHOLD SOLID WASTE GENERATION AND DISPOSAL

Sharholy et al., (2008) state that rapid industrialization and population explosion in India have led to the migration of people from villages to cities, which generate thousands of tonnes of solid waste daily. The study demonstrates that the relative percentage of organic waste in solid waste is generally increasing with decreasing socio-economic status; so, rural households generate more organic waste than urban households. It also shows that the solid waste generation rates in small towns are lower than in the metro cities and the per capita generation rate of solid waste in India ranges from 0.2 to 0.5 kg/ per day. Finally, the study concludes that the lack of resources such as financing, infrastructure, suitable planning and leadership are the main barriers in solid waste management. Therefore, the study recommends that the Municipal authorities should maintain the storage facilities in such a

manner that they do not create unhygienic and unsanitary conditions. Moreover, door-to-door collection of solid waste should be organized through collection on regular pre-informed timing and scheduling.

Longe et al., (2009) have examined the structure of household waste management system, collection and disposal within the context of a wider research on integrated solid waste management in households. The selected residential areas are divided into high, middle and low socio-economic strata. The result reveals that the average income of respondents is considered a very important variable that could influence people's perception and attitude negatively on solid waste management system. It also indicates that the service charge, which is based on the tenement rate system is determined by the type of household and its location. The survey result also illustrates that the rate of willingness to pay is relatively high across the three socio- economic strata. The results therefore clearly show that the people and this perceived rate of willingness is bound to increase with higher income earnings and adequate environmental education of the populace. Finally, the study advocates appropriate lines of action on sustainability of a private sector driven solid waste management scheme in the local government area in Lagos State of Nigeria.

Kumar and Sugirtharan (2010) have done a case study on impact of family income and size on per capita solid waste generation in Manmunai north divisional secretariat of Batticaloa. The household sector is one of the primary sources of solid wastes in the study area. The solid waste generation in the society is increasing with an increase of population, technological development and the changes in the life style of the people. The researchers have selected one hundred respondents with different socio-economic levels from the study area. The result shows that the residential solid waste generation has no significant positive correlation with monthly income whereas significant positive correlation with the family size. It also denotes that the family size has significant positive correlation with food, paper, plastic and metal waste generation. Thus, the researchers conclude that the family size and income are the most significant factors for increasing the solid waste. Based on the results, the researchers say that every person generates 260gms of food waste per day and food waste contributes nearly 88 percentage of the total waste generated in the study area. Hence, there is possibility to adopt environmental friendly waste management

practices such as compost making at household level. Therefore, the study suggests that awareness must be created on waste segregation procedure among the people.

Kayode and Omole (2011) have examined the influence of some socio- economic factors on solid waste generation and disposal in Ibadan Metropolis. The researchers have collected the data through questionnaire and review of existing literature. The relationship between the socio-economic factors of the people of Ibadan metropolis with solid waste generation and disposal is best explained with the use of correlation co-efficient. In this analysis, variables of solid waste generation, method of storage and disposal are used as dependent variables while the socio- economic characteristics such as age, family size, educational status, income, occupation and type of building are dependent variables. The result reveals that age, sex and family size negatively and poorly correlated with the methods used to store solid waste by the household. It also shows that educational status, occupation, monthly income and types of building are positively and fairly correlated with type of equipment for storing waste by household. In the concluding remarks, the study suggests that the government should employ an urban renewal strategy in the core area so as to implement effective environmental policy in the study area.

Khan et al., (2011) have made a comparative study on people's attitudes and participation of municipal solid waste management in India and Qatar, which show that the demographic characteristics of an individual had a little impact on their household waste management behaviour. The research reveals that people in Delhi buy less packaged items compared to those in Doha as packaged products are expensive than buying loose products; thus confirming that solid waste minimization is done due to economic consideration. The waste minimization behaviour in the city of Doha is quite similar to the findings for the city of Delhi. Thus, the study concludes that a well co-ordinated and comprehensive solid waste management programme along with a public awareness programme is needed for Doha and Delhi because of the highest per capita solid waste generation rate and large population respectively. It also proposes that awareness and information campaigns not only in academic institutions should be undertaken, but even in the place of work, so that the youth, particularly in the age group of 18- 20 years of age, can be roped in.

Rode (2011) has made a study on integrated approach of solid waste management in Pune city, which says that the waste is continuously rising due to growth of population, urbanization, higher per capita income and standard of living, changing life style and food habits. His study shows that the population growth is positively correlated with the solid waste generation in Pune Municipal Corporation. The population growth creates more waste due to income, taste pattern and commodities type. It highlights that hospital waste is also negatively correlated with solid waste. Most of the hospitals are using the new instruments with reuse and disposal capacity. Moreover, the study indicates that the solid waste is positively correlated with restaurants in the study area. Thus, the study concludes that proper infrastructure can help to tackle solid waste problem in the study area and people's participation is also essential to ensure a well managed system. Therefore, the study implies that there is a need for scientific planning of the solid waste collection at each household, collection points and the easiest way of transportation up to land fill sites. Government and Municipal Corporation must encourage local management through collection, transport, segregation and disposal of solid waste.

Agwu et al., (2012) have examined the relationship between individual backgrounds (sex, age and social class) and the level of awareness, knowledge and practices of solid waste management in Port-Harcourt city residents, Nigeria. In their research, 800 residents are randomly selected from the two local government areas of the city. The result reveals that the propensity for solid waste management practices differed by backgrounds (sex, social class and age) of the people. It also shows that there is no significant difference between the respondent's knowledge, awareness of solid waste and their social class. The researchers have also found that there is significant relationship between knowledge and practices of solid waste management among the respondents. The findings of the study reveal that the respondents are aware of solid waste management problems but possessed poor waste management practices. Therefore, the study concludes that there is a need for behavioural and attitudinal changes for achieving solid waste reduction, reuse and recycling to the sustainable environmental management.

Kumar and Nandini (2013) have investigated the community attitude, perception and willingness towards solid waste management in

Bangalore city, India. Four hundred households are randomly selected by the investigators for their research. The respondents are divided into three socio-economic strata; high, middle and low income groups based on their socio-economic status. The result reveals that 14.2 per cent of the households are aware about the generation of solid waste and majority of the households (85.2%) are not aware of the solid waste generation and their disposal. The study also shows that 74 per cent of the households are preferred to dispose of their household solid waste on daily basis, because, the location of their houses is near to the community bin. And also, 90.3 per cent of the respondents are not paying any charges for the removal of solid waste. The study indicates that 30.5 per cent of the households are ready to pay extra service fees for the collection of solid waste. Thus, the study concludes that willingness to pay is also positively related to the household income and household size. It also points out that lack of stiff penalties and non-execution of laws are the basic problems for the in-effective management of solid waste. Moreover, the study exhibits that perception and willingness of households are very much needed for proper waste management activities. Hence, the study suggests that strict regulations with environmental awareness programmes should be needed for sorting, composting and reducing the quantity of solid waste.

Mahima and Thomas (2013) have done a research on estimating household's willingness to pay for solid waste management with special reference to Palakkad district in Kerala. Economic development, urbanization and improved living standards in cities generate the huge amount and complexity of solid waste. Hundred households are randomly selected for the purpose of the study. The data shows that majority (70%) of the respondents belong to the group of 25-50 years. With regard to income, 67 percentages of the respondents have monthly income in the range of Rs. 10,000 -20,000. The result reveals that minimum numbers of respondents are willing to pay more than Rs. 50 per month for disposal of solid waste. In this regard, 53 per cent of the respondents express that people should be charged on the basis of the quantity of solid waste generated at their homes. Thus, the study concludes that solid waste management in Palakkad Municipality is inadequate. So, the solid waste management system needs to be upgraded. The residents also should be sensitized towards the importance of segregation of waste at source. It also suggests that

the government should promote private and public participation in the field of solid waste management.

Roy and Deb (2013) have investigated the willingness to pay for an improved waste management in Silchar Municipal area under Cachar district of Assam. An open ended contingent valuation method is selected to elicit household's willingness to pay for waste management. The researchers also have used a multiple regression model in the study to establish the determinants of willingness to pay. The analysis reveals that those with a higher expenditure (Proxy income) are willing to pay for an improved waste management. The result also reveals that most of the household waste is covered by bio -degradable wastes and other consists of plastic, paper, metals and others. It also reveals that majority of the families in the study area are willing to pay for an improved provision of waste management services. In the concluding remarks, the study suggests the proper government intervention will help in better management of waste.

Vitor et al., (2013) state that Ghana and Kumasi Metropolitan assembly have made several attempts at addressing the waste menace, which is on the rise as a result of population hikes, growth of industrialization and consumer attitudes. The logistic regression model is used to establish the determinants of willingness to pay for solid waste management in the study area. The analysis reveals that the level of education, length of stay in the area, housing arrangements and distance of solid waste dumping sites as well as gender significantly influence the respondents' likelihood of willingness to pay for improved waste management services. Their study also reports that female respondents are more willing to pay than men for solid waste management services. It also denotes that those living in their own houses are more willing to give money for waste management improvement as compared to their tenants. Thus, the study concludes that the proper solid waste management services are not provided in the study area. So, the assembly should increase waste collection fees from GHC 3 to GHC 5 (Ghana Cedi). It would lead to improvement in the waste management within the metropolis.

Grover and Singh (2014) have conducted a study in Dehradun city to find out the correlation between residential solid waste generation, family size and income. The composition of municipal solid waste varies according to the cultural habits and economic status of the

residents, urban structure, density of population, extent of commercial activity and climate. The researchers have selected 100 households with different socio-economic levels such as income and family size. The result reveals that residential waste generation increases with increasing family size. Income wise group of society also shows that the great variations in terms of waste composition and characterization. Food, paper, plastic, metal and glass waste generation increases with increasing income level. Thus, the study concludes that a well-managed city with medium or low income may be significantly different from a similar city with poor urban household management. The findings of the study say that waste stream analysis, material balance and life cycle assessment may be helpful in sustainable landfill management. It also indicates that sustainable management may not be possible in absence of complete understanding and required capacity enhancement along with financial support. Therefore, the study suggests that efforts should be made to break the linkage of prosperity to waste generation.

Ogah et al., (2014) have examined the influence of household's size, level of education and income on waste generation in Mararraba area of Karu. The result reveals that the income of household head (71%) exerts the most influence on the amount of solid waste generated, followed by the level of education (25.6%) while household's size exerts the least influence (2.56%). Thus, the implication is that larger the size of income of household heads, the greater will be the amount of waste generated and the higher level of education more waste is generated, while the influence of household size is not significant based on percentage of influence exerted. Based on the result findings, the study suggests that policies should be formulated to raise awareness, promote knowledge and motivate households with regard to environment and waste management practices in the study area. It is also important to investigate what motivates people to reduce and recycle their waste and what discourages them from participating.

Pai et al., (2014) have made a study on impact of urbanization on municipal solid waste management in Karnataka. The factors such as total population, population growth, population decline, discharge volume of domestic waste and hospital waste are considered as the main parameters in their study. The results show that growth of population is one of the major parameters and it directly results in the waste generation. It also notifies that Municipal solid waste generation is the

sum of the domestic waste, hospital waste and also by categorizing the people into high, medium and low income, which contribute in the generation of waste. The study also indicates that the population rate is not only dependent upon the fractional birthrate but also upon the people or individuals coming from other countries or nations as immigrants. So, the results demonstrate that the immigration is also a parameter, which acts as a contribution for the waste generation. From the above results, the study concludes that there is significant relationship between the population and solid waste generation. Hence, the study recommends that necessary action should be taken so as to reduce the waste either by disposing of it or recycling periodically.

Senzige et al., (2014) in their study on factors influencing solid waste generation and composition in urban areas of Dar-Es-Salamm, Tanzania, they found that solid waste generation and composition is highly dependent on population and socio-economic status of the people. It is clear from their research that knowing the population and the weighted average socio-economic status of a city can enable calculation of the solid waste generation and the composition. The per capita waste generations obtained are 1.31 kg/cap/day for high followed by the middle and low socio- economic statuses with 0.94 kg/cap/day and 0.9 kg/cap/day respectively. Moreover, the solid waste compositions exhibit different characteristics for different socio-economic status. The study reveals that the solid waste generation, population and GDP growth are positively correlated. The decreased poverty resulting from increased GDP has bearing on the consumption behaviour of Dar-Es-Salamm. It affects the quantity and type of solid waste generation. Finally, the study recommends that it is to have detailed necessary information on quantification and characterization of solid waste for proper handling of solid waste at different levels of the solid waste management system.

Seth et al., (2014) have examined whether respondents' demographic characteristics could affect the willingness to pay for waste management services in Tuobodom in the Techniman-North district of Ghana. The researchers have selected 200 respondents for the purpose of the study. The study reveals that people with higher education (38%) seem to be willing to pay for improved waste service in the Tuobodom city. But, majority of the respondents (68%) are not willing to pay for the waste management services. It indicates that illicit burning; open dumping of waste and lack of waste collection containers in the Tuobodom

community, which might be the reasons for their unwillingness to pay for improved waste management services. It also reports that a combination of poverty, economic hardships and financial constraints are the hidden factors that restrict to contribute the improved solid domestic waste management. The findings of the study show that the socio-economic characteristics of respondents such as age, education, income and employment have not any significant influence on the respondent's willingness to pay for improved waste services. Based on the results, the study concludes that the waste management department in the study area has been confronted with logistics problem, inadequate workers, lack of sanitary landfill sites and lack of incentives for few personnel.

According to Tiruneh et al., (2015) solid waste is a complete resultant product of every day human activities and unavoidable human product. Dessie is one of the highly expanding and rapidly growing towns in Ethiopia. The average household's solid waste generation rate in the study area is 0.235 kg/per day. The study reveals that there is a significant correlation between household size and solid waste generation in the study area. The growth of solid waste in the study area is increasing from time to time due to different factors. The result shows that when households increase, the quantity of waste generation also increases. Solid waste generation can also be determined by the number of people in a household. It also indicates that the people in the study area dispose of their waste in open places without any form of treatment. Therefore, the study concludes that solid waste generation of a household is mainly the function of income and family size. And the informal disposal of solid waste in open places, road-sides and streams deteriorates the healthy life of the society. Therefore, the study suggests that the Municipality should estimate the generation and determine the material capacity so as to increase the amount of collection.

Bernard and Mildred (2015) have assessed household solid waste management system in baraton centre, Ghana. The researchers have used convenience sampling technique for choosing respondents. Multinominal linear logistic regression analysis test is used to determine the relationship between the level of education and practices regarding solid waste management in the study area. The study depicts that 46 per cent of the respondents use community bin for household solid waste disposal. Moreover, 54 per cent of the respondents keep dustbin

in their home to store their household waste. The result reveals that education level of a family head is negatively associated with the practices regarding household solid waste management in the study area. The study reports that most of the respondents are not satisfied on the waste management system in the study area (84%), while only 4 per cent of the respondents are satisfied. In the concluding remarks, the study suggests that the Municipal council should carry out the solid waste management programmes effectively.

Jasrotia (2015) in his study on status of household solid waste generation in Vidhata Nagar, Jammu, which states that physical composition of solid waste is changing over the years with the economic development of country, increased habitations, density of population, changing food habit, social and cultural habits and effect of globalization. The study shows that maximum numbers of respondents belong to low educational status and 36 per cent of the respondents have higher qualification. It also indicates that 83 per cent of the respondents belong to nuclear family. The researcher found that 56 per cent of the respondents preferred to sell the non-biodegradable waste items (plastic, metal and glass) to waste purchaser. But, 44 percentage of the respondents disposed of their wastes in the dust bins and open dumping sites. Thus, the study concludes that the study area do not have any systematic way for solid waste disposal. Moreover, it has found that there are no transportation facilities for carrying the waste to proper disposal site. Therefore, the study implies that the Municipal Corporation should be provided with community bins for proper storage and collection of solid waste. It also suggests that adequate man power, equipment and finance should be provided by the Jammu Municipal Corporation for proper solid waste management.

Rajkumar (2015) has found that each income group is having association with the attitude towards the waste disposal and the environmental awareness. In his empirical analysis, the data are collected from 515 respondents of the Tiruchirappalli city of the Tamil Nadu through multi-stage random sampling method. The study shows that invariably all income groups use plastic materials at least a couple of times. The result of the study highlights that those having low level of attitude toward disposal, their disposal pattern is not good. But, the high income group, which has the high level of attitude towards disposal, they have an environment friendly manner in the mode of

disposal. Therefore, the study concludes that the low income group is found to have mostly low level of environmental concern; the middle and high income groups are found to have frequently moderate level of environmental concern each. It also reports that the low income group stands in low attitude towards disposal and ecological issues. They dispose of their wastes in open places. Hence, there is a need for shaping the attitudes of the low income group people towards the proper disposal of plastic wastes and creating environmental awareness among them.

Sizya (2015) has found that eighty per cent of the people are willing to pay for improved solid waste management and 19.9 per cent are not willing to pay for solid waste management. A contingent's valuation method (CVM) is employed on 300 randomly selected households from the selected ten wards in Mwanza city, Tanzania. Logit regression technique is also used to estimate the determinants of selected dependent variables on willingness to pay in the study area. The result reveals that 56 per cent of the respondents are willing to pay TZS. 500 – 1000 for solid waste management (SWM) per month for improved services, 19.3 per cent of the respondents are willing to pay above TZS. 1000 with regards to established legal directives; the remaining 9 per cent are willing to pay TZS. 200 – 450. The study also shows that independent variables have direct influences to household's willingness to pay for solid waste management. Finally, the result shows that with exceptional of age, environmental awareness, education and income of the respondents are positive and statistically significant but household type and legal regulatory on environment are negatively significant.

Mukama et al., (2016) state that the generation of household solid waste is influenced by family size, education level and income of the respondents. The major categories of waste generated in households are food remains (38%) and plastics (37%). A high number of respondents are willing to participate in proposed solid waste management initiatives. The study also shows that most of the respondents store their household wastes in polythene bags (59.1%) and sacks (20.2%). The responsibility of waste disposal is on male adults (11.2%) female children (3.0%) male children (4.4%) and housemaids (5.1%). It also indicates that 76.3 per cent of the women respondents are involved in disposing of their household solid waste. The result reveals that the background variables (sex, age and education) have not influenced respondent's

willingness to participate in composting and separation of wastes. The study concludes that the marital status influenced the respondent's willingness to participate in composting probably because the married have a higher sense of responsibility. It also concludes that slum residents have high willingness to participate in waste separation and composting. Therefore, there is a need for concerned authorities to engage residents of urban slums to improve their practices in solid waste management such as waste separation and disposal.

Siddiqui (2016) states that the quantity of generated household solid waste depends on population size, economic growth and consumption pattern. The researcher has conducted a field survey in Jalapur city of Uttar Pradesh state. The result reveals that volume and rate of household solid waste generation is low in the study area. The study area generates about 7.83 tonnes daily with an average generation rate of 0.270 kilo grams. The study indicates that majority of the people dispose of their household solid waste in the nearby river bed. It also shows that there is no bench mark prescribed by the municipal authorities for street sweeping. Heap of garbage and littered streets are noticed all over the city space, which indicates the low attitude of the local bodies as well as the common man. Thus, the study concludes that there is no segregation of waste neither at source nor at destination. Hence, the study recommends that efforts should be made to reduce the waste quantity and to make the best use of it.

Song et al., (2016) have analyzed the residents' attitudes and willingness to pay for solid waste management in Macau, China. The survey shows that most of the respondents are willing to segregate the household solid waste at home. It also shows that 87.4 per cent of the respondents participate in the environmental activities. The result reveals that age, gender and income are not significantly correlated with willingness to pay (WTP) for household solid waste service. But, education significantly influences on willingness for paying waste collection services. The consumption and life styles of the residents associate with the waste management. Thus, the study concludes that there is a need for educational campaigns to promulgate the proper methods to recycle and reuse the solid waste for the residents. Moreover, it is necessary to enrich elementary education in environmental protection and resource conservation to foster the solid waste recycling habits from the child.

Awareness of the people about solid waste and environmental degradation

Joseph (2002) has summarized the salient features of the current scenario of municipal solid waste management in India and the future directions for improving the situation. The study reveals that the explosion in world population changes the nature of solid waste management. It also says that India is facing a municipal solid waste dilemma, for which all elements of the society are responsible. The result reports that the community sensitization and public awareness is low. There is no systematic segregation of organic, inorganic and recyclable wastes at household level. There is an adequate legal framework existing in the country to address municipal solid waste management. In-spite of a stringent legislation in place, open dumping is the most wide spread form of waste disposal. The possible reasons for poor implementation could be a combination of social, technical, institutional and financial issues. Thus, the study concludes that public awareness, political concern and public participation are essential for the successful implementation of the legal provisions and to have an integrated approach towards sustainable management of municipal solid wastes in the country.

Larijani (2010) has attempted to study the environmental awareness of higher primary school teachers (6th and 7th standards) of Mysore city in India. The researcher has selected 136 male and 164 female teachers randomly for the present study. Chi- square test has been adopted by the researcher to find out the significant difference among the teachers with respect to their gender, age and type of school. The statistical analysis shows that 57.7 per cent of the female teachers have higher level of environmental awareness than male teachers. The study also reveals that teachers in the age groups of 31 to 50 years have higher level of awareness as compared to other age groups. And also, the teachers who are working in the private school have higher level of environmental awareness compared to the government school teachers. Finally, the study reveals that there is significant difference among male and female teachers about the environmental degradation. It also shows that majority of the teachers have moderate awareness; only a few of them have high level of environmental awareness. In the concluding remarks, the study proposes that there is an urgent need to educate the public on the issues related to global warming and environmental degradation.

Mengistie and Baraki (2010) have found that majority of the respondents disposed of solid wastes in open spaces and only 6.9 per cent of the households have temporary storage means for solid waste. The main objective of the study is to measure the level of awareness and practices of solid waste management in Kersa Woreda, Eastern Ethiopia. The study reveals that the responsibility of waste management is left for women and girls. It also reports that community household management of waste is in poor condition. The findings of the study show that 45.6 per cent of the household waste and 5.5 per cent of the waste in the urban areas are utilized as manure in gardens and fields. Therefore, the study concludes that community based education on waste management is essential for handling proper solid waste disposal. It also emphasizes that research should be encouraged to look for improved interventions.

Arora and Agarwal (2011) have made an empirical study on knowledge, attitude and practices regarding waste management in selected hostel students of Rajasthan University, Jaipur, which has found that there is significant correlation between knowledge and practices. Moreover, the study shows that 54 per cent of the respondents have low knowledge and 46 per cent of the students possess medium knowledge on waste management. As well as, the responses on attitude have been classified into favourable, less favourable and most favourable. The analysis shows that majority of the students have less favourable attitude towards waste management followed by those having most favourable attitude about the solid waste management (6.10%). In addition, the study reveals that only 1.33 per cent of the students are having good practices, whereas more than half of the students are having moderate practices towards solid waste management. So, the conclusion of the study shows that those who possess good knowledge also have good level of practices; they are able to manage the waste in proper manner. Thus, the study elucidates that majority of the respondents have unsatisfactory knowledge attitude and inadequate practices related to waste management. Hence, the study recommends implementation of training programme is a dire need for the students in hostels and educational institutions.

According to Thakur (2012) environmental pollution in rural areas can be minimized at nominal cost by creating awareness among the

rural residents. Women give more priority to protection and empowering the capacity of nature and caring for nature and environment's future. The study says that women play a vital role in the promotion of environmentally responsible behaviour in the residential setting and also in activities related to preservation of natural resources. From the study it has been observed that there is a need to create awareness regarding environmental pollution among village women so that they can be motivated to control environmental pollution to some extent at house hold level. The study denotes that low income group of rural people have poor sanitary awareness as compared to middle and higher income groups. Due to ignorance and poverty, rural women have poor awareness of solid waste disposal and environmental related problems. Thus, the study concludes that women whose knowledge regarding environment is poor, should be made to become environmentally literate and they should be engaged in environmental development programs such as plantation, kitchen gardening, proper composting, use of smokeless stoves, waste recycling and environmental culture.

Baglari (2012) in his study on soil pollution with special reference to market area of Serfanguri, Assam, states that the qualities of domestic and municipal wastes are related to population growths and production of plastic materials. Various non-removal waste and household garbage along with municipal wastes pollute the soil and land greatly. The study shows that there is lack of dustbin. Drainage systems are blocked due to the waste products thrown on it. The survey indicates that most of the people in the study area are not aware of the soil pollution and its impact. A few of them are aware but still are not interested in dealing with these issues. Then, the people in the market area have not taken any initiatives for prevention. During rainy seasons, the public face difficulties in passing through the market area. Therefore, the study concludes that the government as well as the individuals should realize the need and importance of environmental education in the present day context. Initiatives should be taken for prevention and management of environmental degradation. On the basis of result, the study suggests that environmental education should be imparted and incorporated at every level of education starting from pre-school to formal and non-formal education.

Radha (2012) has evaluated the existing knowledge, awareness and practices regarding bio medical waste management among the

health care workers in a tertiary care rural hospital, Bellur, India. The waste generated from medical activities can be hazardous, toxic and even lethal because of their high potential for diseases transmission and injury that also results in environmental degradation. A cross sectional study design has been adopted by the researcher. The study shows that there is a little gap in knowledge of all four categories of respondents like doctors, nurses, sanitary workers and lab technicians. It reveals that 68.5 per cent of the doctors have better knowledge about bio-medical waste (BMW) management rules 1998, but, none of the sanitary staff are aware of the BMW Management rules. Regarding the attitude towards bio- medical waste, 75 per cent of the sanitary workers have felt that the management of bio medical waste is not an issue at all and it is purely the responsibility of the institution not an individual responsibility, but majority of the doctors, nurses and lab technicians have the favourable attitude of willingness to attend a training programme on management of bio- medical waste. Finally, the result shows that the knowledge about bio –medical waste management including the policies are better in doctors, but practical aspects are better in nurses and the lab technicians. Hence, the study recommends that health care waste management should be supported through appropriate training and commitment of the health care staff, management and health care managers.

Sarkar et al., (2012) have carried out to examine the public awareness about impact of solid waste disposal and its management system on Thanapara, Beparipara and Kagmari region in Tangail Pourashava, Banagaladesh. One hundred people are selected through simple random sampling method. The study shows that the general concept of environmental awareness among the local people of the study areas is satisfied although they had minimum level of knowledge about solid waste, effects of solid wastes and problems associated with solid waste management etc. It also shows that there is a significant difference among various levels of occupants about the awareness of solid waste. The study also reveals that the students and service holders are more aware about solid waste management problems than their counterpart's rickshaw pullers and others. Therefore, the study concludes that it is necessary to improve present solid waste management system of Tangail pourashava and to change the place for dumping solid waste will be negligible. Hence, the study recommends that the management

of disposal facility should be increased to a satisfactory level and awareness must be developed among all classes of people so that the negative consequences of wastes can be reduced to a large extent.

Sujatha (2012) who has made a study on awareness on solid waste disposal among high school students in Avadi, Tamil Nadu, states that students are the future citizens of nation, and they should also actively participate for solving environmental related problems. Three hundred students are selected from five matriculation schools and five government schools in Avadi by using survey method. On the subject of awareness, there is significant difference between the students of government and matriculation schools about solid waste disposal. But there is no significant difference between the boys and girls of Matriculation schools about the awareness level of solid waste disposal. The analysis also indicates that the girls of government schools have more awareness about solid waste disposal than the boys of Government schools. But, the boys of government schools have more awareness about solid waste disposal than the boys of Matriculation schools. Based on the results, the study concludes that there is a need for creation of awareness among students. Thus, the study emphasizes that environmental education in schools must be given equal importance like other conventional subjects. And also, the students must be engaged in eco friendly activities for solving environmental eco-friendly issues.

Wanjari and Patil (2012) have assessed the awareness of environmental degradation among the high school students in Nagpur city, India. Three hundred students from 10 high schools are randomly selected for the present study. Questionnaire method is employed for primary data collection. And also, data have been analyzed by using simple mean and percentage. From the analysis, the result shows that maximum percentages of students are aware of the general structure and working environment. It also reveals that majority of the students do not know the effect of pollutions and man-made activities on the ecological systems and even they do not know habitat of different eco-systems. In addition, the study indicates that majority of the students are aware of the components of environment whilst most of them do not know the factors of environmental degradation. Thus, the study concludes that majority of the schools are not so active to conduct conservatory programmes in their schools. So, the management should conduct environmental campaign on school campus. Therefore, the

study emphasizes that schools should provide environmental awareness not only to the students but also to society. Furthermore, it suggests that the main course of environmental education should be included in school syllabus.

Bansal et al., (2013) have done a survey on knowledge and awareness regarding bio-medical waste management among employees of a tertiary care hospital of Gwalior, Bhopal, which reveals that overall knowledge among medical professionals is higher than Para-medical workers, whilst it is least among non-medical workers. Purposive sampling method has been adopted for the present study. The researchers have interviewed 158 study respondents, of these 44.3 per cent of the respondents are medical professionals and 29.7 per cent of the respondents are para-medical (nurse and lab technicians) and 25.5 per cent of them are non- medical (waste handlers and sweepers). The study reveals that 58.5 per cent of the medical professionals are having good knowledge regarding the bio-medical waste management. But, majority of the non-medical workers have poor knowledge and awareness about the bio-medical waste and its management. On the basis of survey, the researchers conclude that medical professionals and para-medical staff have been quite aware of the hazards associated with bio-medical waste, methods of prevention and segregation. Therefore, the study recommends that orientation trainings should be given to all the functionaries involved in the process of waste management right from waste production to final disposal.

Kumar (2013) has made a study on environmental awareness among rural folks of Hamirpur district of Himachal Pradesh, India. In his study, 1208 respondents are selected from 25 villages of the study district. The result reveals that 95.5 per cent of the respondents are aware of the environment and its features. It is clear from the study that media plays an important role for creating environmental awareness among people. The study also shows that people of the study area are having less awareness about renewable resources and conservation of biological diversity. In contrast to that, majority of the people are aware of local environmental problems like air pollution, water pollution and household waste issues. The findings of the study show that majority of the respondents do not know about the ban of polyethene bags. Thus, the study concludes that there is still a lot of work to be done for creating awareness about environmental problems among the people.

Licy et al., (2013) have done the research work on awareness, attitude and practice of school students towards household waste management, which shows that the high school students are well aware of the principles of waste minimization and the role of local authorities in waste management, segregation of wastes, effective mechanism for household waste management, complications of improper waste management compared to the higher secondary school students in Trissur city, Kerala. The researchers indicate that there are serious drawbacks in practising proper waste management among higher secondary school students compared to high school students. Statistical analysis shows that there is significant difference between awareness and practice towards solid waste management. The findings of the study clearly demonstrate that students are aware of the importance of waste management. But, they are lacking in practice of proper solid waste management. In the concluding remarks, the researchers suggest that giving social duty awareness along with waste management awareness may improve the practice of waste management. Awareness programme of waste management is greatly needed for parents also. This can be given in the school during parent-teacher meetings or in community based programme.

Kumar and Mohit (2014) have made a study on municipal solid waste management in Shivapuri town, Madhya Pradesh, India. The study shows that the present solid waste management practices in the study area are highly unsatisfied. It also shows that the waste is disposed of in open dumping sites or low lying areas. There is no community involvement for handling the waste. The result reveals that the community sensitization and public awareness are low in the study area. There is no system of segregation of organic and in-organic and recyclable wastes at household level. The people do not dispose of the garbage properly and dump it anywhere outside the house. Hence, the study concludes that there is a need to develop a methodology of research for developing interactive techniques for system's design and operational control. It also indicates that it will be nearly impossible for the civic body to provide better surroundings if residents do not take efforts to deposit the waste into the bins and stop the practice of throwing garbage on the road.

Lingam and Poyyamoli (2014) say that urbanization and rapid population growth increases overall waste generation in Cuddalore

Municipality, Tamil Nadu, India. It also indicates that the present status of municipal solid waste management in terms of collection, storage, transportation and disposal practices are poor in the study area of cuddalore. The study area generates 110 metric tonnes of solid waste per day, but the current solid waste collection system is not fully covered in the slums, fishermen colonies and a semi-urban areas. The result reveals that the municipality urgently needs to improve public awareness on municipal solid waste generation especially the concept of 4 R's such as refuse, reuse, recycle and reduce at all levels of society and need to get involvement of women self help groups on municipal solid waste management. The study reports that the success of the municipal authorities in the waste management is based on the availability of financial resources, manpower, good governance and awareness of environmental aspects. The findings of the study recommend that the Cuddalore Municipal Corporation should create awareness among the public to encourage waste segregation and recycling behaviour at source and the local authorities should involve and get support from various resident welfare association and non-governmental organizations on waste management programme.

Neelamegam and Kanmani (2014) have assessed the awareness on solid waste material pollution and global warming among higher secondary school students in Krishnagiri district of Tamil Nadu, India, which reveals that there is a significant correlation between the awareness of solid waste material pollution and global warming among higher secondary school students. It also shows that the higher secondary students of urban areas have more awareness of global warming than the rural based students. The main objective of the study is to find out the knowledge whether; there is any significant difference in solid waste material pollution and global warming among higher secondary students on the basis of their demographic and institutional variables. The result reveals that there is significant difference among higher secondary school students whose major subjects are science, mathematics, history and computer science. It also reports that the self finance school students have more knowledge in solid waste pollution and global warming than the government school students. Hence, the researchers conclude that an efficient management of solid waste material may cause conservation of land resources, protection of natural resources, production of energy resources and living conditions of inhabitants. So, the study recommends

that the people should manage and use their natural efficiently for avoiding the unwanted creation of solid wastes.

Otitoju (2014) has assessed an individual attitude towards recycling on municipal solid waste in Lagos, Nigeria. The survey method is employed in the present study. The result indicates that the respondents have adequate awareness about the current waste recycling programme. Gender is insignificant towards participation in waste recycling. There is significant difference noted between recyclers and non-recyclers on their view towards awareness, workshop and exhibition likewise also showing no difference in their requirements for participation towards the provision of infrastructure facilities, regular collection of separate waste, provision of incentives and enforcement. It shows that women tend to participate more actively in waste recycling than men as they are environmental friendly. In the concluding remarks, the study says that efforts are to be taken so as to involve the public in the policy formation, development of plans and implementation of waste management programs. It suggests that the state should carry out environmental education programs to enhance public awareness on waste separation and recycling. It also reports that the lack of knowledge and awareness are the major limitations preventing the individuals from waste recycling in Lagos State.

Adogue et al., (2015) in their study on assessment of waste management practices among residents of Owerri Municipal Imo State, Nigeria, which reveals that 90 per cent of the respondents are aware of waste management while 97.5 per cent of the respondents have positive attitude towards it. This study indicates that the attitude of people towards waste management can be affected by their level of knowledge and awareness of solid waste management. The result reveals that the female respondents are more aware of solid waste management than male respondents. And females are also significantly more knowledgeable than males about open dumping while males know more about composting and land filling. Thus, the study concludes that proper waste disposal management is essential to sustain healthy living conditions in any environment. The residents of Owerri need environmental education, regular supply of waste collection facilities and designated final dump sites. These will encourage strict adherence to proper and appropriate waste management practices among the people. Therefore, the study

recommends that government should also make adequate efforts to provide means of ferrying collected waste from the points of collection to the final dumpsite; this will help to reduce the common practices of open dumping by individuals.

Akthar and Malaviya (2015) have attempted to assess the level of environmental awareness among rural and urban residents in Bishnah, Jammu and Kashmir, India. Environmental degradation is a major stress on community life in both rural and urban areas. Rural people are directly linked to the environment as compared to urban dwellers. In their study, t-test is used to evaluate the differences between male and female regarding the environmental awareness level. The result reveals that there is significant difference in environmental awareness between male and female. It indicates that male respondents are more aware of environmental awareness than female respondents. The study also shows that the respondents with education level above middle class have higher level of awareness towards environment than the two groups (illiterate and up to middle). The findings of the study show that the urban respondents are more aware of environmental issues than rural respondents. Hence, there is a need of public awareness on the environmental issues, their consequences and the actions that have to be taken to address these issues.

Senthil et al., (2015) have focused on awareness and attitudes of people's perception towards household solid waste disposal in Kumbakonam town of Tamil Nadu, India. Three hundred respondents are involved in their research. More than half of them are using small dustbin for disposal of household wastes. And also, they are disposing of three to six kilo grams degradable and non- degradable wastes per week. But, some of them are putting their household waste along the roadside, street corners and vacant places and in front of unused houses. Further, the study reveals that three fourths of respondents are satisfied with the works of municipality sweepers. But, most of the respondents are not aware of disposal and management of solid waste. Hence, the study concludes that the respondents are willing to participate in the awareness programme; because, three fourths of them are having solid waste problems in their localities especially paper and plastics are spread over the surface, roads and everywhere. It also indicates that the municipality must clean the street of the town and collect dustbins twice a day.

Sundar and Rengasami (2016) have analyzed the awareness level of the respondents on domestic solid waste in Madukkarai town panchayats, coimbatore. Self –prepared questionnaire is used to collect the data. The researchers have used disproportionate stratified random sampling method to select the respondents from Madukarai town panchayat, Coimbatore. The study indicates that the socio-economic status has no relationship with proper domestic waste disposal. The result reveals that there is no significant difference between socio-economic status and proper disposal of household solid waste. It also shows that there is a significant difference between economic status and generation of household solid waste. The study depicts that there is no significant association between socio-economic status and paying fee for waste disposal service in the study area. The study concludes that gender has no any role in the waste disposal.

Impact of solid waste on health and environment and opinion of the respondents regarding solid waste collection and disposal in the study area

Sarkar (2003) points out that most of the waste pickers have migrated from rural India. Unemployment and under poverty line are the two primary reasons for their migration into urban areas. The survey reveals that the waste pickers belong to the poorest and the most deprived section of the urban population. Twenty seven per cent of the waste pickers, who collect medical wastes get injuries from syringes, sharp and broken bottles. And also, some of them are infected by Hepatitis B and C or HIV or other bacterial infection through contaminated injection needles. Moreover, the survey reports that tuberculosis, scabies, multi system allergic disorders, asthma, respiratory infection, ulcer complaint and stomach problems are the common diseases among the child waste pickers in the study area of Delhi. The researcher states that poverty and monotonous work push them into some social evils like drinking, drug addiction and gambling etc. The survey also reveals that even women and child waste pickers are victimized of such vices. Therefore, the study concludes that though the waste pickers contribute substantially towards recovery of recyclable materials, yet they are living under extremely unhygienic conditions. So, it is essential for them to improve their living and working conditions. It also needs public awareness on social and environmental component on solid waste management.

Kaundal and Sharma (2007) have done a research on problems of household waste disposal in Himachal Pradesh, India. The researchers have used multi-stage stratified sampling method to draw a sample of 108 female respondents. On the basis of sample survey, the study shows that all the respondents dispose of the polythene covers in the open place and used to burn them along with other waste. The research points out the chocking of drainage system with accumulation of garbage as a major problem faced outside the house. The foul smell being emitted by accumulated garbage polluting the environment is reported to be a major problem. In the concluding remarks, the results suggest that there is need for creating separate community dustbin for bio-degradable and non-bio-degradable waste materials to solve drudgery in segregation.

Mahar et al., (2007) state that solid waste management is one of the major reasons of environmental degradation in Pakistan. The study reveals that the environmental and sanitary conditions have become more serious year by year, and people are suffering from living in such conditions. The result also indicates that there are guidelines for hospital waste management since 1998, giving detailed information and covering all aspects of safe hospital waste. However, these guidelines are not implemented in the study area. Moreover, the result shows that there are no systematic approaches for the collection and disposal of hazardous waste generation from hospital, industries and agriculture activities. The findings of the study say that promotion of public awareness, legislation, financial and economic calculations strengthen institutional capacity and regulations enforcement and establishment of a proper sanitary landfill are considered to be principal remedial measures to ensure sound environmental maintenance. So, there is strong need to gradually involve private section in the solid waste management in other small cities and towns by offering incentives.

Puri et al., (2008) have analyzed solid waste management and its impact on community health in Jalandhar city, Punjab province. A number of risk factors in the form of foetal diseases are associated with the malpractices of solid waste management. A large number of residents, up to 90-95 per cent are found suffering from fever and loose motions more than once every year. The study indicates that chemical, pesticides, batteries and other domestic hazardous /toxic waste materials should be collected in different pins. So, the study concludes that waste from the hospital should be collected daily and disposed

of into incineration plant. It also recommends that the collection of recyclable /non-bio-degradable waste by NGOs should be motivated for the purpose of recycling them.

Abul (2010) has focused on environmental and health impact of solid waste disposal at Mangwaneni dumpsite of Manzini city, Swaziland. The researcher observes that most of the people in the study area live under the poverty line. A stratified sampling method has been employed in the present study for the selection of respondents and gathering the data. The residents of the study area have been divided into strata, which nearby (less than 200 m) and far away (greater than 200 m) of the dumping site. The study indicates that both residents have been affected by the location of the dumpsite closer to their settlement. It is also noted that the residents located less than 200 meters from the dumpsite are mostly affected by the dumpsite. And consequently, they become victims of malaria, cholera, chest pain, cough and diarrhea. Those who are located more than 200 meters from the dumpsite are also affected by bad smell spreading from the dumpsite. Thus, the study concludes that the dumpsites should be located at least more than 200 meters away from human residences. Therefore, the study recommends that the government and municipalities may revise the rules regarding the locations of the dumpsites. People need to be educated by health motivators about the effects of dumpsites on their health.

Chandramohan et al., (2010) have researched on solid waste, its health impairments and role of rag pickers in Tiruchirapalli city, Tamil Nadu, India, which state that rag-pickers generally comprise women, children and men, who are extremely poor and illiterate. Nevertheless, they help society by removing a considerable portion of the wastes generated in the society. A survey has been conducted from 65 randomly selected rag pickers throughout Trichy city. The majority of the wastes from the city are dumped at the Ariyamangalam dumpsite. The dumping site is surrounded by residential, commercial, institutional, industrial and agricultural areas. Most of the inhabitants belong to low status of income groups and they depend on the dumping yard for their survival by rag picking. The questionnaire survey reveals that majority of the rag pickers suffered from skin allergies, and mixture of illness, following that 15 per cent of them suffered from asthma and five per cent of them suffered from wooping cough. In addition, they face social abuse from certain elements of society, which may lead to many social problems

including the spread of sexually transmitted diseases and AIDS. Hence, the study concludes that they can be properly educated and trained to protect themselves from unhygienic practices and addiction. Either government or non-governmental organizations should devise a suitable proposal to monitor and make use of these unorganized rag-pickers, who are indispensable to the society.

Mane and Hemalatha (2012) have described an existing situation of solid waste management in Pune city, India. It is observed that the people living in this area are having health and hygienic problems such as allergic, asthmatic, bronchitis, skin irritation and gastro intestinal diseases. The study area of Mantarwadi generates many environmental as well as health hazards within surrounding area. It also causes harmful health effect on people living in that area. The study also demonstrates that open dumping of solid waste affect surrounding area of the disposal site. It also produces the bad smell at the time of decomposition process. The investigation has found that some toxic gases are emitted from solid waste landfill. These air pollutants have caused a plethora of health problems among residents nearby dumpsite. The leachate has high organic contents, soluble salts and other constituents capable of polluting ground water. It is proved that this polluted ground water is unfit for drinking and causes health complaints like jaundice, nausea, asthma, miscarriage and infertility. Thus, the research concludes that this leachate has corrosive activity, which is also dangerous for human health. And the dumping ground not only affect environment but also damage the property of surrounding area. Therefore, the current practices need improvement for managing waste.

Thirarattanasunthon et al., (2012) have reported about the health risk behaviour, and the health situation of local scavengers in open dump sites at Nakhon Ratchasima province, North Eastern, Thailand. The data is collected from 121 randomly selected dump sited scavengers. Interview schedule has been used by the researchers in the present study. The survey research shows that most of the scavengers have not been using any protective equipment like mask, gloves and boots during the duty time. Most of them have health behaviour risk of smoking, alcohol consumption and energetic drink. The study also indicates that the scavengers have faced adverse conditions such as vibration from machine, poor ventilation, odor and infections from rodents, reptiles and flies. The survey reveals physical symptoms such

as headache, skin rashes and low back pain among the respondents. In the concluding remarks, the survey reports that potential health effects of waste site-related environmental exposures might include psychological problems, digestive tract disorders and respiratory disorders as well as allergic symptoms. Thus, the study suggests that further action should be taken to reduce adverse exposures during waste collection. It also recommends that dump site scavengers should be incorporated into the formal section programme for reducing health hazards to workers.

Alam and Ahmade (2013) have reviewed the impact of solid waste on health and environment in general aspect. The growth of urban centers and density of population are exclusively for increasing the rate of solid waste in the present scenario. Uncontrolled burning of municipal solid waste and improper incineration contribute significantly to urban air contamination. Health and safety matters are also rising from improper municipal solid waste management. The decomposition of garbage constitute chemicals is a common source of local environmental contamination. In addition, the researchers state that insect and rodent vectors are attracted to the waste and can spread diseases such as cholera and dengue fever. Using water polluted by municipal solid waste for bathing, food crop irrigation and drinking water can also expose individuals to disease organism and other contaminants. A gas is released from decomposed garbage, which enhances the green house effect and climate change. The researchers conclude that improper management of waste handling, other liquid and solid wastes from residents and other sources are a serious health issues and lead to the spread of infectious disease. In the concluding remarks, they suggest that policy in the waste sector should be improved; and also collection of hazardous garbage at collection points shall be safe and performed in an environment friendly manner.

Aruna et al., (2013) in their study on Municipal solid waste management scenario of Kakinada city, which reports that the solid waste disposal methods at Cheedelapara dumping yard generate many environmental as well as health hazards within the surrounding area. In Kakinada city, tube wells are situated nearly 50 to 320 meters away from the disposal sites and people are using water regularly, which is not recommended due to the high probability of ground water contamination. The study also reveals that generation of leachate, gas, odour, noise, and dust, potential fire hazards etc. are the common environmental

problems in the existing sites that pollute nature and affects human health. The study also shows that ground water quality has been significantly affected by leachate percolation. From the analysis, the study concludes that the city has around 83 thousand houses, which generate 260 metric tons of solid waste per day. But, they are not practising any systematic process for disposal of solid waste. Moreover, Kakinada city is facing serious environmental degradation and public health risk due to the contamination of water resources near uncontrolled dumping sites. So, there is an urgent need for controlling water pollution due to indiscriminate dumping of waste.

Butu et al., (2013) have looked at municipal solid waste generation, disposal and consequent environmental impacts in Karu, Nasarawa State, Nigeria. The result of the findings show that population growth and unplanned urban expansion of the study area compounded the problems of solid waste management. The study also reveals that roadside disposal of Municipal solid wastes have serious impact on the environment. The mountains of refuse dumps, which decorate the major roadsides in karu serve as good hideouts for rodents and snakes. Also, the bio-degradable wastes serve as good breeding grounds for cockroaches, houseflies and create stagnant water, which serves as breeding ground for mosquitoes. These spread various diseases like cholera, typhoid fever, malaria and yellow fever. Thus, the study concludes that non-biodegrade fractions of the municipal solid wastes are the major problems in solid waste management, because, plastic, polythene and e-waste materials constitute physical nuisance to the environment. It also concludes that most of the non- bio-degradable solid wastes contain chemicals, which have serious implications on the environmental sustainability and human health. Therefore, the researchers suggest that proper orientation and environmental laws should be put in place for the general public. The government should also make quick efforts to improve the present waste disposal and management system of the study area by providing necessary facilities for house to house and street to street waste collections.

Gogoi (2013) has stated that the Guwahati city faces many problems due to huge population growth within a short period of time. The management of municipal solid waste has become an acute problem due to enhanced economic activities and rapid urbanization. The researcher points out that wastes heap up on the roads owing to the improper

disposal system of Guwahati municipal. People in the study area clean their own houses and dispose of their wastes in the surroundings, which affects the neighbouring community and themselves. This type of dumping leads to unhygienic conditions. It also produces foul smell, breeds various types of insects and infectious organism besides spoiling the environment. Similarly, it reports that municipal trucks simply carry the wastes and dispose of it in the dumping site without any processing, which has become a health risk to the local people with the resultant pollution of the air and water. Therefore, the study concludes that the quantity of municipal solid wastes generated in Guwahati has been consistently rising over the years. This can be attributed to the rapid population growth, mass migration of population from rural to urban areas, floating population and increase in economic activities in the city together with the change in people's lifestyle. It also implies that the proper disposal of waste is essential for the preservative of the living environment and the maintenance of a high level of public hygiene.

Jeyakrishnan et al., (2013) in their study on occupational health problems of municipal solid waste management workers in India reports that respiratory diseases, eye diseases, dermatological problems and nail infection to be high among solid waste handlers. The study also reports that the relationship between exposure of solid waste and increased health risk is greatest where the contact between the solid waste workers and waste is greatest and levels of protection is least. In the study, 36.4 percentage of the respondents are affected by skin diseases due to allergic or fungus infection and chemical wastes. Moreover, 47 per cent of the respondents have nail infection of either fingers or toes due to direct handle with waste. Absence of regular bathing after laboring has found to be significant statistical association with skin diseases, allergy and diarrhea. Therefore, the study concludes that measures are needed to improve the work environment of waste handlers by ensuring availability of protective equipment, clean drinking water and washing and sanitation facilities during working hours. Furthermore, the study implies that a system of health recording and routine surveillance among solid waste workers should be implemented.

Karija et al., (2013) have aimed at investigating the impact of poor municipal solid waste management practices, sanitation status of water quality and public health in Juba City, South Sudan. The city is characterized by rapid development, urban sprawl and inadequate

service provision. The majority of local inhabitants of juba do not have any garbage service and many of them use dry streambeds that transverse the city as dumping areas. The uncontrolled and un-scientific dumping of municipal solid wastes have brought about a rising number of incidents of hazards to human health, contamination of both surface and ground water, which is in turn, a serious human health risk. The result of the study reveals that the Nile river is highly contaminated with extent of fecal coliform, which is unfit to be used as drinking water except for other purposes. The study also shows that the entire streams in Juba city have highly been contaminated due to dumping of waste. Water-borne diseases such as typhoid, diarrhoea, dysentery, hepatitis A and occasionally cholera are currently a serious public health problem in the study area. Thus, the study concludes that the poor municipal solid waste management in Juba is posing high risk to the human health and the environment. Therefore, the study suggests that more extensive surveys are needed to monitor the quality of the river water in order to reduce the level of water-borne diseases incidence. Hence, the city's authorities must allot sufficient fund in municipal solid waste management in order to avoid the high risk to the environment and the loss of innocent lives.

Njoroge et al., (2013) while making a case study on influence of informal solid waste management on livelihoods of urban solid waste collectors of Nakuru Municipality, Kenya, prove that under nutrition, anemia, tuberculosis and other bacterial and parasitic diseases are very common amongst waste pickers. Direct health risks mainly concern those working in the field without using proper gloves, uniforms and safety boots. One hundred and ninety respondents have been selected by purposive and snowball sampling methods. Most of the respondents in this study suffered from serious headaches and backaches. The study has also found that the urban poor have been working in weak conditions and they are not undertaking any precaution. Dust particles are also exacerbated various respiratory symptoms including asthma and various allergies among waste collectors. Therefore, the research concludes that the municipality and health facilities do not meet environmentally safe waste disposal levels because of a sanitary landfills and incinerators. Therefore, it is posing great health risks to the individual actors as they scavenge for some saleable items. The urban poor should be empowered through public, private partnership

to ensure livelihood sustainability. The findings of the study also imply that the local authorities should undertake management reforms to bring an end to nasty areas of uncollected or illegally dumped solid wastes by adopting 3Rs approach of reduce, reuse, and recycle waste, which will result in the minimization of waste reaching the drop off points.

Saha (2013) reports that the poor disposal and handling of waste lead to environmental degradation, damage of eco- system and pose great risks to public health in Pabna city of Bangladesh. The survey reveals that there is a significant link between the improper management of urban solid wastes and the environmental pollution. The findings of the study cite that the study area faces serious environmental problems such as land, water and air pollution due to uncollected solid waste. It also indicates that leachate, gas, odor, noise and dust etc., are the common environmental problems in the existing sites that affect the nature and human health. In spite of a stringent legislation in place, open dumping is the most wide spread form of waste disposal. Thus, the study concludes that the dumping site of the research area is operated in uncontrolled manner. And also, there is no system of segregation of organic, inorganic and recyclable wastes at household level. So, public awareness, political will and public participation are needed for the successful implementation of the legal provision and to have an integrated approach towards sustainable management of municipal solid wastes in the Pabna city.

Sankoh et al., (2013) have examined an environmental and health impact of solid waste disposal on developing cities of Granville brook dumpsite, Freetown, Sierra Leone, which states that both nearby and far-away residents suffered from diseases due to the location of the dumpsite closer to their settlements. The investigators have selected three hundred and ninety eight respondents from nearby residents and two hundred and thirty three respondents from faraway residents of dumpsite through the stratified sampling method. The research reveals that the study area has suffered from related diseases such as malaria, diarrhea, cholera, chest pain and skin diseases. It is also noted that the extent of air and water pollution is worse in the raining season as a result of offensive and disease-carrying odor, as well as polluted ground water in the study area. In the dry season, the fare-away inhabitants are also affected by the smog from the incineration of the dumpsite. Thus, the study concludes that the dumpsite should be properly located

and managed to minimize their effects on the environment. In the concluding remarks, the researchers suggest that the Freetown city council should provide the environmental education programmes for all persons living in less than fifty meters distance from the dumpsite as interim measures. Moreover, people need to be educated by health motivators about the effects of dumpsites on their health.

Singh (2013) has done a case study on impact of solid waste on human health in Varanasi city, India. Increasing urbanization and population are fully responsible for high generation of solid waste and its improper management is a major problem of Municipal Corporation of Varanasi. Improper solid waste disposal and management pollute our natural resources. Indiscriminate dumping of waste contaminates the surface and ground water resources also. Uncontrolled burning of wastes and improper incineration contribute significantly to urban air pollution. Abandoned hazardous wastes create potential risks to human health. The main objective of the study is to find out the various diseases due to solid waste in the dumping site of Mohalla, Varanasi city. The study shows that 55 cases of Malaria, 5 cases of Filarial, 42 cases of typhoid and 61 cases of Dengue have been identified in the study area. It also reveals that maximum case of dengue and minimum case of filariasis have been recorded in the research field. Thus, the study concludes that excrete and other liquid and solid waste from households and community are serious health hazards and it leads to the spread of infectious diseases. Furthermore, it concludes that with increase in the global population and the rising demand for food and other essentials, there has been rise in the amount of waste being generated daily by each household.

Akhtar (2014) has emphasized the issues associated to the rigorous growth of solid waste and its impact on the environment. The world's accelerated economic development in recent decades has led to a rapid urbanization and an uncontrolled population growth in fast developing countries like India and China. Most of the waste ends up in open dumps and wetlands, contaminating surface and groundwater and posing major health hazards. Only a small amount of the region's waste is disposed of in sanitary landfills; but most of the wastes are disposed of into open places or semi controlled unlined landfills without groundwater protection, leachate recovery. The disposing sites serve as breeding grounds for rats, flies, birds and

other organism that serve as disease vectors, smoke from burning waste damage the health of nearby residents and the smell degrades their quality of life. Some hazard wastes have teratogenic (birth defects) and carcinogenic (cancer causing) effects. Thus, the study concludes that the immediate health effects from hazard wastes from bad smell cause irritation to eyes and skin, throat and breathing disorders and other serious health conditions that affect the nervous system and could cause paralysis of the functional body parts. It also can cause contamination of surrounding soil, groundwater and surface water sources. Therefore, the researcher suggests that the charges to be imposed on waste producing companies, factories, shopping centers, hotels also on residential areas where the daily waste generation rate is high. The research also implies that the awareness should be enhanced among the public about the waste generation and its problems.

Devi et al., (2014) have made a research work on the solid waste collection by rag pickers at greater Hyderabad Municipal Corporation, India, which shows that most of the waste pickers are migrated from neighbouring states such as west Bengal, Uttar Pradesh, Bihar. It also reveals that the rag pickers suffer from many diseases, such as respiratory problems, worms, anemia, fever and rashes. The survey indicates that the rag pickers live in rows of hut area near to dumping yard so that they become easily vulnerable to various diseases. Moreover, the study observes that most commonly experienced diseases among waste pickers are tuberculosis, bronchitis, asthma, pneumonia, dysentery, parasites and malnutrition in the study area. Majority of the waste pickers have to spend five to eight hours per day for collecting the waste materials. Furthermore, the study reveals that 82 per cent of the waste pickers have wounds or injuries while handling the waste things. In this regard, the study concludes that lack of precautionary safety measures and lack of awareness about health care are the main reasons of health diseases among the rag pickers. And also, the rag pickers have not taken any care of their good health due to poverty and ignorance. Thus, the study suggests that the city's authorities must heavily invest in municipal solid waste management in order to avoid the high risk to the environment and the loss of innocent lives. It also recommends that the corporation may register the rag pickers involved in work and issue health cards to them so as to enable them to get treatment from Employee's State Insurance (ESI) hospital.

John et al., (2014) have attempted to observe the existence of pollution in ground water quality and its ill effects on human beings who settled near the dump site at Dehradun Municipal Corporation of Uttarkhand. Groundwater water contamination is generally irreversible. They state that once the groundwater is contaminated it is very difficult to restore the original water source and degrades water quality that produces an objectionable taste, odor and excessive hardness. The study area has many bore wells and hand pumps. The depth of these bore wells and hand pumps around the dumping site varies from 350-450 feet. The study also indicates that the municipal wastes are disposed of into pre-excavated trench and covered with a layer of soil. Thus, the study reveals that the ground water has been significantly contaminated due to the leachate from landfill. An extremely high and low pH values in the water will pose hazardous impact on human and animal's health. The findings of the study conclude that the ground water quality does not conform to the drinking water quality standard as per Bureau of Indian Standard (BIS). Hence, the study clearly indicates that landfills in densely populated cities have been monitored on regular basis. So, the study recommends that it is always better to protect ground water first rather than recycling to clean up water from a contamination source.

Loboka et al., (2014) have brought to highlight the municipal solid waste pollution in the Juba city, South Sudan with specific focus on waste management system. Waste is also commonly dumped into watercourses or streams, thereby contributing to make water pollution and to spread waterborne diseases, such as typhoid, cholera, dysentery, diarrhoea, hepatitis A and a number of tropical diseases including malaria in the study area. The research reveals that the poor water quality and sanitation can be directly reflected in the high rate incidence of waterborne diseases, which is currently a serious health problem in Juba City. Majority of the local inhabitants in the study area do not have any garbage service and many of them are using the dry stream beds as dumping site. Due to the lack of environmental protection measures, small ponds of highly polluted water can be seen in the site. Thus, the study concludes that there is a significant relationship between solid waste pollution, water pollution and some of water borne diseases in Juba city. And also, municipal solid waste pollution is real pervasive and serious problem in Juba city that needs a very urgent solution. So, the government must allocate sufficient grant for the waste management

section. And also, the city council must develop comprehensive waste management plan and policy.

Singh et al., (2014) have emphasized the characteristics of waste, adverse environmental impact, health risks, poor waste management practices and also problems associated with solid waste management system at the municipal level. In the study area, insufficient number of waste transport vehicles cause overloading of tucks and spreading of various wastes on the road through which they move. The survey shows that some sanitary workers and waste pickers have been suffering from various diseases like eye problems, respiratory ailments, gastrointestinal ailments and skin allergy. It also demonstrates that open land disposal of solid wastes are associated with the emission of inflammable gases like methane, ammonia, which pollute the air and soil. In the concluding remarks, the study says that increasing urbanization and industrialization are bound to increase the amount of waste produced in Agra city. Proper management of solid waste by the government organization has not been successful and is somewhat poor in this urban centre. So, there is an urgent need for a well defined strategic waste management plan and its strong implementation for protecting public health and clean environment. In addition, the public should be motivated by awareness campaigns and environmental education.

Sidhardhan et al., (2015) have analyzed the solid waste management of three municipalities, which are semi urban area of Tirunelveli district of Tamil Nadu in India and their impact on ground water resources. The dumpsites contain vegetables waste, wood, paper, cloth, glass, various types of plastic waste and metal scraps. It is being operated as open dumps. The researchers have collected water samples from existing well in and around the dump sites in the study area and assessed the possible scenario of ground water pollution caused by solid waste dumping. The study shows the penetration of open dump leachate has occurred to ground water and pollutes the ground water aquifer. Hence, it concludes that the study area has a significant impact on ground water quality. The ground water location of Tenkasi is more affected than the other areas of municipalities. The emphasis should be given to improve waste management practices, design and construct properly landfills sites with lines to prevent the ground water pollution of the study area.

Suleman et al., (2015) have focused on solid waste disposal and health problems among residents in the Sawaba community, Ghana. The study shows the health effects in relation to the modes of solid waste disposal among residents in the community. The result revels that majority of the respondents are concerned with the mosquitoes breeding grounds as a result of the open dump sites, along the banks of water channels and other unauthorized places within the community. The study concludes that the final disposal sites for solid wastes should be located outside residential areas, especially the open dumpsites to avoid proliferation pest and diseases. It is further recommended that residents in the study area should insist on using mosquito nets to avoid being bitten by mosquitoes. And also, the district assembly in the study area should provide health education to live in good health.

Deshmukh et al., (2016) have assessed an impact of municipal solid waste on ground water quality in Sangamner City, Maharastra, India. The researchers found that the groundwater resources around the dumping yard area are facing severe threat from municipal solid waste and impact on the subsurface aqueous environment. It also reveals that the groundwater quality around the dumping yard is unsuitable for drinking. In the study area, people have suffered from various miseries and diseases arising from waste disposal problems. Hence, the study concludes that the present disposal system of municipal solid waste must be abandoned and dump site should be rehabilitated and closed. The suitable place should be chosen under predefined conditions and far from agriculture land, river and residential areas, which minimizes the environmental impact. There is an urgent need to create public awareness on the groundwater sources, causes and prevention of groundwater pollution. Substantial programs with the participation of people can help to minimize the solid waste generation as well as identification of suitable dump site will conserve the groundwater quality in the study area.

Singh et al., (2016) have made a research on assessment of pollution potential of leachate from the municipal solid waste disposal site and its impact on ground water quality in Varanasi region, Uttar Pradesh, India. The researchers state that open dumping of municipal solid waste is prone to groundwater contamination because of leachate production. The result reveals that the ground water of nearby wells is significantly contaminated due to leachate.

It also shows that the quality of ground water is affected in many wells, which are near to landfill site. Moreover, nine per cent of the samples show as unsuitable for drinking purposes and seven samples are grouped characterized by sites close to a landfill site, which is found to be highly polluted due to the contribution from domestic and agriculture waste. The study recommends that an engineered dumping site, which control the impact of leachate on groundwater of the hydrologic region be created.

EFFORTS TAKEN BY THE GOVERNMENT BODIES ON SOLID WASTE COLLECTION AND DISPOSAL

According to Tamil Nadu Commissionerate of town panchayat's manual on solid waste management (2008), the implementation and impact of solid waste management innovations in five localities of Tamil Nadu; Musiri special grade town panchayat in Trichy district, Mudichur village panchayat in kanchipuram district, Pammal municipality in Chennai, Gandhi Nagar selection grade town panchayat in Vellore district and Melpattampakkm first grade town panchayat in Cuddalore district. The solid waste management systems in these localities are widely regarded as successes that deserve replication. The study shows that Musiri special grade town panchayat of Trichy district has 11 transfer points, mudichur village panchayat of Kanchipuram district has 2 transfer locations, Melpattampakkam first grade town panchayat has one transfer point for waste collection and recycling. The study concludes that these five local panchayats have provided necessary vehicles for the waste collectors.

Chandra and Devi (2009) have analyzed the solid waste management in Mysore city, India. The municipal corporation of Mysore city has provided 17 tractors trailer, five tractor tipper and two dumps for waste collection. It has also established small vermin composting plant in the city. The municipal corporation conducts campaign on solid waste management frequently. It has implemented 'Nirmal Nagara Project' in 2001. The municipal corporations also formed student's eco-club for maintaining green environment. The study shows that the city has excel plant, which has the capacity to handle 200 tonnes of waste per day. Thus, the study concludes that Mysore city might need to look for better solution of waste disposal considering unavailability of landfill and disposal site.

Ramesh and Sivaram (2016) have made a study on solid waste management in kurudampalayam panchayat, Tamil Nadu: classic cases that transform waste into resource. Kurudampalayam gram panchayat is located in Coimbatore city of Tamil Nadu. The District Rural Development Agency (DRDA) has established the liquid and solid resource management in 2013 at kurudampalayam village panchayat. The study indicates that nearly 26 workers are engaged in solid resource management in kurudampalayam. This solid waste resource unit has taken more than five million Indian rupees as capital cost, which does not include the cost of land. Funds also have been raised from both government and private sources. The kurudampalayam village panchayat provides two types of dustbins to each household. It also provides a first aid kit, drinking water bottle and toolset to the waste collectors. The panchayat also provides that tri- wheeler vehicle for the waste collections. The solid waste management unit has 10 country cows and ducks. The cow converts such bio-degradable waste into cow dung within 6-8 hours, which otherwise shall take more than 45 days for composting. The researcher concludes that the kurudampalayam solid waste management unit has several ideas to offer any village panchayats that is eager of learning how to manage household solid waste at panchayat level. It also has all potentials to emerge even as training cum demonstration centre for solid waste management in Tamil Nadu.

EFFORTS TO BE TAKEN BY THE LOCAL BODIES ON SOLID WASTE COLLECTION AND DISPOSAL

Lanza (1981) has done a study on Municipal solid waste regulation: An ineffective solution to national problem, which indicates that the state and regional approach is the only viable system to control parochial opposition while simultaneously educating the public on the technological advances of solid waste disposal. The court states that the removal of solid waste is necessary for the continued well-being and health of a community and neighboring communities. The federal and state legislation, which prohibit open dumping have caused a sharp decrease in the number of land disposal sites. Furthermore, the increasing involvement of federal and both governments in solid waste regulation indicates that the problems involving disposal have reached regional and national proportions. The result reveals that

a state wide and regional approach is the most feasible method of eliminating environmentally unsound waste disposal practices. Thus, the study concludes that states and regions should establish public service corporations to plan, finance, construct, operate and regulate waste disposal facilities. Finally, the study reveals that a state wide and regional approach would provide an economic base for better operational control of waste disposal facilities.

Dwivedi and Kishore (1982) state that India had a long and rich tradition of environmental protection, which took the form of worship of some animals and tree, large scale-degradation of the environment has resulted from population pressures, rapid industrialization and indiscriminate use of forest areas for fuel, power generation and irrigation purposes. The wild life population is also on the decline as a result of indiscriminate exploitation and habitat destruction. The study highlights that the public awareness and public participation are the two key elements of environmental policy, planning and management. They have also said that the leadership will have to come from educational institutions, the mass media and the judiciary. A state board has executive and territorial functions such as planning and programming for the prevention, control, or abatement of pollution of streams and wells; inspection of sewage or industrial effluents including municipal plants for the treatment of sewage or trade effluents; and setting standards for the sewage and industrial effluents discharge. The study illustrates that there is no legal requirements for environmental impact assessment of major projects in India and no sustained efforts to solve environmental problems. Thus, the study concludes that mass media will have to be more vigilant by constant publications and exposure of pollution cases.

Ramakrishna (1985) has discussed the emergence of environmental laws in the developing countries, population growth, urbanization and industrial and agricultural developments underlie the primary environmental problems facing India today. Population growth has created water supply, sewage and waste disposal problems. The concentration of population and industrial activity in large cities has overburdened municipal sanitation facilities. The study highlights that India has made significant progress in its pursuit of environmental protection over the last decade. And the government has officially accepted the co-existence of economic development and environmental protection. It also demonstrates that parliament could strengthen the role

of the judiciary by enacting provisions, which give citizens affected by pollution to sue polluters. Thus, the study concludes that concerted and unified efforts by the Indian government are necessary to solve these problems and to assure the future integrity of India's environment. It also ends that without the political will to enforce the laws, no amount of legislation can improve India's environmental situations.

Reddy (2003) has explored the linkages between degradation and policy and institutional environment in the context of agro-climatic regional planning. The study also seeks to measure the extent of damage due to land degradation of various types and their expected trends in the future. The analysis clearly says that the extent and cost of degradation are substantial in India. The various components of land degradation such as salinity, water logging, wind and water erosion are closely associated with water and forest resources. The study shows that the sustainable development is critically linked with land degradation, especially in agrarian economics like India. The result reveals that judicious management is vital for achieving overall sustainable development. Thus, the study concludes that judicious management of irrigation water will go a long way in controlling degradation. Therefore, strengthening the extension network is very much needed in order to alleviate the problems of land degradation. And the achievement of sustainable development could be possible only through judicious management of natural resources without losing much on the pace of the present development.

Ishaq and Omoleke (2004) have made a study on management of environmental pollution in Ibadan city, Africa: The challenges of health hazard facing government and the people. The study reveals that despite the efforts of previous and present administration, piles of decaying garbage, which are substantially domestic in nature dominate strategic locations in the city and the government propaganda has little impact on the environment in the city and its suburbs thereby constituting health hazards such as infections, diarrhea, gastroenteritis and cholera to mention a few. It also indicates that the poor unmaintained sewage system, poultry and piggery wastes also contribute to environmental pollution and nuisance, which are hazardous to human lives. Finally, the study concludes that the environmental awareness and campaigns at the grassroots are needed to be intensified, most especially in the traditionally core of the city. It is recommended that industrial pollution

should also be checked through legal recourse. Any factory that fails to comply with environmental law should be closed dawn summarily.

Kumar et al., (2004) have identified the various legislative provisions available in India and other parts of the world to analyze the environmental issues. The study reveals that the courts play a constructive role by their pragmatic judicial approach towards the problems dealing with noise pollution. However, in India there exists no law exclusively, which deals with the problems of noise, whereas the developed countries of the world have enacted specific laws to control the noise pollution. Moreover, the study highlights that the problem of environmental protection should be given utmost priority and be dealt with effective measures. Thus, the study concludes that the existing enactments, which directly or indirectly relate to the problems of noise pollution in India, are found inadequate to control it on national level. Hence, there is need to have some specific and effective legislation to control noise pollution in the nation, which will be best suited to Indian culture and social set-up. A special tax may be imposed on all the vehicles and other sources of noise pollution in order to provide sufficient funds to implement the programmes and policies of noise pollution control.

Agarwal (2005) while making a study on environmental laws in India: challenges for enforcement, reveals that Supreme Court of India has played a vital role for protection and improvement of environment. It is noticed that more than 200 central and state legislations, which deal with environmental issues. In the past few years there is an increasing trend to the number of cases based on environmental pollution, ecological destruction and conflicts over natural resources' coming up before the courts. The study also indicates that the pollution control board does not have power to punish the violations but can launch prosecution against them in the courts, which ultimately defeats the purpose and object of the environmental laws due to long delays in deciding the cases. So, there is a need to have a comprehensive and an integrated law on environmental protection for meaningful enforcement. Thus, the study concludes that it is not enough to enact the legislations. A positive attitude on the part of everyone in society is essential for effective and efficient enforcement of this legislation. It needs to be appreciated that keeping in view the magnitude of finance required, a judicious mix of incentives, phasing and awareness creating, programmes

about cost-effective technologies are essential as the first prong of the strategy to control environmental degradation.

Dutta et al., (2006) have discussed the environmental management of industrial hazardous wastes in India. Hazardous Wastes Rules 1989 have been framed by the central government and amended in 2000 and 2003 to deal with the hazardous wastes related environmental and health problems that may arise in the near future. Illegal dumping of hazardous wastes by the industries may cause severe environmental pollution and health problems. The study shows that central pollution control board is working for formulation of the solid waste rule in India under the provisions of environment (protection) act, 1986. The study highlights that the environmental impact assessment is being practiced all over the world to decide a site of secured landfill to ensure less legislative impact of such facility on human and ecological systems. The study concludes that regional hazardous waste facility shall be more economical, profitable and will serve the requirement of a region, thus, eliminating the scope of scattered impact of many such facilities of smaller scales.

Periyathambi et al., (2009) have found that the solid waste and public cleansing management bill, which was approved in August 2007 after a 10 years delay, is envisaged to have serious consequences in solid waste management practices and implementation in Malaysia. The study explores the main features of this all encompassing bill and its impacts on the waste management scenario in Malaysia. The study shows that the bill covers the management of solid waste from commercial centers, public sites, construction sites, household's wastes. The study also highlights that the authorized officers are also empowered to stop, search and seize vehicles suspected of carrying anything prohibited by the regulations to curb the increasing rate of illegal dumping faced by the local authorities. The result reveals that there is no incineration of municipal solid waste except of selected islands, and there is also currently no waste segregation. Although the solid waste bill specifically mentions waste minimization with two recycling target of 22% by 2020, the current rate of recycling in Malaysia is only 5%. Thus, there is need to have a clear policy on waste management and legislation to realize the policy is imperative.

Ahmed and Hussain (2011) have carried out a study on "solid waste management of Narayanganj city: An environmental study",

which reveals that there is a significant link between the improper management of urban solid wastes and environmental pollution. The study indicates that the municipal authority spends only about 0.75 million Taka (Currency) for providing the services. The findings of the study suggest that some measures to efficiently manage the solid wastes and to take necessary steps for environmental degradation such as surface and ground water contamination, air pollution, noise pollution and odor due to inefficient management of solid waste of the city. It needs to maintain a scientific and engineering approach by the city authority for solid waste management. It also needs to strengthen legislation, strengthen management, minimize or control the use of non-degradable plastics for daily use. Therefore, it is important to launch a long- term awareness building and campaign programme in the study area so that people will be motivated about enhancing their own environmental conditions willingly.

Amokaye (2012) has examined both from the theoretical and practical points of view the moralities for achieving effective and efficient enforcement of Nigerian environmental laws. The study provides the justification for governmental regulation of environmental pollution in the face of market failure by providing both socio-political and economic perspectives of environmental policy with regard to both normative and positive dimensions of securing optimal environmental governance. While environmental regulations are justified in one width, strict application of command and control approach may be counter-productive in environmental management. Thus, the study concludes that the government must promote, implement and enforce the environmental policies in a transparent manner. There is need to streamline some of law to reduce cost and wastage associated with the administration of environmental problems in Nigeria.

Bahauddin and Uddin (2012) have found that Dhaka, the capital city of Bangladesh is facing serious environmental degradation and public health risk due to uncollected disposal of waste on streets and other public areas, clogged drainage system by indiscriminately dumped wastes and by contamination of wastes resources near uncontrolled dumping sites. In Dhaka city, conservation department is responsible for solid waste management includes cleaning of streets and drains. The composition of solid waste in Dhaka city reveals a high potential for making compost from organic matter after sorting and appropriate

treatment and recycling of paper and plastic products. The result shows that there is no independent law in Bangladesh to address the problems of solid waste. Thus, the study concludes that clean campaigns and other educational programs can change public attitudes and create environmental awareness and the proper behaviour towards minimizing the volume of solid waste. It also indicates that the municipality also needs to increase the experts to monitor solid waste management activities.

Alzahrani (2013) has analyzed the legal and regulatory framework recently implemented by Saudi Arabia. The contribution of solid waste to Saudi Arabian landfills was considered a significant threat to public health and environment. The study shows that the 1998 guidelines and the 2001 regulations of solid waste management reflect the basic legal mechanisms in industrial countries. It also reveals that health care providers are required to abide by regulations in the proper handling and storage of medical waste, and private waste management firms must be licensed and abide by regulations related to transport, treatment and disposal. The study concludes that the Saudi Arabia regulations, unfortunately, lack the same level of civil and criminal penalties against violations, and thus the law lacks the bite of its counterparts in industrial countries. Until the regulations of 1998, medical waste was generally viewed to be municipal and its disposal occurred through municipal waste management systems. In the absence of a large and experienced enforcement bureaucracy, Saudi Arabia should consider the implementation of economic mechanisms to encourage proper waste management practices.

Bhattacharya (2013) has done a research on NGOs and environmental protection in Assam, which shows that non-governmental organizations play a significant role in environment protection. It is also found to be involved in different spheres of environmental activities like protecting bio-diversity, reducing environmental pollution and also promoting sustainable livelihood of the people living in close proximity with nature. He states that the degradation of environment cannot be upgraded in a day or two and is also a complex process that requires long term goal; it is difficult to assess their success or failure in one or two projects. The garbage management and solid waste management is yet a serious threat to environment particularly in urban areas. The government and members of society show a kind of aloofness and

reluctance to recognize the problem. Thus, the study concludes that the role of NGOs in environment protection is increasing with the formation of new organizations both at national level and gross root level, which not only take the local environmental issues, but also issues, which are of global significance.

Mane and Anjum (2013) state that there are many issues faced by the environment and people living in the surrounding of the planet and the reasons could be associated with the extra burden of the waste dumping, mismanagement, unscientific management and the ignorance for the implementation civic bodies for the municipality of Pune. The study shows that the laws related with solid waste management in India talk about treatment, handling and other scientific techniques but whether implemented successfully or not is a big question and matter of discussion. The result reveals that the environmental problems must be solved as early as possible to reduce the intensity of complex issues, which are worsening due to increasing population and generation of wastes. So, there is also need form newer products like composts and recycled ones, which are eco friendly and long lasting. Hence, the findings of the study urge for strict legislative efforts and effective implementation by active participation of community, public and private agencies are vital for the safe management of solid wastes. Finally, the study shows that the problems faced by the community at large should be solved by the government and all other interested parties in peaceful ways to eradicate the long lasting issues before they turn into the devastating situations.

Deshmukh (2014) has observed that people are very much concerned about personal health but are negligent in maintaining healthy environment, which is corollary of health. The study shows that environmental education becomes an integral part of the strategy for ecological development, environmental improvement and protection as well as prevention of environmental degradation. Therefore, the study concludes that the laws of environment should be framed, amended and implemented in consonance with the basic human right of the individuals irrespective of all national and international boundaries and barriers keeping in view the safety of human life and liberty. When every person assures himself or herself a pollution free environment, the problem of its protection will be solved. The model of transformation of this idea into practice should be from individual to national level.

The individual should get in association with the like-minded people, i.e. self help group (SHG) and the SHG at large could invoke national commitment in making health and healthy environment as the basic human rights.

Limbu (2014) in her study on solid waste management in the town of Darjeeling: an environmental concern, which says that the respective governments in the country have implemented laws regarding environment issues but these laws sometimes conflict with the development process and the former have to surrender in retrospect. The result reveals that the municipal authority has provided 18 numbers of roadside vats for collection of solid wastes. But, the people of the study area prefer to throw solid wastes in the road sides, inside the surface drains, in the allies and rear side ditches where the dust bins or vats are not located within the reach of the people. It also highlights that the overall picture of solid waste management in the municipal towns is not quite satisfactory and needs to be improved in order to achieve proper environmental sanitation. It also reveals that the efficiency of waste collection must be improved in the town by bringing about the necessary changes in the design of equipment used by sanitary staff, man power management and planning. Thus, the study concludes that regular analysis and monitoring of solid waste characteristics are not done and presence of toxic and hazardous materials cannot be ruled out.

Vilas (2015) has discussed the legal profile and policies available on solid waste management in India, responsibilities of the concerned departments and future, need to enhance legal regime for better management of Indian environment. The failure of municipal solid waste management can result in serious health problems and environmental degradation. The study highlights that integrated solid waste management provides a framework and ideal guidelines for the treatment of wastes where sustainable waste management practices are followed and all states must include ideal aspect of ISWM (Integrated Solid Waste Management). The result reveals that solid waste management rules 2000 are that they do not mention about the role played by informal sector workers. The study concludes that environmental and health impact assessment should strictly practise in order to designate the future impact on the environmental components and selected of proper sites for treatment of hazardous wastes. So, there is need to carry out changes in existing laws regarding disposal of hazardous wastes,

plastic wastes and e-wastes etc., as per changing conditions of lifestyle patterns of the Indian society.

Dash (2015) has reviewed the environmental pollution and its disastrous effects. The researcher states that urbanization and industrialization has led shifting of people from village to town, which produce thousands of tonness of Municipal solid waste daily. Now-a days, many people dump their household garbage into river, streams and seas, thus making water bodies the final resting place of cans, bottles, plastics and other household products. The agriculture application of municipal solid waste can lead to a potential environmental threat due to the presence of pathogens and toxic pollutant. The continuation of hazardous metal ions in the environment is a potential problem to water and soil quality due to their high toxicity to plant, animal and human life. In addition, there is a number of water borne diseases like cholera, diarrhea, dysentery etc, which are transmitted by drinking contaminated water. In the concluding remarks, the study suggests that an effective measurement has to be taken in this direction to curb all this menace and find an amicable way to solve the issue.

Ghosh and Bhattacharya (2015) have described the present scenario of solid waste generation, collection, transportation and treatment in India. Potential environmental and human health effects resulting from waste generation and disposal are also discussed in the study. The result reveals that bio-medical wastes and industrial wastes are not allowed to be mixed with municipal wastes. Routine use of pesticides on garbage has been banned by the Supreme Court in 1997. Littering and throwing of garbage on road sides are also prohibited. The study concludes that solid waste disposal sites in India are often a source of livelihood for the urban poor, who locate their residences in proximity to these sites, making them highly susceptible to health disorders. It also indicates that lack of resources such as financing, infrastructure, suitable planning and leadership are the main barriers for effective solid waste management. The findings of the study recommend that the municipal authorities should maintain the storage facilities in such a manner that they do not create unhygienic and unsanitary conditions. And a new survey should be carried out on the generation and characterization of solid waste management in India. In spite of vermi-composting or composting, an open dump or uncontrolled waste disposal area should be rehabilitated.

Niyati (2015) has made a study on judicial activism for environment protection in India. The study highlights that there is ample of constitutional and legislative provisions on environment protection in India. Despite of these legislations, rules and regulations, protection and preservation of the environment is still a pressing issue. The study reveals that a strong foundation for environmental jurisprudence in India helped in the protection and preservation of its environment as well as its people. In addition, the role of concerned citizens, NGOs and the media viz enactment of various provisions of the law, especially related to development and environmental issues has become phenomenal. The findings of the study show that the central and state government have taken some proactive steps in the formulation of municipal solid waste rule, Delhi CNG (Compressed Natural Gas) policy, Karnataka municipal act, which are the direct result of Supreme Court order. Thus, the study concludes that there is need for an effective and efficient enforcement of the constitutional mandate and the other environmental legislations.

Joseph (2016) has analyzed the environmental protection in India. Environmental protection has become a major issue in contemporary world. The severe consequences of environment degradation include climate change, famine, drought, loss of bio-diversity, conflicts, human rights abuse, extreme poverty and migration have attracted global attention on the need for environment protection. The problem of environmental degradation compels people to take active participation in environmental protection movements in India. The World Bank estimates the environmental degradation is costing India around 5.7 per cent of its GDP every year. Social factors such as population growth, poverty and urbanization contribute to environment degradation in India. Indian constitution ensures environment protection through directive principles of state policy as well as fundamental rights and duties. The government of Delhi has undertaken various schemes on environment protection by addressing the problem of air, noise, water pollution and disposal of waste including sold waste, e-waste, bio-medical waste, protecting greenery by planting trees, protecting parks and measures in response to climate change. Thus, the study concludes that a balanced industrialization and development policy is to be framed for the protection of environmental resources for existence and survival of human beings.

Joshi and Ahmed (2016) have reviewed the status and challenges of municipal solid waste management in India. Law and rules against the environmental degradation play an important role in the protection of all natural establishments and thus ultimately protect the dimensions of the environmental laws by interpreting provisions of the constitutions. Public interest litigation in India has emerged as a very effective instrument for the enforcement of the fundamental rights including environment, health and safety justice and the fundamental rights. These laws and acts are being synchronized with the highest standards adopted from the international provisions. The study describes that the national green tribunal and its branches are playing a significant role in the environmental issues in India. Thus, the study concludes that these legal provisions will be the only tools that will ensure a healthy and secure atmosphere for all the citizens against the dreadful consequences of environmental degradation or climate change. There should be minimum possibilities the laws and rules for the offenders to escape from the penalties.

Gupta and Arora (2016) have made a study on management of municipal solid waste in Delhi. The study also indicates that the Municipal Corporation of Delhi and the government of Delhi have realized the seriousness of the situation and framed guidelines in the form of the master plan (2005-2021) for disposal and treatment of municipal solid waste for the entire state of Delhi. The study shows that the management of the solid waste in the study area is not satisfactory. The present policies and infrastructure are inadequate in dealing with enormous quantity of municipal solid waste generated in the study area. The civic bodies in the city have no provision for disposal of their own waste produced. It is clearly evident that any substantial change in the present scenario is not possible without a three-way partnership of the government, the private sector and the citizens. Finally, the study concludes that there is also a need to develop a methodology of research for developing interactive techniques for systems design and operational control. In the concluding remarks, the study recommends that more initiatives need to be taken towards educating people about proper collection and disposal of household solid waste.

Mamady (2016) has done a cross sectional study on factors influencing attitude, safety behaviour and knowledge regarding household waste management in guinea, China. The study states that the household

has important roles and responsibilities in indiscriminate dumping of municipal solid waste. Respondents having no education attainment (54.3%) and those with primary school level (45.7%) often dispose of their household solid waste in open place, while the respondents with secondary (36.6%) and tertiary (38.8%) schooling background often favoured private companies. It also demonstrates that unplanned residential area is an additional factor associated with indiscriminate waste disposal. The result reveals that the poor knowledge level of the respondents is strongly influenced by gender, income and education. In the concluding remarks, the study indicates that more efforts are needed to adopt community action programmes on proper household solid waste collection and disposal in the study area.

Mukerji et al., (2016) have assessed the knowledge of the residents and their willingness to engage in solid waste management in Delhi city. The researchers have adopted stratified random sampling method for fixing the sample size. Questionnaire method is also used in the present study. The result reveals that sixty per cent of the respondents do not know the difference between bio-degradable and non-degradable waste. The study shows that majority of the residents have lack of awareness regarding the threat of environmental degradation due to poor waste management. The result indicates that the female respondents have higher knowledge about waste handling than male respondents. Moreover, the result depicts that the older- age group have higher level of awareness regarding waste disposal than the younger group. Therefore, the study concludes the private waste management companies can help in the regular transport of waste, and in the processing of hazardous domestic waste.

Nisha and Sugumar (2016) have aimed to determine the impact of an intervention programme on the knowledge, attitudes and practices concerning solid waste management in Chennai city, India. Fifty female homemakers are selected through purposive random sampling technique. A structured questionnaire is used to collect the details regarding the level of knowledge, attitude and waste handling practices of the selected women respondents before and after intervention programme. The result reveals that only thirty five home makers have waste handling beahviour after intervention programme. It also shows that only thirty five female respondents have higher knowledge on proper household solid waste handling than others. It concludes that there is an urgent

need for the adoption of a proper waste disposal technique, which will be a holistic sustainable solution for the problems of solid waste management. Hence, there is a need of the hour to create awareness and impart education for the homemakers to understand the waste related problems and concerns, appropriate technology behind solid waste management and its benefits.

Rajdeep and Kumar (2016) have discussed the health and safety assurance through environmental laws in India. Laws and rules against the environmental issues play an important role in the protection of the all natural establishment and thus ultimately protect the public health. There are number of general and specific legislations in India relevant to the environment regulations. Moreover, the study indicates that the environmental clearance system must be centralized and coordinating with the socio-economic and public interests. In the concluding remarks, the study suggests that the environmental protecting legal provisions in India must be upgraded to put a more strict and practical approach to deal with the issues effectively and to minimize the frequencies of the same. Ultimately, these legal provisions will be the only tools that will ensure a healthy and secure area for all citizens against the terrible consequences of environmental degradation or climate change.

Mohsin et al., (2016) state that the condition of solid waste management is very low in Ahmedpur East of Punjab province. The primary collection of solid waste is mainly done by the sanitary workers. The coverage area of solid waste collection is 70 per cent while remaining 30 per cent is partially covered. The result reveals that the study area has limited door to door household solid waste collection service and no private partnership involved in the solid waste management process. The field survey portrays that the study area is unable to fully achieve the successful primary and secondary collection and disposal of household due to lack of waste collection equipments. It also shows that the majority of the residents are not willing to pay for household waste collection service. The study proposes that open garbage heaps should replace with covered waste containers. It also intends that sanitary workers should procure with safety equipments.

RESEARCH GAP

The review of related literature of this study indicates the existing knowledge on household solid waste collection and disposal,

environmental degradation, causes of household solid waste generation, improper waste disposal method and its impact on health and environment and government efforts in developed and developing countries. However, there is a gap in the assessment of knowledge and awareness on solid waste, environmental degradation, proper waste collection and disposal, influences of socio-economic factors on household solid waste generation and the impact of improper solid waste handling on health and sanitation in rural areas of Tirunelveli district of Tamil Nadu. Lack of adoption of micro level research and appropriate analysis of data related to impact of solid waste on environment and health are also observed as gap in the present research. In this context, the present study is attempted to fill up these gaps in relation to impact of solid waste in rural areas of Tirunelveli District of Tamil Nadu.

Chapter-3

RESEARCH METHODOLOGY

Methodology is a technique to systematically solve the research problem. It also gives the researcher the necessary training in collecting material and arranging or card-indexing them, participation in the field work when required and also training in techniques for the collection of data appropriate to particular problems, in the use of statistics, questionnaires and controlled experimentation and in recording evidence, sorting it out and interpreting it (Kothari, 2010). Accordingly, in this chapter, the procedure followed in the present study is presented. It presents, in detail, following aspect of the methodology of the study. Detailed explanations of each category are given below.

3.1. TITLE OF THE STUDY

"Impact of Solid Waste on Environment and Health: A Sociological Study in Tirunelveli District of Tamil Nadu."

3.2. STATEMENT OF THE PROBLEM

From the insight and perspectives provided by review of certain studies on 'Impact of Solid Waste on Environment and Health' the present study is undertaken with specific reference to Tirunelveli District. The study is confined to studying the household solid waste generation and disposal taking into account the socio-economic conditions of respondents selected for the study and their influence on household solid waste generation and disposal (1), awareness of rural women about solid waste and environmental degradation (2), impact of solid waste on environment and health (3), perception of women respondents about the efforts taken by the government bodies on solid waste collection and disposal (4).

Waste is a natural outcome of human activities. The wastes consist of bio-degradable or non-bio-degradable waste. Solid waste is referred to as rubbish, trash, garbage or useless or unwanted materials. Solid waste is one of the major environmental and health issues in the developing countries. It is also a big challenge for sustainable development of the nation. Solid waste is a broad term, which includes all kinds of waste such as municipal solid waste (MSW), industrial waste, hazardous waste, bio-medical and electronic waste (E-waste) depending on their values and sources. This garbage is generated mainly from residential and commercial activities. Improper collection and disposal of household solid waste cause health hazards to inhabitants. It also leads to intolerable conditions and spreads communicable diseases. Solid waste blocks drains, creating stagnant water for insect breeding and floods during rainy seasons. Insect and rodent are attracted to the dumping waste and spread diseases such as Malaria and Dengue fever. Growing urbanization, density of population and industrial growth are leading severe problems of waste generation and disposal in Indian cities. Economic activities and technological developments lead to generation of large quantity of solid waste in urban areas. Moreover, the changing occupation structure, increases in consumption levels and changing lifestyles also lead to waste generation in the developing cities. Waste generation is a problem not only in urban areas but also in rural areas. It leads to unhygienic conditions and affects human health. The quantity of waste generated by the people will differ according to their socio-economic conditions, population and commercial activities. In the present time, the solid waste problem includes improper waste collection system, open dumping, inadequate equipments and other forms of improper disposing of waste. Unless these problems are looked into properly, it will become a challenge for future generation.

In 1947, cities and towns of India generated 6 million tonnes of solid waste; in 1997 it was about 48 million tonnes. More than 25 per cent of the Municipal Solid Waste (MSW) is not collected at all; 70 per cent of the Indian cities do not have adequate facilities to transport the waste and there are no sanitary landfills to dispose of the waste. The existing landfills are neither well equipped nor well managed and are not lined properly to protect against contamination of soil and ground water. Ancient culture of our society dealt with the disposing of waste

in different ways; dump it outside their settlements; incorporate some of it into flooring and building materials; recycle some of it. Dumping or burning solid waste has been a standard practicing over the centuries. In developed nations, people have awareness about how to minimize the waste generation. But in the developing countries, people do not care about the waste and they are not involved to take efforts for disposing of waste properly.

Rapid Industrialization and Population explosion in India have led to the migration of people from rural areas to urban cities for employment and education purposes, which generate large quantity of solid waste daily. Similarly, family size and income level are also the main factors for increasing the domestic solid waste in rural and urban areas; because, the per capita domestic waste generation quantity is varying time to time due to changing pattern of income and consumption. Demographic variables such as gender, age, income, education level, social and occupational structure are playing a significant role in making the people participate in the solid waste Disposal. Moreover, community involvement and Peoples' attitudes towards environment protection are also encouraging the public in their participation in the solid waste collection and disposal through waste minimizing performances such as recycling, reuse and reduce. The highly educated people with high income have positive attitude towards the disposal of solid waste in proper manner than the people of low level of education and income. Further, inadequacy of sanitation facilities provided by the local authorities is also a major problem for solid waste collection and disposal in rural areas. Hence, without the effective public involvement in the solid collection and disposal; the creation of waste free environment (city/village) may not be possible.

The Tirunelveli district is the sixth largest Municipal Corporation in the Tamil Nadu state. It has three revenue divisions namely Tirunelveli, Cheranmahadevi and Tenkasi. The solid waste generation of Tirunelveli Corporation, Municipalities and town panchyats are 48 tonnes, 49.75 tonnes and 66 tonnes respectively. The solid waste collection of Tirunelveli Corporation, Municipalities and town panchayats are 38 tonnes, 36.5 tonnes and 27 tonnes respectively. The nature of ground water in the study district is generally good. But, the quality of surface water in the surroundings areas of Cheranmahadevi block, Ambasamudram Taluk and Papanasam areas are affected by the

discharges from Industries. A series of legal measures have been enacted all over the world and particularly in India since 1986. Recently the government of Tamil Nadu has implemented a new regulation on the form of domestic solid wastes in order to save our environment from further degradation. However, any number of laws and acts cannot bring the preferred results unless people come forward to accept it and adopt it.

Therefore, the present study makes an attempt to find out as to what extent the various regulation of the government including the recent one have created impact on awareness and practice of the people towards a cleaner and eco-friendly environment by minimizing solid waste generated in their day to day life.

Even though the problems of solid waste has been evaluated on different points of time in different parts of country, still no systematic and comprehensive research work has been done as a sociological study in the selected area in the recent past. Hence, to know the current situation, the present research has been undertaken with the following objectives.

3.3. GENERAL OBJECTIVE

"Impact of Solid Waste on Environment and Health: A Sociological Study in Tirunelveli District of Tamil Nadu."

Specific objectives

1. To assess the socio-economic conditions of the people and their influence on solid waste generation and disposal.
2. To know the awareness of the people about the solid waste and environmental degradation.
3. To study the impact of solid waste on health and environment and opinion of the respondents regarding solid waste collection and disposal in the study area.
4. To analyze the perception of the women respondents about the efforts taken by the government bodies on collection and disposal of solid waste.
5. To suggest the ways and means to control and regulate the disposal of solid waste so as to protect the environment from further degradation.

3.4. HYPOTHESES

The following hypotheses are proposed and tested in the present investigation.

1. The social factors (Religion, caste, type of family, marital status and education) do not associate with awareness of solid waste and environmental degradation.
2. Economic factors (income and occupation) do not associate with awareness of solid waste and environmental degradation.
3. Age does not associate with awareness of solid waste and environmental degradation.

3.5. CONCEPT AND OPERATIONAL DEFINITION

The following working definitions for concepts of 'Impact', 'Solid Waste', 'Environment' and 'Health' have been evolved for the purpose of the present study.

Impact

The concept of 'impact' in this study, refers to the negative influence of improper disposal of solid waste thereby affecting the normal conditions of environment and human health.

Solid Waste

The term 'solid waste' in this study, refers to the solid waste materials generated in the households of the respondents and in their residential streets, which come under the jurisdiction of Cheranmahadevi block of Tirunelveli Municipal Corporation.

Environment

The term 'Environment' in this study, refers to the pollution free physical situation in the study area where people live.

Health

The term 'Health' in this study, refers to diseases free physical conditions of the people in the study area.

3.6. METHODOLOGY

Research Design

Descriptive research design is adopted to carry out the empirical investigation based upon, which the data analysis and discussion have been carried out in order to fulfill satisfactorily the objectives of the study and test validity of the hypotheses.

3.7. REASONS FOR SELECTION OF THE STUDY DISTRICT

Tirunelveli District is selected as the area of study through simple random sampling technique. It is one of the fast growing districts in Tamil Nadu with a number of industrial units and hub of commercial activities. Moreover, it is one of the important Municipal Corporations in Tamil Nadu registering higher rate of urban growth (2011 census).

3.8. PROFILE OF THE STUDY DISTRICT

Tirunelveli district is established in 1790 and it is divided into Tuticorin and Tirunelveli districts in 1986. The city became a Municipal Corporation in 1994. The district is located 700 km away from the capital of the Tamil Nadu. The Tirunelveli city is known as Nellai Cheemai, which means "A developed foreign town". The city had been under the prominence of the Pandya kings serving as their secondary capital while Madurai remained its primary capital. It was an important city of the Chola kingdom and of the Vijaya Nagar Empire. The city was the chief commercial town in the period of Arcot Nawabs and Nayaks. They were among the various ruling dynasties of Tamil Nadu.

The district is located in the southern part of Tamil Nadu and also it is surrounded by Viruthunagar district on the North, kanyakumari district on the South, Tuticorin district on the East and the Western Ghats on the West. The Tirunelveli city is also called by the surname of Nellai Kattapomman District. The city is located in the world map, between 08^0, 05' and 09^0 30' latitude and 77^0 25' of the eastern longitude.

The study district has three revenue divisions namely Tirunelveli, Chreanmahadevi and Tenkasi. It also has 10 Taluks, i.e. Tirunelveli, Palayamkottai, Sankarankovil, Tenkasi, Shencottai, Sivagiri, Ambasamudran, Nanguneri, Radhapuram and V.K. Puthur. The study district has one Municipal Corporation, five Municipalities, 19 community development blocks, 38 town panchayats and 631 revenue villages.

According to 2011 census, Tirunelveli district has a population of 498,984 with 2, 46,710 males and 2, 52,274 females. The average literacy rate of the city is 81.49% compared to the national average of 72.99%. As per religious census of 2011, the district has 69.0% Hindus,

20.2% Muslims, 10.5% Christians, 0.01% Sikhs, 0.01% Buddhists, 0.02% Jains and 0.35% following other religions.

The district is a major area for wind power generation. The most wind power generation units in Tamil Nadu are located in Tirunelveli and Kanyakumari Districts. They have contributed 2036.9 MW to the state power generation capacity in 2005.

Tirunelveli is the traditional city poised with the water wealth from Tamiraparani River, placing it in an easily accessible location for both people and business. The river divides the city into Tirunelveli the head quarters and palayamkottai area. The Tamiraparani River is mentioned as a Pothigai Nathi in the Tamil literature. The Palayamkottai area is known as the "Oxford of South India". All kinds of schools and colleges with an established history have been functioning here.

Occupation

Agriculture plays an important role in the district economy. The major food crops are paddy, ragi, maize and the commercial crops are banana, cotton, groundnut and sugarcane. Most of the crops have three or five months for harvesting except chilies and cotton, which take more than five months for harvesting. Sankarancovil Taluk has a rich black soil, which is highly suitable for cotton farming.

Irrigation

The district is blessed with the Western Ghats from, which all the perennial rivers follow and drain towards the East. The sources of irrigation are canal, tank and well, which covers 1,33,106 hectares. Tamiraparani River is a main river of the Tirunelveli District, which has a large network of tributaries, which includes the Peyar, Ullar, Pampar, Karaiyar, Manimuthar, Varahanathi, Ramanathi, Jambunathi, Gadananathi, Kallur, Krunaiyar, Pachaiyar, Chittar, Gundar, Hanumanathi and Karuppanathi. The lifeline of the district river Tamiraparani feeds the district and satisfies the thirst of residents of Tuticorin district too.

Soils

In Tirunelveli district, soils have been classified into five categories such as (i) deep red soil (ii) red sandy soil (iii) black cotton soil (iv) saline coastal alluvium and river alluvium. Major parts of the district are covered by deep red soil. It is found in Sivakasi, Tenkasi, Senkottai

and Sankarankovil blocks and it is suitable for cultivating coconut and Palmyrah trees. The black cotton soil is found in Tirunelveli, Palayamkottai and Sankaran kovil blocks. The river alluvial soils occur along with the river courses of Tamiraparani and Chittar River covering the blocks of Tirunelveli and Palayamkottai.

Industries

Tirunelveli is an important industrial centre. Paper, cement industry, tea, spinning and weaving are the promising industries. The India Cement Ltd., at Thalaiyuthu, the Sun Paper Mills Private Ltd., at Cheranmahadevi, Madura Coats Private Ltd., at Ambasamudram and Bombay burma tea factory at Manjolai are the main landmarks in Tirunelveli district Industries. Handlooms, poultry farming, beedi making, mat weaving, carpentry, tiles making and brickkiln are the important village industries of Tirunelveli District. The Patthamadai mat is famous for world trade. Moreover, the study district is also famous for the production of handloom cloth. The Tirunelveli city has 406 registered factories, 357 small scale industrial units. Kallidaikurichi Pappads, Karukurichi mud pots and Tirunelveli "Halva" are specialties, which earned many laurels to the District.

Tourism

Papanasam Agasthiyar falls and the courtllam water falls are the main tourist spots in the study district. The famous courtllam is called by the name of "Spa of South". It has more medicinal value. It also has a Birds Sanctuary at Mundathurai. Tigers, spotted deers, lion tailed monkeys and elephants are the living being in the wild animal Sanctuary at Kalakad.

Religious Significance

The Nellaiyappar temple, Kasiviswanathar temple and Sanakara nainar temple are famous of the Tirunelveli district signifying the Hindu culture. Palayamcottai has many cathedrals and Athankarai Pallivasal and Pottal Puthur Darga are considered a significant sacred place for Muslims.

Climate and Rainfall

The weather condition of district is generally hot and humid. The average Annual rainfall is 680 Mm. The economy of district is primarily

based on agriculture. Tirunelveli District gets the rain under the help of both northeast and southwest monsoons. The Northeast monsoon mainly contributes to the rainfall in the study district. Ambasamuthiram, Tirunelveli and Kadayanallur areas are receiving minimum rainfall. The city has a sub tropical climate. The climate condition is hot and dry during the period of May to June. At the same time, the weather is very pleasant in the months of December to January. The minimum and maximum temperature of the district is 22.9^0 C and 33.5^0 C respectively.

Wind

Winds are generally light and moderate in strength. Between May and September winds are mainly north westerly or westerly. From October to February winds are mainly north-easterly or northerly.

Forest

The district has 1, 22,055 hectare of which 81700 hectare is set apart for tiger revenue forest of Mundathurai and Kalakadu. The entire forest areas of the district enlarge along the Western Ghats. The forest of the district are technically classified as southern hilltop tropical ever green forests, west coast tropical evergreen forests, southern moist mixed deciduous forests, carnatic umbrella thorn forests, southern euphorbia scrub and southern thorn scrub.

Evapo transpiration

The high rate of evapo transpiration indicates that this will affect soil moisture and high transpiration from crop plants affects the crop growth in years of low rainfall. Hence, precipitation below evapo transpiration is a direct indication of dry conditions in an area. The climatic condition reveals that the ideal season for irrigated crops lasts between May and September. The remaining months may be put to dry land management.

Transport

The district has a well-built transportation system. The surfaced roads are covering 45,515 kms and un-surfaced roads are covering 86,116 kms. About 247 kms are covered by railways. The length of road per 1000 sq.km is 782.58 kms and length of surfaced road per 1000 sq.kms of area is 653.23 kms. Twenty two kilometers of highway are maintained

by the state highways department and thirty kilometers by the national highway department. The district is located on NH7, 150 km north of Madurai city and 91 km south of Kanyakumari district. NH 7A, an extension of NH 7 connect with Palayamcottai and Tuticorin port. The district is also connected by major high ways to Kollam, Tiruchendur, Rajapalayam, Ambasamudram, Sankarankovil and Nazareth. The nearest airport to Tirunelveli is Tuticorin airport at vaagaikulam in Tuticorin district, 22 km east of the city, which offers regular flights to Chennai. The nearest international airports are Madurai International Airport and Thiruvananthapuram International Airport**.**

Financial Institutions

The Tirunelveli district is well served by 143 branches of nationalized banks, 44 co-operative bank branches, 51 Pandian grama bank branches, 33 private sector bank branches and more than 500 chit fund companies.

Education

The study district has eighty schools, twenty nine higher secondary schools, twelve high schools, twenty two middle schools and seventeen primary schools; the Municipal Corporation of Tirunelveli operates thirty three of these schools. In addition, eight arts and science colleges and six professional colleges are servicing in the study district. The district has two universities, the Manonmaniam Sundaranar University and Anna University of Technology. Veterinary college and research institution, Government College of Engineering, Tirunelveli Medical College, Tirunelveli Law Colleges are the professional colleges operated by the Government of Tamil Nadu. The City has a District Science Centre with permanent exhibition, Science Shows; interactive self guided tours, a mini planetarium and sky observation.

3.9. PROFILE OF THE STUDY AREA AND SETTING: STUDY BLOCK

One district in Tamil Nadu State namely Tirunelveli district is selected randomly for the present study. Out of 19 blocks in Tirunelveli District, Cheranmahadevi block is selected through Simple Random Sampling through lot method. The selected block has 34 revenue villages with a population of 28,557 (2011 census). The study block has 12 village Panchayats such as South Veeravanallur, Malayan Kulam, Pottal,

Mulachi, Vadakku Karukurichi, Puthukudi, Therku Ariyanaipuram, Kunioor, Ulangankulam, Karisal patti, Venkatarengapuram and Thiruviruttanpuli.

Cheranmahadevi block is located on the banks of the river Tamiraparani. It has got a central government controlled archaeological temple named bakthavachala vishnu temple, which is considered to be a monument for its medieval carvings referring to the period of Chola and Pandya kings. The Cheranmahadevi block comes under the control of Ambasamudram Taluk and Tirunelveli Distict.

The study block has a total area of 20554.76 Sq.km. It is surrounded by Kalakkadu block on the south, Pappakudi block on the west and Palayamkottai block on the east. The study block has been divided into thirty four revenue villages and three town panchayats. The Cheranmahadvei block is benefitted by the two monsoon winds namely south west monsoon and north east monsoon. The study block depends upon the Manimutharu Dam, Karaiyar Dam, Thamiraparani River and Canadian Canal for cultivation and irrigation.

The study block has 2225 hectares forest areas. It is also scattered throughout the block. Under the scheme of afforestation, trees have been planted extensively.

The population of the Cheranmahadevi block is a mixture of various communities and religions. According to 2001 census, the study block has a population of 16, 320 as against a population of 27, 23, 988 in Tirunelveli District. Of the population of study block, 7678 are males and 8342 are females. In 2011 census, the study block has a population of 28,557 as against a population of 30, 77,233 in Tirunelveli District. Of the population of the study block, 17,564 are males and 17,698 are females.

Crops cultivated

Paddy, banana, groundnuts, coconut, turmeric, cotton and chilies are the major crops in the study block. The study block is industrially backward. There are no large scale industries for the economic development.

Education

Education plays an important role in the life style of the people. The study block has sixty elementary schools, twenty two middle

schools, six high schools and 5 higher secondary schools. There are four libraries providing facilities to enrich the knowledge of the literate people. It is also known as one of the head quarters of the educational districts of the district. The study block has 52 per cent literacy rate.

Banking Facilities

Banking facilities are inadequate in the study block. The Cheranmahadevi block has only seven agricultural credit societies and two public sector banks for providing financial facilities and services for economic development. According to the 2011 census, 30 per cent of the population of this block is dependent on agricultural activities for their survival. Remaining of them depend on non-agricultural activities. Beedi making and trading is highly profitable business, which feeds huge people across the block.

Transport and communication

Transport and communication are the major problems in development. Unless good transport facilities are provided, it is very difficult to transport agricultural commodities to the markets. Similarly, the school going children will be denied of the benefit of acquiring higher education. In this block, five villages have not got proper transport facilities and road also.

All the villages of Cheranmahadevi block are provided with electric power. Street lights including tube and mercury are provided in the villages and almost all houses are provided with the specialty of electric power. The government of Tamil Nadu is providing free of cost electricity to the farmers.

Water Service

Drinking water facility is the symbol of good health and healthy environment and it has the direct effect in our body functional system. In the 34 villages of this study block, there are adequate ordinary hand pumps, over head tanks, ground level reservoirs and public taps. Manimuthar dam plays an important role in providing water not only to this block but to other blocks also. Water supply is ensured to all the villages, which have been made free from scarcity of drinking water problem other than extra ordinary situations.

Medical Facility

To meet medical facilities, there is only one government hospital along with three primary health centres and six maternity centres are in the study block. The list of villages in the study block furnished in the census report forms the sample frame.

3.10. UNIVERSE

The Universe of the study comprises all the rural women coming under the age group of 18-59 years and residing in Cheranmahadevi block of Tirunelveli District in Tamil Nadu**.**

3.11. STUDY POPULATION

The study population consists of 439 rural women coming under the age group of 18-59 years, who are selected from the study village panchayats through proportionate sampling method.

3.12. SAMPLING

The study covers one block of Cheranmahadevi of the total 19 blocks of the Tirunelveli District. The study block is chosen through simple random sampling technique using lot method.

3.13. SAMPLE SIZE

The list of villagers in the study block furnished in the census report 2011 forms the sample frame. For the purpose of the present study, five per cent of the rural households each from every study village panchayat are selected through proportionate sampling technique as under:

Selection of Sample

S.No	Name of the Village Panchayats	No. of Households	Study households Selected through Proportionate sampling technique
1	Therkku Veeravanallur	1075	54
2	Malayankulam	413	21
3	Pottal	1100	55
4	Mulachi	800	40
5	Puthukkudi	958	48

S.No	Name of the Village Panchayats	No. of Households	Study households Selected through Proportionate sampling technique
6	Vadakku Karukurichi	892	45
7	Kuniyur	904	45
8	Therkku Ariyanayaki Puram	283	14
9	Ulagankulam	653	33
10	Karisal Patti	490	25
11	Venkatarengapuram	287	14
12	Thiruvirutanpuli	901	45
	Total	**8756**	**439**

Source: Computed from field data

Totally 439 households are selected for the study. These households are selected from the list of village panchayats as per 2011 census. One woman from each of the households is selected and interviewed for the purpose of the study. Thus, 439 rural women coming under the age group of 18-59 years belonging to the study households are selected. In the case of more than one woman available under the age group of 18-59 years in the study households, the woman who is reportedly mostly involved in collection and disposal of household solid waste are selected as the respondents in this context.

Thus, the position of the sample proposed is as shown below

No of block : 1

The Number of Village panchayats to which the selected women respondents of the age group of 18-59 years belonged : 12

A total number of sample respondents' households' selected : 439

In all, 439 respondents coming under the age group of 18-59 years are selected for the study.

3.14. METHOD OF DATA ANALYSIS

For the analysis of data and testing the hypotheses, the statistical tools like average, percentage, case study and observation methods have been applied in the present study. Data are analyzed through

statistical package for social sciences (SPSS) in the computer. The data have been presented in tabular, diagrammatic and textual forms.

3.15. SOURCES OF DATA

There are primary and secondary sources from, which the relevant data and information are collected for the present study.

Primary Data

Primary data are elicited by the researcher administering interview schedule among the rural women respondents. Besides, Case studies and observation techniques are also used to supplement the primary data collected through personal interview schedule.

Secondary Data

Secondary data are also collected from the sources such as statistical department in the study district, non- governmental organizations (NGOs) functioning in the study area, self help groups (SHGs), health officers, sanitary inspectors, sanitary workers, block profile book, records of village panchayats, relevant books, journals, reports, national and international publications on impact of solid waste on environment and health and from relevant government organizations such as Collectorate, District Pollution Control Board (DPCB),village administrative office, village panchayat presidents, ward members and related websites and data bases.

3.16. TOOLS OF DATA COLLECTION

A structured interview schedule is administered by the researcher for data collection. It comprises both open ended and close ended questions. In addition, the researcher has studied various journals, pamphlets, booklets, websites based materials, articles and reports published by the government and non-governmental organizations (NGOs) relating to the subject under investigation.

Data are gathered through personal interview by using interview schedules among the selected rural women respondents in the study area. In the present study, proper care has been taken to reduce the non-sampling errors especially in the case of rural women sample respondents. The co-operation of the respondents is easily obtained by the researcher. Further, the statistical department, block development

office, non-governmental organizations and local leaders are enormously helpful in furnishing data and information about the villages, households and functioning of solid waste collection and disposal in their villages.

3.17. PILOT STUDY

A pilot study is the primary work to gain clear cut and specific research perspective in the subject of investigation undertaken. For a research study, a pilot study is essential and it simplifies the task of designing an interview schedule or questionnaire.

In the pilot study undertaken for the research, 40 rural women are interviewed by the researcher about the general particulars, living arrangements, types of dustbin, various methods of waste disposal, waste collection service, awareness towards solid waste and environmental degradation, environment and health impact, opinion of solid waste collection and disposal, perception of women respondents about the government efforts on household waste collection and disposal in the selected village panchayats.

3.18. PRE-TEST

The draft interview schedule is administered among rural women residing in the areas similar to the study area to test reliability and validity. After the pre-test, the research supervisor and the researcher edited and reconstructed the interview schedule taking into account the result of the pre-test as well as objectives of the study.

3.19. PERIOD OF THE STUDY

The field investigation and data collection are carried out during the period from December 2015 to April 2016.

3.20. STRUCTURE OF THE THESIS

The structure of the thesis contains six chapters. They are (1) Introduction (2) Review of Literature (3) Methodology (4) Analysis and Interpretation (5) Case study (6) Summary findings and Conclusion.

3.21. VARIABLES USED IN THE STUDY

The data of the following variables are collected.

- Demographic Variable: Age
- Social variables: Education, Housing, Religion, Caste, Marital status

- Economic Variables: Occupation, Source of personal income, Family income
- Opinion about solid waste collection and disposal in the study area
- Awareness of the people towards solid waste and environmental degradation
- Impact of solid waste on environment and health
- Perception of women respondents about the efforts taken by the government bodies on collection and disposal of solid waste.

3.22. SCOPE AND LIMITATIONS OF THE STUDY

Scope of the study

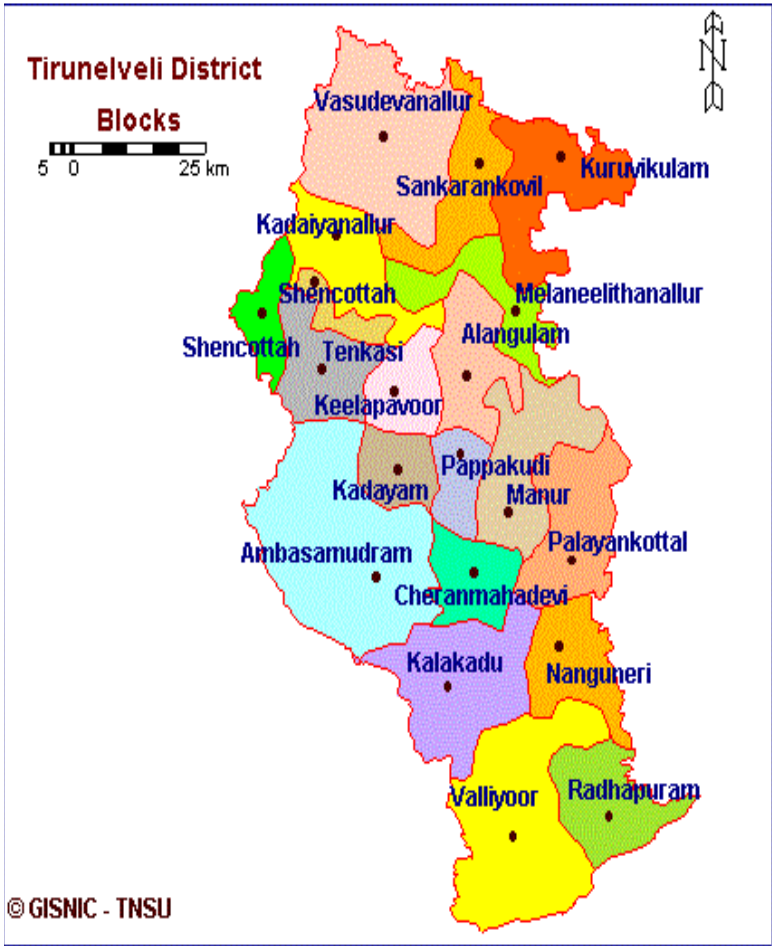
The present study is concentrated on socio-economic status of respondents' influences on solid waste disposal and generation of household waste, awareness of people about the solid waste and environmental degradation and impact of solid waste on health and environment, perception of the women respondents about the efforts taken by the government bodies on collection and disposal of solid waste. And the study has been undertaken among rural women coming under the age group of 18-59 years in rural areas of Cheranmahadevi block.

The outcome of the research findings are expected to help the policy makers, town planners and the organizations working for the promotion of environmental protection besides the civic administration to improve the quality of life of people living in rural and urban areas in Tirunelveli District. This would suggest measures to facilitate people's effective participation and co-operation with the government machinery in making programmes of environmental protection become a successful one.

Limitations of the study

The findings of the study are applicable only to rural women respondents; so they do not represent the urban areas of the district. The researcher has concentrated only one block of the study district. Because studying of all blocks may not possible at the level of an individual researcher, due to constraints imposed by time, energy and money. The researcher was unable to elicit data and information from both officials and non-officials of the study village Panchayats. Because of their non-availability in the study area due to their pre-occupation

with commitment during the time of field investigation. While being interviewed, the rural women respondents lose interest and are not willing to answer the questions asked by the researcher. Hence, the researcher has taken greater efforts in establishing rapport with the rural women respondents for the purpose of eliciting necessary data and information related to the objectives of the present study. This is the scope and limitations of the study.



Chapter-4

DATA ANALYSIS AND INTERPRETATION

4.1. INTRODUCTION

In this chapter, the data related to characteristics of respondents is analysed and the findings are presented and discussed. Socio-economic conditions of the respondents and their influence on solid waste generation, disposing methods, awareness on solid waste and environmental degradation, impact of improper household solid waste on environment and health, respondents' opinion about solid waste services in the study area and perception of women respondents about the efforts taken by the governments bodies on proper solid waste collection and disposal are described here.

4.2 SOCIO-ECONOMIC CHARACTERISTICS OF WOMEN RESPONDENTS

The socio-economic characteristics of women respondents such as religion, community, marital status, educational level, occupation, type of family, housing structure, income and ownership status of women are explained here.

Table Number	Variable	Frequency	Percentage
4.2.1	**Religion**		
	Hindu	277	63.1
	Christian	98	22.3
	Muslim	64	14.6
	Total	**439**	**100.0**

Table Number	Variable	Frequency	Percentage
4.2.2	**Community**		
	Other community	52	11.8
	Backward community	187	42.6
	Most Backward Community	92	21.0
	Scheduled Caste	108	24.6
	Total	**439**	**100.0**
4.2.3	**Marital Status**		
	Married	316	72.0
	Single	61	13.9
	Widow	48	10.9
	Divorced	14	3.2
	Total	**439**	**100.0**
4.2.4	**Educational level**		
	Illiterate	78	17.8
	Primary	63	14.4
	Middle	116	26.4
	High School	55	12.5
	Hr.Sec	48	10.9
	Under graduation	46	10.5
	Post graduation	22	5.0
	Professional	11	2.5
	Total	**439**	**100.0**
4.2.5	**Occupation**		
	Govt. employee	18	4.1
	Private employee	83	18.9
	MGNREGP	112	25.5
	Farmer	46	10.5
	Self employment	73	16.6
	Daily wager	75	17.1
	Weaving	32	7.3
	Total	**439**	**100.0**

Table Number	Variable	Frequency	Percentage
4.2.6	**Type of family**		
	Nuclear Family	329	74.9
	Joint Family	86	19.6
	Extended Family	24	5.5
	Total	**439**	**100.0**
4.2.7	**Housing structure**		
	Thatched	189	43.0
	Pucca	144	32.8
	Semi Pucca	71	16.2
	Kutcha	35	8.0
	Ownership status		
4.2.8	Owned	350	79.7
	Rented	60	13.7
	Leased in	29	6.6
	Total	**439**	**100.0**
4.2.9	**Monthly income of respondent(in Rs)**		
	below Rs.3000	310	70.6
	Rs.3001-6000	58	13.2
	Rs.6001-9000	27	6.1
	Rs.9001-12000	24	5.5
	Above 12001	20	4.6
	Total	**439**	**100.0**
4.2.10	**Monthly income of the Family (in Rs)**		
	below Rs.3000	123	28.0
	Rs.3001-6000	230	52.3
	Rs.6001-9000	41	9.3
	Rs.9001-12000	15	3.4
	Above 12001	30	7.0
	Total	**439**	**100.0**

Source: Field data

Religion

Table 4.2.1 reveals that majority of the women respondents belong to Hindus (63.1%) followed by Christians (22.3%) and Muslim (14.6%). This shows the dominance of Hindus in the research area. (Table 4.2.1).

Community of Women Respondents

Regarding the community of the women respondents, 42.6 per cent of them belong to Backward Community, 24.6 per cent to SC category, 21 per cent to the Most Backward Community and 11.8 per cent to Other Caste (Table 4.2.2). It is evident that the research area has different community groups.

Marital Status of Women Respondents

As per marital status, majority (72 %) of women respondents are married, 13.9 per cent are single and 10.9 per cent of the women respondents are widows followed by the divorced (3.2%). Out of women respondents selected for the study, majority of them are married. (Table.4.2.3).

Education of Women Respondents

Regarding the educational status of the women respondents, 17.8 per cent of the respondents are illiterate whereas 26.4 per cent of the respondents are educated up to middle school followed by Primary School (14.4%), high School (12.5%), higher secondary school (10.9%), under graduation (10.5%) and post graduation (5.0%). Only 2.5 per cent of women respondents have professional degree as seen in Table 4.2.4. The Table shows that majority of the women respondents are educated ranging from primary to professional degrees.

Occupation of Women Respondents

The Table 4.2.5 depicts the occupational status of women respondents. It shows that 25.5 per cent of the women respondents are working under the scheme of MGNREGP (Mahatma Gandhi National Rural Employment Guarantee Programme) followed by private employee (18.9%), daily wager (17.1%) self employment (16.6%), farmer (10.5%), weavers (7.3%) and government employee (4.1%). Generally rural women are in low paid occupation, which implies their low economic status. In short, no one is unemployed even though under employed at low remuneration.

Type of Family

Table 4.2.6 portrays the type of family of the women respondents. Greater portions (about 74%) of the respondents are living in nuclear family followed by joint family (19.6%) and extended family (5.5%), which indicates the trend of disintegration of joint family system in rural areas.

Housing Structure

Among the 439 women respondents, 189 (43%) of them live in thatched houses followed by 144 of them (32%) live in pucca houses, 71 respondents (16.2%) live in semi pucca houses and 35 of them (8.0%) live in kutcha houses. Therefore, it is concluded that more number of the women respondents are living in thatched houses. Even though, the types of thatched houses are common in the study area, well constructed concrete houses are also identified and shown in Table 4.2.7.

Ownership status of house

Table 4.2.8 illustrates that 79.7 per cent of the respondents live in their own houses followed by rented houses (13.7%) and the remaining of them (6.6%) live in houses taken on lease. It is inferred that majority of the women respondents have own houses. Leased house means that a specified amount of money as agreed by owner and is paid to the house owners by the leasee for a maximum period of three years. For the leased houses, the house owners are very strict to period of lease as there are wide chances of increase of lease amount or to sell off to someone, preferably to the real estate promoters, which now crawl into rural areas also.

Monthly income of the respondents

Table 4.2.9 clearly indicates that the majority of the women respondents (71.0%) belong to the category of monthly income below Rs.3000 followed by 13 per cent of the respondents earning an income between Rs. 3001-6000 per month. Sixty one per cent of the respondents belong to the monthly income category of people earning between Rs.6001-9000 per month. About 6 per cent and 4.6 per cent of them earn between Rs.9000-12000 and above Rs.12000 per month respectively. It is understood from the Table (4.2.9) that the monthly income of most of the women respondents is below Rs.3000.

Monthly income of the family

Table 4.2.10 clearly demonstrates that a little more than half of the women respondents' families (52.4 %) belong to the category of income below Rs.3000 per month followed by 28 per cent of the respondents' family members are earning an income between Rs.3001-6000 per month. Nine per cent of the respondents' families belong to the income category between Rs.6001-9000 per month. Only 3.40 per cent and 6.8 per cent of them belong to between Rs.9001-12000 and above 12000 per month respectively.

Therefore, the Table (4.2.10) concludes that a little more than half of the respondents' families are getting monthly income below Rs.3000 through various occupational activities undertaken by them.

Demographic Characteristics of the women respondents

Table Number	Variable	Frequency	Per cent
	Age		
4.2.11	18- 27 years	41	9.3
	28- 37 years	116	26.4
	38- 47 years	149	34.0
	48 + years	133	30.3
	Total	**439**	**100.0**
	Mean	**41.96**	
4.2.12	**Size of Family Members**		
	3-4 Members	165	37.6
	5-6 Members	142	32.3
	7-8 Members	94	21.4
	above 9 Members	38	8.7
	Total	**439**	**100.0**

Source: Field data

Age

Table 4.2.11 shows that age of the women respondents has been classified into four sub groups. Thirty four per cent of the women

respondents come under the age group of 38-47 years, twenty six per cent of the women respondents belong to the category of 28-37 years of age and the remaining are in the age group between 18-27 years. The average age is 41.96 years.

Size of Family members

Table 4.2.12 clearly reveals the family size of the women respondents. About 38 per cent of the respondents' family size is three to four members followed by five to six members (32.3%) seven to eight members (21.4%) and 8.7 per cent of the respondents have more than nine members in the family.

Therefore, it is inferred that more number of women respondents' family size is three to four members.

Respondents are asked about the approximate quantity of household solid waste generated per week in kilograms. Their responses are presented in Table 4.2.13.

Frequency distribution of women respondents by generation of household solid waste (in k.g)

Table Number	Variable	Frequency	Per cent
4.2.13	**Generation of household Solid waste per week in kilograms**		
	below 3	199	45.3
	4 - 7	122	27.8
	8 - 11	89	20.3
	12 -15	29	6.6
	Total	**439**	**100.0**

Source: Field data

Out of the 439 women respondents, 45.3 per cent of them report that their weekly generation of household solid waste is below three kilograms followed by four to seven kilograms (27.8%), eight to eleven kilograms (20.3%) and twelve to fifteen kilograms (6.6%).

Hence, it is inferred from the above Table (4.2.13) that more number of the women respondents generate below three kilograms of household solid waste per week and the highest generation of household

solid waste is by the marginal 6.6 per cent of the women respondents selected for the study.

Respondents are enquired about the major components of the household solid waste generation in their home. Their responses are shown in the following figure1.

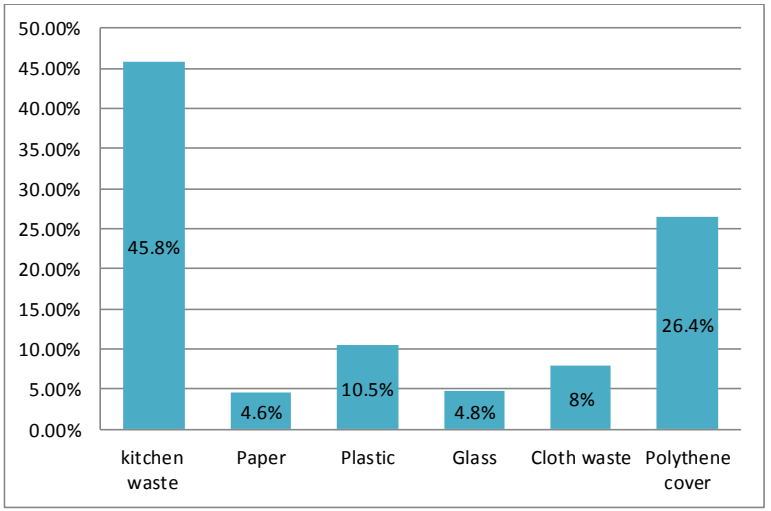


Figure -1: Major components of household solid waste

Regarding the major components of household solid waste generation in the residence of the women respondents, it is depicted in Figure-1 that the largest share of the household waste is kitchen waste (45.8%) followed by polythene cover waste (26.4%), plastic waste (10.5%), cloth waste (8.0%), glass and paper waste constitute 4.8 per cent and 4.6 per cent respectively.

Hence, it is concluded that the major share of the waste generated is bio-degradable waste, i.e. kitchen waste. However, there is cause for concern as polythene covers and plastic waste occupy the second and third place, which demands proper waste collection and disposal techniques in order to address the hazardousness caused to the environment.

The respondents are probed on the use of dustbin in their homes and the type of dustbin used to which they answered as shown in Tables 4.2.14 and 4.2.15.

Frequency distribution of women respondents by users and non-users of dustbin as well as types of dustbin used.

Table Number	Variable	Frequency	Per cent
4.2.14	**Having Dustbin**		
	Yes	280	63.8
	No	159	36.2
	Total	**439**	**100.0**
4.2.15	**Types of Dustbin**		
	Plastic	110	39.0
	Polythene cover	92	33.0
	Metal	67	24.0
	Mud container	11	4.0
	Total	**280**	**100.0**

Source: Field data

From the above Table (4.2.14), it is evident that majority (63.8%) of the respondents are in the practice of using dustbin in their homes for collecting household solid waste to be disposed of while 36.2 per cent are non- users.

Among the users, dustbin made of plastic (39.0%), polythene covers (33.0%), metal (24.0%) and mud container (4.0%) are being used in the residence of the 280 users of the solid waste dustbin made up of different materials.

This implies that the habit of using dustbin inside the homes of women respondents has picked up, which reflects the attitudes of proper disposal of household solid waste among the women.

Thus, the Table 4.2.15 shows that plastic bucket, polythene cover and metal container are the types of dustbin used by the women respondents for household solid waste disposal.

This analysis bears relevance to the theory of planned behaviour.

Respondents are enquired whether they use separate dustbin for collecting degradable and non-degradable waste and the type of dustbin used in their homes are probed further. Their responses are presented in the following Tables 4.2.16 and 4.2.17.

Frequency distribution of women respondents by use of separate dustbin for degradable and non-degradable household solid waste and types of dustbin.

Table Number	Variable	Frequency	Percent
4.2.16	**Use of Separate dustbin for degradable and non- degradable household solid waste**		
	Yes	74	26.4
	No	206	73.6
	Total	**280**	**100.0**
4.2.17	**Types of dustbin (Users)**		
	Plastic	23	31.0
	Polythene cover	16	21.6
	Metal	15	20.3
	Bamboo	14	19.0
	Mud container	6	8.1
	Total	**74**	**100.0**

Source: Field data

The above Table 4.2.16 reveals that only 26.4 per cent of the respondents segregate the bio-degradable and non-degradable waste and use separate dustbin for keeping the waste to be disposed. The dustbin used for keeping the waste by the users are Plastic container (31.0%), Polyethylene cover (21.6%), Metal vessel (20.3%), Bamboo basket (19.0%) and Mud container (8.1%) in the descending order of importance (Table 4.2.17).

It reveals that among the 280 users of dustbin, only 74 users segregate their waste. This indicates that more awareness needs to be created among the users of dustbin and also non users regarding the importance of segregating the waste at the source**.**

The women respondents are asked as to how the non-users of dustbin dispose of their household solid waste. The responses are presented in the following Table 4.2.18.

Frequency distribution of women respondents by non-users of dustbin for disposing of household solid waste.

Table Number	Variable	Frequency	Percent
4.2.18	**Dispose of household solid waste**		
	Thrown outside the house in the street	140	88.0
	Burning the solid waste in the street	135	85.0
	Thrown into drainage	125	69.0
	Thrown into pit in the street	120	75.0
	Using the street container	110	69.0
		N=159	**100.0 ***

Source: field data
*Multiple answers

The Table 4.2.18 shows that all the women respondents of the non-users of dustbin are habituated to dispose of their household solid waste by burning the solid waste in the street (100%) followed by using the street container (89%), thrown outside the house in the street (86.4%), thrown into pit in the street (68.1%) and thrown into drainage (57.6%). So, the Table reveals that burning the household solid waste is done by all the women respondents of the non-users of the dustbin followed by using the street container and throwing the solid waste out in the street.

Thus, the Table concludes that the women respondents of non-users of dustbin do not have awareness in the proper disposal of household solid waste, which results in environmental warming and serious health problems.

So, the Table implies that the awareness programs are to be conducted especially for rural women in getting them acquainted with proper disposal of household solid waste.

The questions regarding the collection of waste from the homes of women respondents, the agency which collects the waste and the frequency of household solid waste collection are asked and the results are presented in the following Tables 4.2.19, 4.2.20 and 4.2.21.

Frequency distribution of women respondents by collection of household solid waste, agency of household solid waste collection and frequency of waste collection**.**

Table Number	Variable	Frequency	Percent
	Solid waste collection		
4.2.19	Yes	248	56.5
	No	191	43.5
	Total	**439**	**100.0**
4.2.20	**Solid waste collectors**		
	Sanitary workers	162	65.3
	Rag pickers	63	25.4
	Private contractors	23	9.3
	Total	**248**	**100.0**
4.2.21	**Frequency of household solid waste collection time (Per week)**		
	Daily	15	6.0
	Once in two days	79	32.0
	Once in three days	56	22.6
	Weekly	58	23.4
	Rarely	40	16.0
	Total	**248**	**100.0**

Source: Field data

On interrogation whether the respondents have waste collection service in their residential areas, Majority of the respondents opine positively and 43.5 per cent of them stated in the negative. Sanitary workers (65.3%), rag pickers (25.4%) and private contractors (9.3%) are engaged in the waste collection services in the study area. Majority of the sanitary workers is involved in household solid waste collection among others.

For the 248 households, it is found that waste is collected daily as reported by 6.0 per cent of the women respondents followed by once in two days (32.0%), once in three days (22.6%), once in a week (23.4%) and waste is rarely collected (16.0%).

It is concluded that the waste collection service is not done regularly in the study area.

Figure-2 represents the responses to the question as to be engaged in the disposing of household solid waste from the house of women respondents.

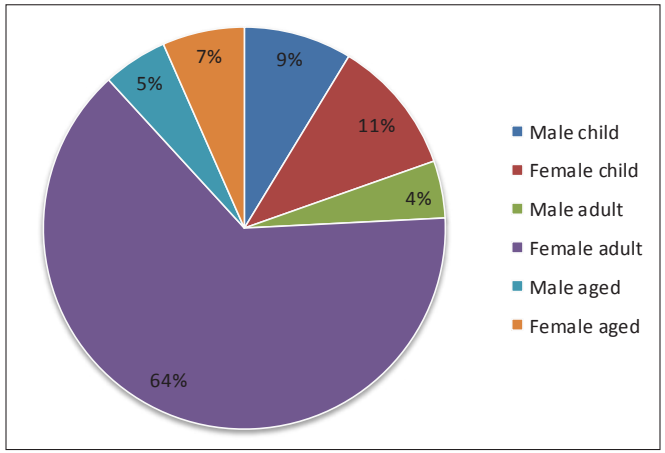


Figure - 2

Sixty four per cent of the female adults are engaged in disposal of their household solid waste followed by female child (10.9%), male child (8.7%), female aged (6.6%) male aged (5.2%) and male adult (4.6%).

The figure-2 reveals that majority of the female adults are involved in the disposal of household solid waste followed by that female child and male child, who are also helping. The percentage of male and female aged in the disposal of household solid waste is very least. Compared to male child, the percentage of female child is more in the disposal of solid waste. On the whole, the Figure-2 shows that female adult members are in the disposal of solid waste to a greater extent.

So, that the practice of shouldering the responsibility of maintaining the cleanliness of the house falls on the female adult is seen in the above Figure 2.

Tables 4.2.22, 4.2.23 and 4.2.24 bring out the responses to the questions regarding the availability and non- availability of street bins and frequency of collection of waste from the dustbins kept in the streets of the study area villages. The results are presented in the following Tables 4.2.22, 4.2.23 and 4.2.24.

Frequency distribution of women respondents by street bins availability, non-availability, waste collectors of street bins and frequency of waste collection.

Table Number	Variable	Frequency	Percent
4.2.22	**Street bins availability**		
	Yes	320	73.0
	No	119	27.0
	Total	**439**	**100.0**
4.2.23	**Waste collectors of street bin**		
	Sanitary workers	270	84.3
	Rag pickers	40	12.6
	Private contractors	10	3.1
	Total	**320**	**100.0**
4.2.24	**Period of waste collection**		
	Weekly	10	3.0
	Once in two weeks	50	16.0
	Once in three weeks	55	17.0
	Once in four weeks	120	37.5
	Once in five weeks	85	26.5
	Total	**320**	**100.0**

Source: Field data

The Table 4.2.22 reveals that for 73 per cent of the respondents, street bins are available in their residential areas for disposing of household solid waste whereas 27 per cent of them do not have the facility of street bins for disposing of their household solid waste.

Regarding the waste collectors of the street bins, sanitary workers (84.3%), rag pickers (12.6%) and private contractors (3.1%) are engaged in the waste collection services in the study areas (Table. 4.2.23).

Regarding the period of waste collection, about twenty eight per cent of the women respondents state that waste is collected once in four weeks from the street bins followed by once in five weeks (21.6%),

once in three weeks (18.7%) and weekly once (3.0 per cent) in the descending order of importance (Table 4.2.24).

It is understood from the Table that dustbins are available in majority of the streets of study area. Sanitary workers are mostly involved in emptying the street bins dumped with household solid waste. The collection of household solid waste done mostly once in four weeks. The waste collectors are to be motivated to get involved in the disposal of household solid waste dumped in the street bins frequently.

The researcher probes to check if the women respondents know about composting of bio-degradable waste and its benefits. The results are presented in the following Tables 4.2.25 and 4.2.26.

Frequency distribution of women respondents by knowledge and benefits of composting.

Table Number	Variable	Frequency	Percent
4.2.25	**Knowledge of composting**		
	Yes	138	31.4
	No	301	68.6
	Total	**439**	**100.0**
4.2.26	**Benefits of composting**		
	Avoid ground water contamination	138	100.0
	Help creates environment friendly surroundings	130	94.2
	Control emissions of foul odour of garbage	125	90.5
	Prevent spread of diseases	120	86.9
	Reduce multiplication of pests	110	79.7
		N=138	**100.0***

Source: Field data
*Multiple Answers

The above Table 4.2.25 clearly depicts that majority (68.6 %) of the respondents do not know anything about composting and its benefits. Only 31.4 per cent of the total women respondents report in positive. Among those who have reported in the positive, all the

women respondent are aware of the benefits of composting, which avoid ground water contamination (100%) followed by help creates environment friendly surroundings (94.1%), control emissions of foul odour of garbage (90.5%), prevent spread of diseases (86.9%) and reduce multiplication of pests (79.7%).

The Table 4.2.26 implies that the awareness of composting of bio-degradable waste and its benefits is lacking in majority of women respondents.

Hence, it is inferred from the Table that relevant awareness programs are to be conducted to the benefit of rural women, who are involved mostly in disposal of household solid waste.

Women respondents are asked about their responses on household waste found outside their homes. The results are shown in the following Table 4.2.27.

Frequency distribution of women respondents by their responses regarding the household solid waste found outside their homes.

Table Number	Variable	Frequency	Percent
4.2.27	**Responses on household solid waste found outside their houses**		
	Inform the non-officials (elected representatives) to take action	430	98.0
	Inform the village officials (Panchayat clerk, Sanitary inspector) for proper cleaning	420	95.7
	Present the matter in the grama sabha meeting when it is convened	415	94.5
	Inform the sanitary workers for proper disposal	410	93.4
	Trying to remove waste by self	405	92.2
	Encourage the students and non students youth to look into this matter	400	91.1
	Burning the household solid waste	191	43.5
		N=439	**100.0***

Source: Field data
*Multiple answers

Out of the total women respondents, 98 per cent of them state that they will inform the non- officials (elected representatives) to take action for cleaning the street followed by inform the village officials (95.7%), present the matter in the grama sabha meeting when it is convened (94.5%), inform the sanitary workers for proper cleaning (93.4%), trying to remove waste by self (92.2%) encourage the students and non-students youth to look into this matter (91.1%) and burning the household solid waste (43.5%).

This analysis corresponds with planned behaviour theory.

Table 4.2.28 depicts the suggestions given by the women respondents with regard to payment of fee for the purpose of solid waste collection.

Frequency distribution of women respondents by their suggestion with regard to payment of fee for the purpose of solid waste collection.

Table Number	Variable	Frequency	Percent
4.2.28	**Suggestions given by the women respondents with regard to the payment of fee for household solid waste collection**		
	Nominal fee may be fixed for periodical collection	439	100.0
	Creation of awareness regarding this	420	95.7
	One of the family members of the area may take up the responsibility for collecting money	410	93.3
	Self help group members may be engaged in the task of mobilizing the money for the disposal of household solid waste	405	92.2
	Good idea it can be adopted	400	91.1
		N=439	**100.0***

Source: Field data
*Multiple answers

The total number of women respondents interviewed for the study, suggest that 'nominal fee may be fixed for periodical collection of household solid waste followed by creation of awareness regarding waste collection of fee' (95.6%) 'One of the family members of the area may take up the responsibility for collecting money' (93.3%) 'Self help group members may be engaged in the task of mobilizing the money for disposal of waste' (92.2%) and 'good idea that collection of fee may be adopted' (91.1%) towards the disposal of household solid waste.

It is understood from the Table that all the women respondents have suggested that nominal fee may be fixed for the purpose of disposal of household solid waste.

It is inferred from the Table 4.2.28 that the selected women in the study area report that they will abide by the measures taken towards making the environment free from waste thereby taking care of the health of all people in the study area.

The researcher has probed regarding the awareness level of women respondents about household solid waste. The results are presented in the following Table 4.2.29.

Frequency distribution of women respondents by awareness of household solid waste

Table Number	Variable	Frequency	Percent
4.2.29	**Solid waste awareness among the respondents**		
	Low level	206	47.0
	Medium level	127	29.0
	High Level	106	24.0
	Total	**439**	**100.0**

Source: Field data

The Table above depicts the awareness of the respondents in the study area regarding household solid waste and the cause of excessive waste. The women respondents show low level of awareness in understanding the fact that if waste is not managed properly and responsibly, it will have a detrimental effect on their own lives and the environment. More than half of them belonged to the category of those who are very low on awareness followed by 30 per cent of them with moderate knowledge and 24 per cent of them with high level of awareness. They were adjudged on the basis of awareness regarding the generation of household waste, managing household solid waste at the source of generation, hazardous waste items, reducing, reusing and recycling of waste, proper household solid waste collection and disposal reflecting positively on the status

of the village and the onus of managing household solid waste vested with the women in the households.

This analysis bears relevance to the theory of planned behaviour.

The respondents are asked about the question regarding their awareness of the impact of the improper collection and disposal of household solid waste leading to environmental degradation. Their answers are presented in the following Table 4.2.30, in terms of Low, Medium and High level of awareness.

Frequency distribution of women respondents by leading to environmental degradation.

Table Number	Variable	Frequency	Percent
4.2.30	**Environmental awareness among the respondents**		
	Low level	196	45
	Medium level	141	32
	High Level	102	23
	Total	**439**	**100.00**

Source: Field data

The proportion of respondents who are aware of the impact of the improper collection and disposal of household solid waste on the environmental degradation is very low. Thirty two per cent of them are medium level awareness followed by high level (23%). The assessment is based on the factors affecting environment degradation like, use and burning of plastic, stagnation of water, improper disposal of hazardous waste both at home and in commercial complexes and contamination of water sources. They were also tested on their knowledge about use of solar power, using bio waste as fertilizers, discouraging the use of plastic bags, preserving environment for the posterity and regarding government to be held responsible for maintaining clean environment and also providing environment friendly bins for collection of household solid waste.

Based on the findings, it may be concluded that the awareness level of the people living in rural areas needs to be enhanced as to how to preserve and protect the environment by using environment friendly articles in the day to day life and optimum use of perishable and non perishable resources are to be dealt with as per the needs of the people.

This analysis corresponds with the theory of planned behaviour.

The researcher posed the question regarding the proximity of the dumpsite from their homes. The results are presented in the following figure-3.

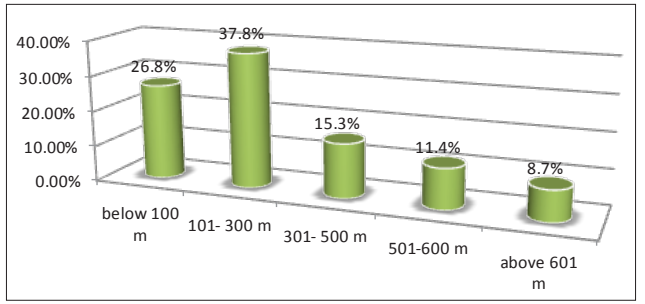


Figure - 3: Distance of dumpsite from their residential areas

It is seen from the above figure-3 that 37.8 per cent of the women respondents selected for the study report that the distance between residential area and dumpsite ranges from 101-300 Metres followed by below 100 Metres (26.8%), 301- 500 Metres (15.3%), 501 - 600 Metres (11.4%) and only in the case of 8.7 per cent of the women respondents, the distance is above 601 Metres away from their residential areas.

It is inferred from the above figure-3 that for number of women respondents, the distance between residential areas and dumpsite varies from 101-300 Metres. Hence, the figure implies that there is every likelihood of affecting health of people and polluting environment.

However, it is noted from the above figure that at least for a little less than one tenth of the women respondents, their dumpsite is above 601 Metres away from their residential areas.

The respondents are asked about the emissions of odour and the frequency of spread of odour from the dumpsite and their responses are presented in the following Tables 4.2.31 and 4.2.32.

Frequency distribution of women respondents by the emissions of odour and the frequency of spread of odour from the dumpsite.

Table Number	Variable	Frequency	Percent
4.2.31	**Emissions of odour from dumpsite**		
	Yes	287	65.4
	No	152	34.6
	Total	**439**	**100.0**

4.2.32	**Frequency of spread of odour from dumpsite**		
	Frequently	144	50.6
	Sometimes	63	21.6
	Always	53	18.5
	Rarely	27	9.3
	Total	**287**	**100.00**

Source: Field data

Among those who have stated the positive remarks regarding the emissions of the odour from the dumpsite, just half of them report that emission of odour is felt by them frequently followed by sometimes on certain occasion due rain, burning, clearing, being mud shelter for village pigs and grazing by the cattle (32.8%), always (12.0%) and rarely (6.2%).

It is inferred from the Table 4.2.31 that majority of the women respondents in the study area have felt the emissions of the odour from the dumpsite and half of them state that the emissions from dumpsite is felt frequently i.e many times at short intervals.

Thus, the Table shows that the environment, in which the women respondents and their family members live is filled with odour emitting from dumpsite and to that extent, the health of the people living in the study areas is getting affected in course of time.

The researcher has probed to find out when the women respondents feel stench from the dumpsite intolerable. Their answers are shown in the following figure-4.

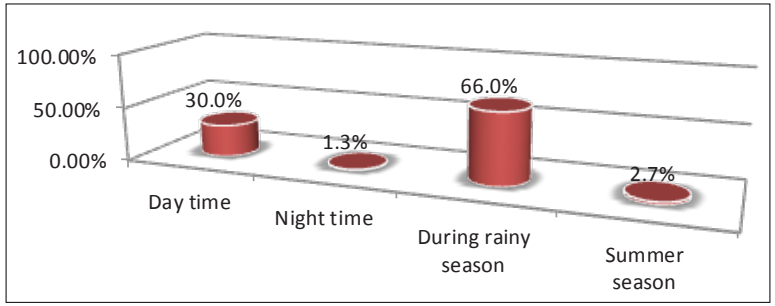


Figure - 4: When the respondents feel the stench emanating from dumpsite intolerable

The above figure-4 reveals that among those who have reported the time and season of emissions of odour from dumpsite, which is intolerable, about 50 per cent of them refer to 'rainy season' to the emissions of stench from dumpsite followed by 'day time' (38.0%) 'summer season' (10.4%) and 'night time' (1.3%).

It is inferred from above figure-4 that during rainy season and day time, the stench emitting from dumpsite is intolerable for about half and more numbers of women respectively.

So, the figure implies that people in the study area are affected due to the emission of stench from the dumpsite during rainy season and day time and the environment, in which people live, in the study area, is also affected. So, this requires that the proper steps are to be taken in this regard by the Panchayati Raj institutions, Non–Governmental Organizations (NGOs) and Community Based Organizations (CBOs).

The respondents are inquired about the environmental problems, which they face in day to day life. Their responses are illustrated in Table 4.2.33.

Frequency distribution of women respondents by environmental problems confronted by them.

Table Number	Variable	Frequency	Percent
4.2.33	**Environmental problems**		
	Dumping of greater quantity of solid waste in the dumpsite and irregular treatment of the solid waste dumped.	430	97.9
	Contamination of water sources (due to dumping of waste)	425	96.8
	Open air defecation and improper treatment of human excreta	410	93.3
	Spreads of odour emitted from dumping of waste	405	92.2
	Improper disposal of waste in the street	400	91.1
	Drainage clogs	395	89.9
		N=439	**100***

Source: Field data
*Multiple answers

Out of the total number of women respondents selected for the study, 97.9 per cent of them have referred to dumping of greater quantity

of household solid waste in the dumpsite and irregular treatment of the solid waste dumped as one of the major environmental problems confronted by them in their residential areas followed by contamination of water sources (96.8%), open air defecation and improper treatment of human excreta (93.3%), spread of odour emitted from dumpsite (92.2%) and improper disposal of household solid waste in the street (91.1%).

It is understood from the Table 4.2.33 that the environment of the residential areas of the women respondents and health of people living in such environment are affected due to the solid waste dumped in the dumpsite.

The researcher discussed with the women respondents regarding the type of diseases due to which the women respondents have been affected during past three months prior to the date of investigation by the researcher. Their responses are tabulated in the following Tables 4.2.34 and 4.3.35.

Frequency distribution of women respondents by the type of diseases by which they are affected.

Table Number	Variable	Frequency	Percent
4.2.34	**Respondents are affected by diseases during past three months prior to the investigation**		
	Yes	307	69.9
	No	132	30.1
	Total	**439**	**100.0**
4.2.35	**Type of disease**		
	Cold and cough	96	31.2
	Fever	53	17.2
	Skin allergy	49	16.0
	Typhoid fever	41	13.3
	Dysentery	28	9.0
	Diarrhoea	21	7.0
	Vomiting	14	4.5
	Dengue fever	5	2.0
	Total	**307**	**100.0**

Source: Field data

About seventy per cent of the women respondents interviewed for the study, say that they are affected by diseases during three months period prior to the investigation of the researcher in the study area whereas thirty per cent of the women respondents' state in the negative regarding their getting affected by diseases.

The above Table 4.2.35 shows that thirty one per cent of the women respondents who have been affected by diseases, have reported that cold and cough have affected them followed by fever (17.2%), skin allergy (16.0%), typhoid fever (13.3.%), dysentery (9.1%), diarrhoea (7.0%), vomiting (4.5%) and dengue fever (2.0%). Thus, the Table reveals that more number of women respondents are affected by the diseases of cold and cough, fever, skin allergy and typhoid fever.

However, it is noted from the Table 4.2.34 that 30.1 per cent of the women respondents have not been affected by any diseases. So, it is evident from the Table that little less than three fourth of women respondents have been affected by different diseases.

The Table implies that proper disposal of household solid waste is the need of the hour to deal with health and environment of the people living in study area.

The researcher has probed further to find if the respondents' family members are affected by diseases and how they are affected during the past three month's period prior to the date of investigation by the researcher due to the improper disposal of household solid waste. Their answers are presented in the following Tables 4.2.36 and 4.2.37.

Frequency distribution of women respondents' family members affected by diseases.

Table Number	Variable	Frequency	Percent
4.2.36	**Family members affected by diseases**		
	Yes	223	50.8
	No	216	49.2
	Total	**439**	**100.0**

Table Number	Variable	Frequency	Percent
4.2.37	**Type of diseases by which family members of the women respondents are affected**		
	Cold and cough	92	41.0
	Fever	69	31.0
	Typhoid fever	18	8.0
	Jaundice	18	8.0
	Skin allergy	15	7.0
	Diarrhoea	11	5.0
	Total	**223**	**100.0**

Source: Field data

About fifty one per cent of the respondents selected for the study, say that their family members are affected by diseases during three months period prior to the investigation of the researcher in the study area. A little less than fifty per cent of the women respondents state in the negative regarding their family members getting affected by diseases. Among those who have stated that their family members are affected by diseases, forty one per cent of them refer to cold and cough followed by fever (30.9%) by which their family members are affected.

So, cold, cough and fever are the diseases by which more number of family members of the women respondents have been affected due to improper disposal of household solid waste and proximity of the dumpsite from their residential areas.

Having come to understand the seriousness of health issues caused by living near the dumping yard, the researcher focused on how the most vulnerable group of the society, viz., children, are affected due to the proximity to the dumping yard. Their answers are presented in the following Tables 4.2.38 and 4.2.39.

Frequency distribution of children of women respondents by the diseases and physical injuries with which the children are affected.

Table Number	Variable	Frequency	Percent
4.2.38	**Children affected due to the proximity of dumping yard**		
	Yes	232	53.0
	No	207	47.0
	Total	**439**	**100.0**
4.2.39	**Types of diseases**		
	Vomiting	59	25.4
	Cough	45	19.4
	Skin allergy	36	15.5
	Injuries while playing	35	15.1
	Nasal stiffness	31	13.4
	Throat infection	26	11.2
	Total	**232**	**100.0**

Source: Field data

The Table 4.2.38 reveals that fifty three per cent of the children of women respondents interviewed for the study are affected by the diseases, while forty seven per cent of the women respondents state in the negative. Among those children of the women respondents affected by the diseases, vomiting is reported by twenty five per cent followed by cough (19.3%), skin allergy (15.5%) injuries while playing (15.0%) nasal stiffness (13.4%) and throat infection (11.2%).

It is inferred from the Table 4.2.39 construction of resource recovery park might go a long way in preventing the children from getting affected by the diseases. Since, this type of arrangement paves the way for recycling of the waste to be used for constructive purposes thereby maintaining pollution free environment to the benefit of people at large.

The researcher has enquired regarding the place where they get treatment from and the distance to the centre from their homes. The responses are tabulated in the Tables 4.2.40 and 4.2.41.

Frequency distribution of women respondents by the type of medical facilities in the study area and the distance between hospital and homes.

Table Number	Medical facilities in the study areas	Frequency	Percent
4.2.40	Government hospital	206	47.0
	Home medicine	73	17.0
	Charitable hospital	66	15.0
	Traditional healer	44	10.0
	Medical shop	28	6.3
	Private hospital	22	5.0
	Total	**439**	**100.0**
4.2.41	**Distance between hospital and home**		
	0-3 km	168	38.3
	4-7 km	195	44.4
	8-11 km	76	17.3
	Total	**439**	**100.0**

Source: Field data

It is understood from the Table 4.2.40 that more number of women respondents visit government hospital for treatment (46.9%) followed by home medicine (16.6%) and charitable hospital (15.0%). At the same time, it is to be noted that the services of traditional healer (10.0%) are also utilized for medical treatment. The distance between the place of medical facilities and residences of women respondents ranges from four to seven kilo meters for more number of women respondents.

The women respondents have probed regarding their having and not having health insurance and reasons for not having health insurance. Their answers are shown in the following Tables 4.2.42, 4.2.43 and 4.2.44.

Frequency distribution of women respondents by having and not having health insurance and reasons for not having.

Table Number	Having Health Insurance	Frequency	Percent
4.2.42	Yes	173	39.4
	No	266	60.6
	Total	**439**	**100.0**

Table Number	Having Health Insurance	Frequency	Percent
4.2.43	**Name of the Health Insurance Policy**		
	Chief minister's comprehensive health insurance scheme	112	65.0
	Kalaignar insurance scheme for life saving treatment	33	19.0
	Star plus health insurance	18	10.0
	New health insurance scheme of Tamil Nadu government	10	6.0
	Total	**173**	**100.0**
4.2.44	**Reasons for not having health insurance policy**		
	Long process to get government health insurance scheme	97	36.4
	No need	84	31.6
	Do not know about the government insurance scheme	56	21.0
	Cannot afford to invest money in the private insurance scheme	29	11.0
	Total	**266**	**100.0**

Source: Field data

The Table 4.2.42 shows that among 439 women respondents, 39.4 per cent of them have health insurance while 60.6 per cent of them state in the negative.

Among those who are availing of health insurance, 65 per cent of them are having chief minister's comprehensive health insurance scheme followed by Kalaignar insurance scheme for life saving treatment (19%) star plus health insurance (10.0%) and new health insurance scheme of Tamil Nadu government (6.0%).

Among those who do not have health insurance, 36.4 per cent of them state that it is a long process to get benefited under the government health insurance scheme followed by 'no need' (31.5%), 'do not know about the government insurance scheme' (21%). It is inferred from the Table 4.2.44 that majority of the women respondents do not have the facility of the health Insurance scheme. Only a little more than one third of the women respondents have registered under the health insurance scheme. The scheme of chief minister's comprehensive health insurance scheme is registered by majority of women respondents. And the reasons for not having registered under any health insurance scheme attributed to the reason that it is a long process to get benefited under the health insurance scheme and 'No need' as reported by more number of women respondents. An awareness drive and a quick processing of insurance scheme may bring all the women respondents under the various health insurance schemes thereby creating a safety net for the rural masses.

The respondents are asked about the different sources of drinking water in their locality, taste of water and reasons for the difference in quality of water. Their responses are presented in the following Tables 4.2.45, 4.2.46, 4.2.47 and 4.2.48.

Frequency distribution of women respondents by sources of drinking water, taste of drinking water, knowledge and reasons for difference in quality of water.

Table Number	Variables	Frequency	Percent
4.2.45	**Sources of Drinking water**		
	Public taps through which water is supplied through panchayats over head tank	230	52.0
	Hand pumps sunk in the streets of villages	161	37.0
	Bore well sunk in the houses of respondents	48	11.0
	Total	**439**	**100.0**
4.2.46	**Taste of water**		
	Soft water	249	57.0
	Hard water	190	43.0
	Total	**439**	**100.0**

4.2.47	**Knowledge for different quality of water**		
	Know	85	34.3
	Do not know	105	65.7
	Total	**190**	**100.0**
		N=85	**100***

Table Number	Variables	Frequency	Percent
4.2.48	**Reasons**		
	Waste thrown into water bodies	85	100.0
	Out flowing of industrial waste water and mixing in the river water	80	94.1
	Improper maintenance of drainage system	75	88.2
	The quality of land is spoiled due to the mixing of untreated hazardous solid waste	70	82.3
	Improper dumping of solid waste	65	76.4
		N=85	**100***

Source: Field data
*Multiple answers

The Table 4.2.48 shows that the waste thrown into water bodies and household solid waste and industrial waste mixing with in the Tamiraparani river water are the major reasons for difference in quality of water. Also, the public tab through, which the water is supplied from panchayats over head tank service, is the major source of drinking water.

Regarding the taste of water, more than half of the women respondents state that the taste of drinking water is soft. Among who have stated in the positive regarding the difference in drinking water, all of the women respondents attributed to the waste thrown in water bodies, to their response of differences in quality of water followed by out flowing of industrial waste water and mixing in the Tamiraparani river water (94.1%), improper maintenance of drainage system (88.2%), the

quality of land is spoiled due to the mixing of untreated hazardous solid waste (82.3%) and improper dumping of solid waste in all porampokku land (waste land of village).

It is evidently felt that the three sources of availing water in the study area is purely at nature's resource depends on purity of ground water, which should not be affected by the worst effect due to improper and unhygienic management of solid waste of the area. Getting of soft or salt water with mild or hard taste is the yield partially because of arbitrary dumping of solid waste in the surrounding area without proper evacuation and lethargy in maintaining the ground tidy and waste free.

The women respondents are asked in what way the mixing of household solid waste with water bodies affect the nature and their responses are given in the following Table 4.2.49.

Frequency distribution of women respondents by how the nature is affected due to mixing of household solid waste with water bodies.

Table Number	Variable	Frequency	Percent
4.2.49	**Nature is affected due to mixing of household solid waste with water bodies**		
	Corrosion of water quality thereby making water unsuitable for human consumption	435	99.0
	Spreading water borne diseases	420	95.6
	Water stagnant through floating of household solid materials	410	93.3
	Disruption of food chains	405	92.2
	Destruction of Aquatic animals	400	91.1
	Decrease of dissolving oxygen level	350	79.7
		N=439	**100.0***

Source: Field data
*Multiple answers

The above Table 4.2.49 reveals that 99 per cent of the women respondents state that mixing of solid waste with water bodies affects the nature due to corrosion of water quality thereby making water unsuitable for human consumption followed by spreading water borne diseases

(95.6%), water stagnant through floating of household solid materials (93.3%), disruption of food chains (92.2%), destruction of aquatic animals (91.1%) and decrease of dissolving oxygen level (79.7%).

The mixing of household solid waste with water bodies affect the nature due to corrosion of water quality thereby making water unsuitable for human consumption, spreading water borne diseases and water stagnant through floating of household solid materials.

It is observed in the research area the acute scarcity of qualitative water to a specific level is caused due to mixing of household solid waste with water resources because of lack of awareness among the respondents and less motivation from the government or other service oriented organization including primary health level outlets and secondary hygiene protection social activists. This problem can be eradicated through motivational campaigns and involvement of government sectors concerned with an attitude of service towards the wellness of the people.

The Table 4.2.50 gives the responses to the question as to how the hygiene among family members is affected by dumping and keeping of waste in dustbins in the premises of women respondents uncared for.

Frequency distribution of women respondents by how the hygiene of their family members is affected.

Table Number	How hygiene among family members is affected by dumping and keeping of waste in dustbin	Frequency	Percent
4.2.50	Excrete of insects in the bathroom and rest room taps where especially women and children lay their hands for caring out domestic activities	119	27.0
	Children playing using the materials of the waste with their bare hand.	95	22.0
	Breeding ground for housefly cockroaches, etc	90	20.5
	Adult members as well as children using utensils without washing hands and vessels.	50	11.3
	Uncleaned conditions in the kitchen, bed room, dining and common hall	45	10.2
	Emission of odour from uncleaned and over filing of waste dumped and kept in the dustbin for many days.	40	9.0
	Total	**439**	**100.0**

Source: Field data

The Table 4.2.50 shows that 27 per cent of women respondents selected for the study attributed 'excrete of insects in the bathroom and rest room taps where especially women and children lay their hands for caring out domestic activities' to the affected hygiene of family members of women respondents followed by children playing using the materials of the waste with their bare hand (22.0%) and breeding ground for house fly, cockroaches etc., (20.5%).

It is understood from the above Table 4.2.50 that as to how the hygiene of the family members of women respondents in their homes is affected by dumping and keeping of waste in dustbins in their premises uncared for.

The respondents are asked about the mode of transport used to transfer the household solid waste from their residential street bins to the dumping yard. The responses are shown in the following Figure-5.

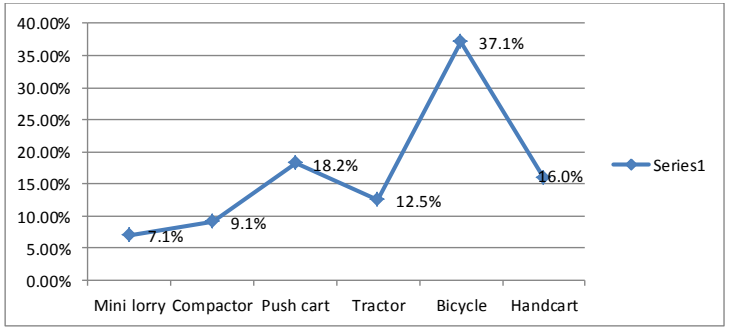


Figure - 5: Mode of transport used for disposal of household solid waste from the residential street bins to dumping yard

The Figure-5 indicates that bicycle is used for transport of waste materials from residential street bins to dumpsite as reported by more number of women respondents followed by push cart (18.2%) and hand cart (16.0%). It is observed from the study area that the women respondents and their family members are to be provided with orientation and training program periodically in respect of collecting and dumping of household solid waste systematically without getting it spread over the place where the street bin is kept for collecting purposes.

The women respondents in the study area are to be educated through Self Help Group Members (SHGs) and Non-Governmental Organizations (NGOs) as how to dispose of household solid waste materials and maintain environmental sanitation and hygiene of

their family members. It is also observed that the sanitary workers deputed by the local bodies are not provided with necessary safety equipments like cloves, masks, boots etc. The data on the figure also implies that associative form of social processes of Co-operation, Assimilation, Accommodation are to be instilled both in the minds of women and their family members as well as sanitary workers for proper disposal of household solid waste materials dumped in the dustbin of street.

The respondents are asked about the dumpsite for the household solid waste. Their answers are presented in the following Table 4.2.51.

Frequency distribution of women respondents by dumpsite

Table Number	Variable	Frequency	Percent
4.2.51	**Dumpsite for the collected household solid waste**		
	Along the site of the panchayat road	157	35.8
	In the purampokku land of the village	124	28.2
	Near to village pond	84	19.1
	Village river bank	46	10.5
	Collection centre in the entrance of the village	28	6.4
	Total	**439**	**100.0**

Source: Field data

As per the above Table 4.2.51, the dumpsite for household solid waste comprises along the site of the panchayat road (35.8%), in the purampokku land of the village (28.2%) near to village pond (19.1%) and river bank (10.5%). The Table implies that more number of the village people especially women selected for the study and the local body members are not bothered about the kind of negative impact, which will be created on the life of the villagers as well as the ground water used both for domestic and agriculture purposes. The very fact that the disposal of household solid waste material should be carried out in such a way that it should not affect the life of the villagers, health of the cattle and fertility of the soil, environmental sanitation, seems to be not realized. The people who pass by the dumpsite get affected by intolerable stench and the health of the cattle, which consume the plastic materials while grazing nearby the dumpsite get spoiled leading to loss of life in course of time.

Hence, the villagers especially women in the study area are to be sensitized to these problems so as to find out the solution through the application of Participatory Rural Appraisal (PRA) method involving

people, in the main, facilitated by officials, non- officials and by the educational institutions.

The women respondents are asked regarding the problems faced during the transportation of waste from the street container kept in the village to the dumping yard. The results are given in the following Table 4.2.52.

Frequency distribution of women respondents by problems faced during the transportation of household waste materials from village street bin to dumpsite.

Table Number	Variable	Frequency	Percent
4.2.52	**Problems faced during the transportation**		
	Improper cleaning	184	42.0
	Transportation of waste materials in such a way that they fall off from the vehicle all the way from village street bin to dumpsite	77	17.5
	Noise pollution resulting from clearing the waste materials by the sanitary workers	55	12.5
	Emission of harmful gases injures health of the villagers and that of the sanitary workers while clearing	53	12.0
	Clearing the dumped household solid waste materials form the street duct bins Causing nuisance to the public due to flying insects emerging out of waste.	45	10.0
	Creating feeling of allergy for the villagers due to the spread of intolerable stench while transporting the waste material all the way from street dustbin to dumpsite outside the village.	25	6.0
	Total	**439**	**100.0**

Source: Field data

The above Table 4.2.52 clearly shows the problems confronted while clearing the household waste for purpose of disposing of it. The problem of 'improper cleaning' (42.0%) is reported by more number of women respondents followed by transportation of waste materials in such a way that they fall off from the vehicle all the way from village street bin to dumpsite (17.5%) and noise pollution resulting from clearing the waste materials by the sanitary workers (12.5%).

It is inferred from the Table that the transportation of waste from the street container kept in the village to the dumping yard need to be improved upon without causing any nuisance to environment and health of the villagers.

The study implies that the periodical meetings of primary health centre doctors, health inspectors and sanitary inspectors and staff nurses, male and female health workers are to be conducted in the village involving all the villagers, especially rural women in order to make them get acquainted with the seriousness of the problems faced while clearing the waste. And also, the necessity of the people's co-operation in such matter is to be instilled in the minds of the people with help of village school teachers, officials, non-officials, traditional leaders, student and non- students youth of the villagers. The minds of the villagers, especially of women, is to be impressed upon towards constructive way of disposal of household solid waste through screening short films, documentary films etc., specially created for that purpose.

The respondents are asked about the improper management of household solid waste that affects the social life. Their results are presented in the following Table 4.2.53.

Frequency distribution of women respondents by how the improper collection and disposal of household solid waste that affects the social life.

Table Number	Social life affected by the improper handling of household solid waste	Frequency	Percent
4.2.53	School going children are affected by the odour while crossing the dumpsite	400	91.1
	Burning of waste creates smog and ashes affecting the environment and health of people	435	99.0
	Villagers are reluctant to attend the public meeting due to improper handling of waste materials and open dumpsite emitting foul smell	410	93.3
	The dumpsite prevents other villagers from visiting the study village and reduces the frequencies of visit	405	92.2
	The meeting of village non-student youth in the common place of the village for holding sports and creation of awareness programmes etc come to an end cut sorting the time schedule of meeting because of nuisance caused by dumpsite.	415	94.5
		N=439	**100***

Source: Field data
*Multiple answers

It is inferred from the Table 4.2.53 that the social life of the villagers get affected because of burning of waste, which creates smog and ashes affecting the environment and health of people (99.0%), followed by the meeting of village non-student youth in the common place of the village for holding sports and creation of awareness programmes etc., come to end cut sorting the time schedule of meeting because of nuisance caused by dumpsite (94.5%) and the villagers are reluctant to attend the public meeting due to improper handling of waste materials and open dumpsite emitting foul smell (93.3%).

The above analysis is related to the theory of Anomie.

The question is relating to as to how the women respondents' day to day routine life is affected by household solid waste and their answers are presented in the following Table 4.2.54.

Frequency distribution of women respondents by difficulties experienced in their day to day routine life because of household solid waste.

Table number	Variable	Frequency	Percent
4.2.54	**Difficulties experienced in their day to day routine life**		
	Odour producing vomiting sensation	157	35.8
	Spoiling fresh mood while inhaling	107	24.4
	Feeling of head ache	92	21.0
	Irritation while handling solid waste	53	12.0
	Stress	30	6.8
	Total	**439**	**100.0**

Source: Field data

The Table 4.2.54 depicts that 35.8 per cent of the women respondents selected for the study felt the difficulties of smelling of odour leading to vomiting sensation followed by spoiling fresh mood (24.4%) and feeling of head ache (21.0%).

It is inferred from the Table that smelling odour leading to vomit sensation has affected more number of women respondents in their day to day routine life because of presence of household solid waste. The data in the Table implies that special meetings need to be conducted involving health officials, sanitary workers in order to keep the villagers

informed of the evil effect of presence of household solid waste and the pamphlets, wall papers etc., may be prepared and distributed for the villagers and also pasted on the walls of building visible to the village people, whenever they pass by all the main streets of the villages.

The researcher has enquired whether the village panchayats are taking any precautionary measures to address the problems of the house of solid waste. The results are presented in the following Table 4.2.55.

Frequency distribution of women respondents by precautious measures of village panchayat taken for preventing the health of village people from getting affected by the problems caused by the household solid waste.

Table Number	Variable	Frequency	Percent
4.2.55	**Precautious measures of village panchayats**		
	Team of sanitary inspectors visiting the villages door to door for checking water tank and drainage	435	99.0
	Vaccination against water borne diseases	410	93.3
	Medical camp	350	79.7
	Conducting awareness programs	300	68.3
	Distributing pamphlets about the water borne diseases	310	70.6
		N=439	**100.0***

Source: Field data
*Multiple answers

The Table 4.2.55 presents that majority of the respondents (99%) state that precautious measures like team of sanitary inspectors visiting the villages door to door for checking water tank and drainage are to be taken for the purpose of preventing the health of the people from getting affected by the problem of household solid waste followed by vaccination against water borne diseases (93.3%) and medical camps (79.7%).

It is inferred from the Table that a team of sanitary inspectors visiting the people door to door in the villages for checking water tank and drainage is what is needed among others.

It is understood from the above Table that precautious measures such as team and camp works will be of immense use for dealing with health of the village people as well as environmental sanitation of the villages.

The researcher has probed the opinion of the women regarding the solid waste collection and disposal in their residential areas. Their answers are presented in the following Table 4.2.56.

Frequency distribution of women respondents by their opinion about solid waste collection and disposal in their areas.

Table Number	Opinion of the respondents regarding solid waste collection and disposal in their residential areas	Frequency	Percent
4.2.56	Not satisfied	202	46.0
	Satisfied	159	36.2
	Highly satisfied	78	17.8
	Total	**439**	**100.0**

Source: Field data

The respondents are asked about the sufficiency of sanitary workers and their activities like the frequency of collection and segregation of waste, clearing of waste bins, cleaning and maintaining public toilets, treatment of hazardous waste, keeping the surroundings of the waste bin clean, transportation of waste from the bins to the yard, handling of waste in a precautious manner etc. They are also asked about the sanitation awareness camps conducted by the village panchayats during the rainy seasons for dealing with seasonal diseases; dissuading the villagers from using and burning of plastic waste, whether the vehicle transporting the waste was covered properly with suitable thick cloth/ jute material as well as the disposal of dead animals. Less than half of the women respondents (46%) opined that the solid waste collection and disposal system are not satisfied, the scores of which have been prepared based upon the Likert scale, followed by satisfied (36.2%) and highly satisfied (17.8 %).

It is concluded from the Table 4.2.56 that the task of house solid waste collection and disposal have to be improved upon by involving the officials and non officials of village panchayats including the sanitary workers. The Table implies that it might pave the way for maintaining clean and healthy environment for the villagers to live in. The awareness

level of household solid waste is to be enhanced especially among the rural women so as to handle their household solid waste in a responsible and systematic manner.

Perception of women respondents about the efforts taken by the government bodies on solid waste collection and disposal. Their responses are shown in the following Table 4.2.57.

Frequency distribution of women respondents by their perception about the efforts taken by the government bodies on solid waste collection and disposal.

Table Number	Variable	Frequency	Percent
4.2.57	**Government bodies efforts on disposal of household solid waste**		
	Moderate	191	43.5
	Good	143	32.6
	Excellent	105	23.9
	Total	**439**	**100.0**

Source: Field data

The above Table 4.2.57 shows the responses to the efforts taken by the government bodies in generating awareness among the people regarding the disposal of household solid waste and also the preventive measures taken against spread of diseases. About 44 per cent of the women respondents state that the government bodies' efforts are moderate while 32.6 per cent report that it is good. About 24 per cent have said that the efforts of government bodies are excellent. So, the Table implies that the efforts of local body have benefitted the women respondents.

The Table 4.2.57 concludes that the participation of majority of the women respondents has not been fully enlisted since they report that the efforts are only moderate. So, the study implies that either the efforts taken by the government bodies have not reached all the women respondents or they have not thought of the importance of participating in the campaigns.

Hence, concerted efforts need to be taken to cover every household of the villages and ensure that the awareness reaches the village people.

Suggestions of women respondents for proper household solid waste collection and disposal and their answers are presented in the following Table 4.2.58.

Frequency distribution of women respondents by their suggestions regarding the proper household solid waste collection and disposal.

Table Number	Suggestions	Frequency	Percent
4.2.58	Provide separate street bins for degradable and non-degradable household solid waste	420	95.6
	Promote regular door to door collection	439	100.00
	Create awareness on 3Rs- Recycle, Reuse, Reduce	410	93.3
	Conduct training programme on household solid waste collection and disposal	405	92.2
	Provide recycle bins in every residential area.	370	84.2
	Street bins should be emptied on proper interval	400	91.1
	Construct resource recovery park for waste recycling	350	79.7
	Increase the vehicles for waste collection service	430	97.9
	Increase the number of sanitary workers	425	96.8
	Allocate sufficient fund for household solid waste collection and disposal	395	89.9
	Proper maintenance of dumpsite	435	99.0
	Conduct sanitation and health camps frequently	424	96.5
	Conduct short term social survey on solid waste collection and disposal in village level	427	97.2
	Promote public-private partnership on solid waste collection and disposal	404	92.0
		N=439	**100. 0***

Source: Field data
*Multiple answers

The total number of the women respondents interviewed for the study suggest that 'promote door to door collection regular' (100.0%), 'proper maintenance of dumpsite' (99.0%), 'increase the vehicles for waste collection service' (97.9%), 'conduct short term social survey on solid waste collection and disposal' (97.2%) towards proper collection and disposal of household solid waste.

It is understood from the Table 4.2.58 that all the women respondents suggest that promote door to door collection on regular basis for the purpose of proper collection of household solid waste.

Respondents are probed on their expectation about the role of NGOs to safeguard the environment and their responses are presented in the following Table 4.2.59.

Frequency distribution of women respondents by their expectations from NGOs for safeguarding the environment.

Table number	Suggestion	Frequency	Percent
4.2.59	Organize seminars, conference and meeting for promoting environmental awareness	410	93.3
	Conduct participatory rural appraisal programme among villagers to assess sanitation	350	79.7
	Encourage the people to use cloth bags	425	97.0
	Conduct outreach programmes for village sanitary workers	435	99.0
	Motivate rural women to segregate their household waste into degradable and non-degradable waste	405	92.2
	Conduct awareness programmes about clean India in school and college campus	400	91.1
	Distribute pamphlets about waterborne diseases	415	94.5
	Conduct campaign about the problems of improper disposal of household solid waste in slum areas	430	98.0
	Promote tree plantation for protecting the environment	428	97.4
	Monitor the quality of environment and status of sanitation in village level	422	96.1
	Provide proper training for making bio-waste manure	413	94.0
	Encourage for proper household waste disposal	418	95.2
		N=439	**100.0***

Source: Field data
*Multiple answer

Out of the total respondents, 99 per cent of them expect the role from Non- Governmental Organizations (NGOs) regarding proper solid waste collection and disposal like to conduct outreach programmes to the sanitary workers for proper handling solid waste followed by conduct campaign about the problems of improper disposal of household solid waste in slum areas (98.0%), promote tree plantation (97.4%) encourage the people to use cloth bags instead of plastic and polythene bags (97.0%) and monitor the quality of village environment and status of sanitation in the descending order of importance (96.1%).

AWARENESS ON HOUSEHOLD SOLID WASTE BY BACKGROUND VARIABLES OF RESPONDENTS

An index for the awareness on solid waste is developed using 20 aspects by giving score (five point scale) '5' for strongly agree, '4' for agree, '3' for neutral, '2' for strongly disagree and '1' for strongly disagree for each aspect of respondents, adding all the scores and categorized into three groups as Low, Moderate and High. The level of awareness is analyzed in relation to the background characteristics of the respondents. The awareness on solid waste is found to be at low level in 47 per cent of the respondents, at moderate level in 29 per cent of them and high level in 24 per cent (**Refer to Table number 4.2.29**).

The association between solid waste and background variables are assessed using the Chi-square test of significance.

Table 4.2.60. Age of the respondents by awareness on household solid waste of women

Age of the respondents Low		Awareness on household solid waste			Total
		Medium	High		
18-27 years	No	16	18	7	**41**
	Per cent	39.0%	43.9%	17.1%	**100.0%**
28- 37 years	No	51	34	31	**116**
	Per cent	44.0%	29.3%	26.7%	**100.0%**
38-47 years	No	79	31	39	**149**
	Per cent	53.0%	20.8%	26.2%	**100.0%**
48+ years	No	60	44	29	**133**
	Per cent	45.1%	33.1%	21.8%	**100.0%**

Age of the respondents Low		Awareness on household solid waste			Total
		Medium	High		
Total	No	**206**	**127**	**106**	**439**
	Per cent	47%	29%	24.%	**100.00%**

Chi square =11.135, P=.084

The above Table 4.2.60 shows that there is no significant association ($p>0.05$) between age of respondents and awareness on solid waste. This implies that level of awareness on solid waste does not vary significantly across the age group.

Table. 4.2.61. Religion of the respondents by awareness on household solid waste of women

Religion of the Respondents Low		Awareness on household Solid Waste			Total
		Medium	High		
Hindu	No	111	96	70	**277**
	Percent	40.1%	34.7%	25.3%	**100.0%**
Non- Hindu	No	95	31	36	**162**
	Percent	58.6%	19.1%	22.2%	**100.0%**
Total	No	**206**	**127**	**106**	**439**
	Percent	46.9%	28.9%	24.1%	100.0%

Chi Square = 16.417 p =.000

The Table 4.2.61 explains that there is significant association ($p<0.05$) between religion of respondents and awareness on solid waste. This implies that the level of awareness on solid waste varies significantly across the religious groups.

Table 4.2.62. Community of the respondents by awareness on household solid waste of women

Community of the Respondents Low		Awareness on household Solid Waste			Total
		Medium	High		
OC	No	23	11	18	**52**
	Percent	44.2%	21.2%	34.6%	**100.0%**
BC	No	103	40	44	**187**
	Percent	55.1%	21.4%	23.5%	**100.0%**

Community of the Respondents Low		Awareness on household Solid Waste			Total
		Medium	High		
MBC	No	39	29	24	**92**
	Percent	42.4%	31.5%	26.1%	**100.0%**
SC/ST	No	41	47	20	**108**
	Percent	38.0%	43.5%	18.5%	**100.0%**
Total	No	**206**	**127**	**106**	**439**
	Percent	46.9%	28.9%	24.1%	**100.0%**

Chi Square = 21.853, p =.001

Analysis of awareness level based on caste shows that caste is significantly ($p<0.05$) associated with awareness on household solid waste. Among the respondents who showed high level of awareness of solid waste, it is found that it is high among the backward and most backward castes while compared to the SC/ ST and other castes.

Table. 4.2.63. Education of the respondents by awareness on household solid waste of women

Education of the Respondents		Awareness on Solid Waste			Total
		Low	Medium	High	
Illiterate	No	49	19	10	**78**
	Percent	62.8%	24.4%	12.8%	**100.0%**
Primary	No	29	24	10	**63**
	Percent	46.0%	38.1%	15.9%	**100.0%**
Middle	No	37	42	37	**116**
	Percent	31.9%	36.2%	31.9%	**100.0%**
High School	No	23	12	20	**55**
	Percent	41.8%	21.8%	36.4%	**100.0%**
Hr.Sec	No	28	15	5	**48**
	Percent	58.3%	31.2%	10.4%	**100.0%**
Under graduation	No	27	8	11	**46**
	Percent	58.7%	17.4%	23.9%	**100.0%**

Education of the Respondents		Awareness on Solid Waste			Total
		Low	Medium	High	
Post graduation	No	8	5	9	**22**
	Percent	36.4%	22.7%	40.9%	**100.0%**
Professional	No	5	2	4	**11**
	Percent	45.5%	18.2%	36.4%	**100.0%**
Total	No	**206**	**127**	**106**	**439**
	Percent	46.9%	28.9%	24.1%	**100.0%**

Chi Square = 40.937, p =.000

As presumed that literates are likely to know more about solid waste than illiterates, the above table proves that the presumption is correct. Education of women plays a significant role in determining the awareness levels regarding household solid waste at five per cent of significance ($p<0.05$).

Table 4.2.64. Occupation of the respondents by awareness on household solid waste of women

Occupation of the Respondents		Awareness on Solid Waste			Total
		Low	Medium	High	
Employed (Govt/Private)	No	45	25	31	**101**
	Percent	44.6%	24.8%	30.7%	**100.0%**
MGNREGP	No	42	51	19	**112**
	Percent	37.5%	45.5%	17.0%	**100.0%**
Farmer	No	19	9	18	**46**
	Percent	41.3%	19.6%	39.1%	**100.0%**
Self employment	No	37	15	21	**73**
	Percent	50.7%	20.5%	28.8%	**100.0%**
Daily wager	No	37	21	17	**75**
	Percent	49.3%	28.0%	22.7%	**100.0%**
Weaving	No	26	6	0	**32**
	Percent	81.2%	18.8%	0.0%	**100.0%**
Total	No	**206**	**127**	**106**	**439**
	Percent	46.9%	28.9%	24.1%	100.0%

Chi Square = 43.423, p =.000

Occupation of the respondents is significantly ($p<0.05$) associated with the awareness of solid waste management. This implies that the null hypothesis that "the awareness level of solid waste does not vary by occupation of women" is rejected. Hence, it reveals that awareness of household solid waste varied according to the occupation of respondents.

Table 4.2.65. Monthly income of the respondents by awareness on household solid waste of women

Monthly income of the Respondents		Awareness on household Solid Waste			Total
		Low	Medium	High	
below Rs.3000	No	139	98	73	**310**
	Percent	44.8%	31.6%	23.5%	**100.0%**
Rs.3001-6000	No	33	15	10	**58**
	Percent	56.9%	25.9%	17.2%	**100.0%**
Rs.6001-9000	No	19	6	2	**27**
	Percent	70.4%	22.2%	7.4%	**100.0%**
Rs.9001-12000	No	7	5	12	**24**
	Percent	29.2%	20.8%	50.0%	**100.0%**
Above 12001	No	8	3	9	**20**
	Percent	40.0%	15.0%	45.0%	**100.0%**
Total	No	**206**	**127**	**106**	**439**
	Percent	46.9%	28.9%	24.1%	100.0%

Chi Square = 24.332, p =.002

Monthly income of the respondents is significantly ($p<0.05$) associated with awareness about solid waste. So, the null hypothesis that "awareness of household solid waste does not vary by monthly income of women" is rejected implying that awareness of solid waste varies across the category of income of women.

Table 4.2.66. Type of family of the respondents by awareness on household solid waste of women

Family Type		Awareness on Solid Waste			Total
		Low	Medium	High	
Nuclear Family	No	144	88	97	**329**
	Percent	43.8%	26.7%	29.5%	**100.0%**
Joint family	No	55	23	8	**86**
	Percent	64.0%	26.7%	9.3%	**100.0%**
Extended Family	No	7	16	1	**24**
	Percent	29.2%	66.7%	4.2%	**100.0%**
Total	No	**206**	**127**	**106**	**439**
	Percent	46.9%	28.9%	24.1%	**100.0%**

Chi- Square = 35.820, p=.000

The Table 4.2.66 reveals that there is significant ($p<0.05$) association between type of family of family of women respondents and awareness on household solid waste. This implies that level of awareness on household solid waste does vary significantly across the type of family groups.

Table 4.2.67. Family income of the respondents by awareness on household solid waste of women

Monthly income of the family		Awareness on Solid Waste			Total
		Low	Medium	High	
below Rs.3000	No	70	45	8	**123**
	Percent	56.9%	36.6%	6.5%	**100.0%**
Rs.3001-6000	No	102	67	59	**228**
	Percent	44.7%	29.4%	25.9%	**100.0%**
Rs.6001-9000	No	21	6	15	**42**
	Percent	50.0%	14.3%	35.7%	**100.0%**
Rs.9001-12000	No	5	3	8	**16**
	Percent	31.2%	18.8%	50.0%	**100.0%**

Monthly income of the family		Awareness on Solid Waste			Total
		Low	Medium	High	
Above 12001	No	8	6	16	**30**
	Percent	26.7%	20.0%	53.3%	**100.0%**
Total	No	**206**	**127**	**106**	**439**
	Percent	46.9%	28.9%	24.1%	**100.0%**

Chi Square = 46.893, p =.000

It is observed from the Table 4.2.67 that there is significant ($p<0.05$) association between monthly income of the family and awareness level on household solid waste. This implies that level of awareness on solid waste does vary significantly across the income of the family.

Table 4.2.68. Marital status of the respondents by awareness on household solid waste of women

Marital status of the respondents		Awareness on household solid waste			Total
		Low	Medium	High	
Married	No	143	91	82	**316**
	Per cent	45.3%	28.8%	25.9%	**100.0%**
Other than married	No	63	36	24	**123**
	Per cent	51.2%	29.3%	19.5%	**100.0%**
Total	No	**206**	**127**	**106**	**439**
	Per cent	46.9%	28.9%	24.1%	100.0%

Chi- Square = 2.198, p=.333

The above Table 4.2.68 explains that there is no significant ($p>0.05$) association between marital status of respondents on solid waste awareness of women. This implies that level of awareness on solid waste does not vary significantly across the marital groups.

AWARENESS ON ENVIRONMENTAL DEGRADATION

An index is developed using the information that respondent's awareness level on environmental degradation by giving score '5' for strongly agree, '4' for agree,'3' for neutral,'2' for disagree and '1' for strongly disagree for each respondent, added total score of all items of environmental awareness and then classified the total score into three groups as Low, Moderate and high. The association between the level of awareness and each background variables of respondents (hypothesis) is tested using chi-square test of significance. The results are presented in this section.

The awareness of environmental degradation of women is at low level in 45 per cent, moderate level in 34 percent and high level in 21 per cent **(Refer to Table Number 4.2.30).**

Table 4.2.69. Age of the respondents by awareness on environmental degradation of women

Age of the Respondents		Awareness on Environmental degradation			Total
		Low	Medium	High	
18- 27 years	No	15	19	7	**41**
	Percent	36.6%	46.3%	17.1%	**100.0%**
28- 37 years	No	47	39	30	**116**
	Percent	40.5%	33.6%	25.9%	**100.0%**
38- 47 years	No	74	38	37	**149**
	Percent	49.7%	25.5%	24.8%	**100.0%**
48 + years	No	60	45	28	**133**
	Percent	45.1%	33.8%	21.1%	**100.0%**
Total	No	**196**	**141**	**102**	**439**
	Percent	44.6%	32.1%	23.2%	100.0%

Chi- square =8.153, p=.0227

The above Table 4.2.69 reveals that there is significant association ($p<0.05$) between age of respondents and awareness on environmental degradation. This implies that level of awareness on environmental degradation does vary significantly across the age group.

Table 4.2.70. Religion of the respondents by awareness on environmental degradation of women

Religion of the Respondents		Awareness on Environmental degradation			Total
		Low	Medium	High	
Hindu	No	109	102	66	**277**
	Percent	39.4%	36.8%	23.8%	**100.0%**
Non- Hindu	No	87	39	36	**162**
	Percent	53.7%	24.1%	22.2%	**100.0%**
Total	No	**196**	**141**	**102**	**439**
	Percent	44.6%	32.1%	23.2%	100.0%

Chi- Square =10.003, p =.007

It is observed from the Table 4.2.70 that there is a significant association ($p<0.05$) between religion of respondents and awareness on environmental degradation. This implies that the level of awareness on environmental does vary significantly across the religious groups

Table 4.2.71. Community of the respondents by awareness on environmental degradation of women

Community of the Respondents		Awareness on Environmental degradation			Total
		Low	Medium	High	
OC	No	23	15	14	**52**
	Percent	44.2%	28.8%	26.9%	**100.0%**
BC	No	95	48	44	**187**
	Percent	50.8%	25.7%	23.5%	**100.0%**
MBC	No	38	30	24	**92**
	Percent	41.3%	32.6%	26.1%	**100.0%**
SC/ST	No	40	48	20	**108**
	Percent	37.0%	44.4%	18.5%	**100.0%**
Total	No	**196**	**141**	**102**	**439**
	Percent	44.6%	32.1%	23.2%	100.0%

Chi- Square =12.599, p =.052

The above Table 4.2.71 explains that there is no significant ($p>0.05$) association between communities of respondents and awareness about environmental degradation. This implies that level of awareness about environmental degradation does not differ significantly across the communities.

Table 4.2.72. Education of the respondents by awareness on environmental degradation of women

Education of the Respondents		Awareness on Environmental degradation			Total
		Low	Medium	High	
Illiterate	No	49	19	10	**78**
	Percent	62.8%	24.4%	12.8%	**100.0%**
Primary	No	29	24	10	**63**
	Percent	46.0%	38.1%	15.9%	**100.0%**
Middle	No	35	44	37	**116**
	Percent	30.2%	37.9%	31.9%	**100.0%**
High School	No	19	17	19	**55**
	Percent	34.5%	30.9%	34.5%	**100.0%**
Hr.Sec	No	26	17	5	**48**
	Percent	54.2%	35.4%	10.4%	**100.0%**
Under graduation	No	26	12	8	**46**
	Percent	56.5%	26.1%	17.4%	**100.0%**
Post graduation	No	8	5	9	**22**
	Percent	36.4%	22.7%	40.9%	**100.0%**
Professional	No	4	3	4	**11**
	Percent	36.4%	27.3%	36.4%	**100.0%**
Total	No	**196**	**141**	**102**	**439**
	Percent	44.6%	32.1%	23.2%	100.0%

Chi- Square =39.937, p =.000

Analysis of education by awareness on level of environmental degradation shows that education is significantly ($p<0.05$) associated with awareness about environmental degradation. This implies that level of awareness about environmental degradation does vary significantly associated with the education of respondents.

Table 4.2.73. Occupation of the respondents by awareness on environmental degradation of women

Occupation of the Respondents		Awareness on Environmental degradation			Total
		Low	Medium	High	
Employed (Govt/Private)	No	43	30	28	**101**
	Percent	42.6%	29.7%	27.7%	**100.0%**
MGNREGP	No	40	53	19	**112**
	Percent	35.7%	47.3%	17.0%	**100.0%**
Farmer	No	18	11	17	**46**
	Percent	39.1%	23.9%	37.0%	**100.0%**
Self employment	No	33	19	21	**73**
	Percent	45.2%	26.0%	28.8%	**100.0%**
Daily wager	No	37	21	17	**75**
	Percent	49.3%	28.0%	22.7%	**100.0%**
Weaving	No	25	7	0	**32**
	Percent	78.1%	21.9%	0.0%	**100.0%**
Total	No	**196**	**141**	**102**	**439**
	Percent	44.6%	32.1%	23.2%	100.0%

Chi- Square =37.217, p =.000

Occupation of the respondents is significantly ($p<0.05$) associated with the awareness of environmental degradation. This implies that the null hypothesis that "the awareness level of environmental degradation does not vary by occupation of women" is rejected. Hence, it reveals that awareness of solid waste varied by occupation of respondents.

Table 4.2.74. Monthly income of the respondents by awareness on environmental degradation of women

Monthly income of the Respondents		Awareness on Environmental degradation			Total
		Low	Medium	High	
Below Rs.3000	No	133	105	72	**310**
	Percent	42.9%	33.9%	23.2%	**100.0%**
Rs.3001-6000	No	32	16	10	**58**
	Percent	55.2%	27.6%	17.2%	**100.0%**
Rs.6001-9000	No	17	8	2	**27**
	Percent	63.0%	29.6%	7.4%	**100.0%**
Rs.9001-12000	No	7	6	11	**24**
	Percent	29.2%	25.0%	45.8%	**100.0%**
Above 12001	No	7	6	7	**20**
	Percent	35.0%	30.0%	35.0%	**100.0%**
Total	No	**196**	**141**	**102**	**439**
	Percent	44.6%	32.1%	23.2%	100.0%

Chi- Square =16.785, p =.032

It is observed from the Table 4.2.74 that there is significant ($p<0.05$) association between monthly income of the family and awareness level on environmental degradation. This implies that level of awareness on environmental degradation does vary significantly across the income of the respondents.

Table 4.2.75. Family type of the respondents by awareness on environmental degradation of women

Family Type		Awareness on Environmental degradation			Total
		Low	Medium	High	
Nuclear Family	No	137	99	93	**329**
	Percent	41.6%	30.1%	28.3%	**100.0%**
Joint family	No	52	26	8	**86**
	Percent	60.5%	30.2%	9.3%	**100.0%**

Family Type		Awareness on Environmental degradation			Total
		Low	Medium	High	
Extended Family	No	7	16	1	**24**
	Percent	29.2%	66.7%	4.2%	**100.0%**
Total	No	**196**	**141**	**102**	**439**
	Percent	44.6%	32.1%	23.2%	100.0%

Chi- Square = 30.736, p =.000

The Table 4.2.75 represents that there is significant ($p<0.05$) association between type of family of respondents and awareness on environmental degradation. This implies that level of awareness of environmental degradation does vary significantly across the type of family groups.

Table 4.2.76. Family income of the respondents by awareness on environmental degradation of women

Monthly income of the family		Awareness on Environmental degradation			Total
		Low	Medium	High	
below Rs.3000	No	68	47	8	**123**
	Percent	55.3%	38.2%	6.5%	**100.0%**
Rs.3001-6000	No	95	75	58	**228**
	Percent	41.7%	32.9%	25.4%	**100.0%**
Rs.6001-9000	No	21	7	14	**42**
	Percent	50.0%	16.7%	33.3%	**100.0%**
Rs.9001-12000	No	5	3	8	**16**
	Percent	31.2%	18.8%	50.0%	**100.0%**
Above 12001	No	7	9	14	**30**
	Percent	23.3%	30.0%	46.7%	**100.0%**
Total	No	**196**	**141**	**102**	**439**
	Percent	44.6%	32.1%	23.2%	100.0%

Chi- Square =42.216, p =.000

Family income of respondents is significantly ($p<0.05$) associated with the awareness level on environmental degradation. This implies that level of awareness on environmental degradation does vary significantly across the income of the family. Hence, the null hypothesis that "environmental awareness level does vary by family income of respondents" is rejected.

Table 4.2.77. Marital status of the respondents by awareness on environmental degradation of women

Marital Status of the Respondents		Awareness on Environmental degradation			Total
		Low	Medium	High	
Married	No	135	103	78	**316**
	Percent	42.7%	32.6%	24.7%	**100.0%**
other than married	No	61	38	24	**123**
	Percent	49.6%	30.9%	19.5%	**100.0%**
Total	No	**196**	**141**	**102**	**439**
	Percent	44.6%	32.1%	23.2%	100.0%

Chi- Square =2.035, p =. 361

The above Table 4.2.77 explains that there is no significant ($p>0.05$) association between marital status of respondents on environmental awareness of women. This implies that level of awareness on environmental degradation does not vary significantly across the marital status of respondents.

Chapter-5

CASE STUDY

INTRODUCTION

For the purpose of present study, eight cases have been identified, studied and presented keeping in view the objectives of the study. The responses obtained from the cases regarding the household solid waste disposal have been presented as reported by them. Further, permission has also been obtained, in person, from the cases for mentioning their names in the analysis and presentation of the cases by the researcher. Accordingly, the names of the eight cases have been mentioned in the presentation of the cases as under.

CASE 1

Devi: I am 40 years old and native of karukurichi panchayat. I live in a joint family with 10 members and earn Rs.4000 per month through tailoring. Apart from me, the rest of the family members are agricultural labourers. The average solid waste generated in my home per week is around three to five kilograms. Though I have kept a mud pot to collect the waste, I am forced to dispose of the waste after a few days since door to door collection of waste is not practised in our village. The panchayat has not placed sufficient bins in the street of the village for collection of waste. I do not have sufficient area around my houses for making vegetable cultivation or keeping a kitchen garden; I dispose of the food and vegetable waste in the drain and burn the plastic and cloth wastes in the nearby purampokku (waste) land of the village. The street bins, wherever kept in the streets of the village, are not cleared regularly and most of them are damaged owing to shortage of sanitary workers to clean and maintain them. Such being the situation,

I request the village panchayat to take appropriate measures for proper household solid waste collection and disposal in the village panchayat areas through the Swacch Bharath Mission (Clean India Scheme)

CASE 2

Saroja: I am a native of south veeravanallur panchayat aged 55 and I have been running a tea shop for past ten years in the village. The minimum waste generated from my tea shop is around seven to nine kilo grams per week, which is collected in a wooden box kept as waste bin in the premises. The sanitary workers do not cover the commercial area for collection of waste and hence, I am forced to burn all the waste, once in a week, in the nearby waste land. Some of my customers add to littering the place by not using the bin. The rag pickers of the panchayat have been converted into sanitary workers under the clean India scheme; but, their services are limited only to the residential areas especially where the panchayat president resides. Open air defecation is still in vogue in the nearby areas since public toilets have not been constructed for the use of villagers. Further, no initiative has been taken by the officials and non-officials of the village panchayat to change the habit of open air defecation of the villagers. The village panchayat is unable to maintain the environmental sanitation of the village for proper household solid waste collection and disposal due to lack of resources and man power.

CASE 3

Mariammal: I am self employed, aged 55 maintaining the household activities including the disposal of household solid waste. I segregate the dry and wet household solid waste and drop such waste collection in the street dustbin. The sanitary workers come and collect the waste from the dust bin once in a week. The residents are mostly dependent on the street bins for waste disposal. The improper cleaning and maintenance of the bins leads to the over flowing of waste into the drain thereby clogging the flow of waste water. Stray animal menace has shot up due to the improper waste disposal. The drinking water sources also get contaminated due to improper maintenance of drainage. The pond in the village is used by the farmers for irrigating their fields. But many times, the fishes in the pond are found dead due to water contamination. In some of the wards in the village, waste is dumped

along the road side, which adds to the environmental hazard. Because of this, the village people find it difficult to move from one place to another place during the rainy season since the water from the drain over flows on the roads. Hence, suitable remedial measures are to be taken by the village panchayat concerned together with people's participation for the purpose of maintaining the household solid waste disposal properly. Systematic waste management strategies for establishing a resource recovery park have to be put in place so as to prevent the water resources from getting contaminated due to improper disposal of household solid waste.

CASE 4

Rani: I am a government employee hailing from malayankulam panchayat and have two cows in my home and all the waste food and vegetable peels generated in my house is mixed along with the cattle feed. The cow dunk is used as manure both for the kitchen garden in the backyard of the house and the organic bonsai garden that is on the terrace of my house. Gunnysacks are used to grow the plants on the terrace. The plastic waste like milk covers etc., which is stored in a plastic bin, is disposed of once in two days, in the street bins provided by the village panchayat. My children are now conscious of minimizing household solid waste and reusing the inorganic waste appropriately. The sanitary workers visit once in a week, clear the waste bins and dumps the collected the waste in the open dumpsite, which is near by the river bank. When there is delay in clearing of the waste, the elders of the street burn the waste, which pollutes the air with dust and smoke emerging from the burning. The foul stench that emanates from the street bins is unbearable. The workers of Mahatma Gandhi National Rural Employment Guarantee Programme (MGNREGP) clean the village road only during the rainy season and on occurrence of flood.

CASE 5

Parvathy: I am from karisalpatti, aged 45 and work in a private textile mill. I go to the mill by 8 a.m. every day. The sanitation of the village is not satisfactory and there are no dustbins kept in the streets. Since, the sanitary workers do not come and collect the household solid waste, my mother-in-law throws away the food and vegetable waste on the road side and also burns the plastic and cloth waste. We have

not kept a dustbin in our house for collecting the waste materials for disposal. The sanitary workers clean the streets only during the festival seasons, visits houses and water sources to chlorinate the water sources of village and over head tanks and open wells in and around villages and domestic sump used for water storage during the rainy season. The staff from the sanitation and health department visit the villages occasionally to distribute pamphlets about water borne diseases and their prevention and also conduct health and sanitation camps as and when the sanitary workers receive the instructions and orders in this regard from their superior officers. Also, it can be observed that the household waste water flows into the water sources directly contaminating them thereby making the water unfit for domestic use. The people of the village use the water sources for bathing their cattle, which again adds to the contamination of water. In short, the channels of water sources might soon turn into a drain if it is not properly maintained and protected. The quality of the air in the village is getting deteriorated into production of stench because of presence of putrefying waste as well as smog caused by burning of garbage. The local body including the panchayat president does not look at the issue as one that needs immediate attention. If the issue is not addressed properly, the health and environmental sanitation of the villagers will be at stake.

CASE 6

Kamala: I am Kamala, aged 53, resident of Ariyanayaki puram Panchayat and I have been in this village for the past 30 years. Household waste collection through sanitary workers started only five months back (prior to the data investigation by the researcher). The sanitary workers do not use safety devices like gloves and boots while handling the household solid waste and the push cart and bicycle that are used for collecting waste do not have a proper cover. As a result, the household solid waste collected using the push cart tends to spill over the village panchayat road thereby making the village road look messy and untidy. The situation has got worsened during the last rains in January and February 2016. All the wastes get washed into the drains, clogging the water flow, which result in flooding the place with sewage water. The sewage water gets mixed with drinking water sources and the village has been under the threat and spreading of water borne diseases and I am a victim of typhoid fever. My grand children also had severe cold

and throat infections. The village panchayat has addressed the issue of water contamination when we lodge a complaint with them. There is neither a dumping site nor a system for waste disposal. Hence, I request the village panchayat and NGOs (Non-Governmental Organizations) to provide training to the rural people in order to create awareness among them regarding the proper disposal of household solid waste.

CASE 7

Banu: I am Banu aged 45, belong to Venkatarengapuram Panchayat working in a private company. My house is situated in the boundary of the village, which is just 100 meters away from the dumpsite. The site, which is being used for dumping waste for the past five years, is a water body, which has dried up due to lack of rains. The waste from the chicken shops is also dumped in the site. And a section of people use a part of the site as burial ground/cemetery. The stray animals feed on this waste. Since there is no system to process household solid waste, the whole place looks dirty and also lets out a strong stench due to the decomposing of waste. The village panchayat has not considered the issue as a serious one even after the 2016 Chennai floods, which is a severe blow for misusing the environment. We will lose the water body in future due to the continuous disposal of household solid waste in it using as a dumpsite by the villagers. We have requested the official and non-official of the village panchayat to find a remedy to this issue and help us lead healthy life.

CASE 8

Manjula: I am Manjula aged 36, serve as an Anganwadi worker. Our panchayat has not provided us with separate dustbins for putting segregated waste as in the case of town panchayats. The sanitary inspectors visit the village number of times; but their visits are restricted to the rainy season only. Though I have seen many posters on the walls of government buildings, bus stand etc., and also propaganda through the mass media in respect of promotion of household waste free environment and tree plantation, we burn our household waste in the purampokku (waste) land like others in the village since, there is no system for household waste collection and disposal of the waste. I have started carrying cloth bags for my shopping and also reusing the non degradable waste like broken plastic buckets etc., for the purpose

of planting and growing saplings due to the impact of clean and green city scheme implementation by the government. The NSS (National Service Scheme) volunteers have conducted awareness programmes in the village school regarding the disposal of household solid waste. My suggestion is that environmental education must be made to become a part of the school curriculum right from the primary classes so that the children get habituated to protecting the environment around them. The officials and non-officials of the village panchayat should put more thrust on making the rural population become aware of the environmental hazards caused by improper disposal of household solid waste and devise proper mechanism for household solid waste collection and disposal. This can enable us to live in a clean and pollution free environment and also transmit the same to the posterity.

CONCLUSION

In all the cases cited above, one thing that we find in common is that the initiative on the part of the local bodies in dealing with collection and disposal of household solid waste is lacking. In most of the village panchayats, their involvement in controlling health hazards is restricted to the rainy season alone. There has been no initiative in creating awareness regarding importance of household solid waste disposal and protection of environment, which has resulted in the misuse of the water resources and also polluting the environment because of excessive dumping and burning of household solid waste including plastic waste materials. In many cases, it is heartening to find that women are taking efforts to use the bio-degradable waste generated for gardening and reusing the non-degradable waste thereby transmitting to posterity a healthy way of disposing of the household of solid waste. All of the cases interviewed for in-depth case study have suggested that the village panchayats may provide two different types of dustbin for collection and disposal of degradable and non-degradable household solid waste thereby creating awareness among the village people in this regard. The village people's participation in the disposal of household solid waste can be enlisted effectively through the application of participatory rural appraisal method (PRA), which will acquaint the village people in course of time, with health and pollution free environment.

Chapter-6

MAJOR FINDINGS, RECOMMENDATIONS AND CONCLUSION

MAJOR FINDINGS

Improper solid waste collection and disposal are the major challenges confronted by many countries around the world. It leads to severe hazards, such as health risks and environmental pollution. Population growth, urbanization and industrialization are the main challenges for national, state and local municipal bodies in the present situation. This situation necessitates to study the impact of solid waste on environment and health: A sociological study in Tirunelveli district of Tamil Nadu. One block in Tirunelveli District has been selected and 439 rural women are selected using proportionate sampling from 12 village panchayats. Interview technique is adopted for gathering the required data from the women respondents. Tabular analysis with application of percentage and Chi- square test of significance are used in the analysis of data.

SOCIO-ECONOMIC CONDITIONS OF WOMEN RESPONDENTS

It is found that 63.1 per cent of the women belong to the Hindu religion. About forty three per cent of them are hailing from backward community. Regarding the marital status, more number (72%) of them are married. Predominant numbers (82.2%) of women are educated ranging from primary to professional degrees. Twenty five per cent of the rural women are earning through Mahatma Gandhi National Rural Employment Guarantee Programme (MGNREGP). Greater portions (74.9%) of women live in nuclear family, which indicates the trend

of disintegration of joint family system in rural areas. More number (43%) of women live in thatched houses. Great numbers (80%) of them live in their own houses. Large number (71%) of the women came under the category of monthly income below Rs.3000 and more than half of them report that the family monthly income ranges from Rs.3001- 6000 from various occupations. Thirty four per cent of the respondents are coming under the age group of 38-47 years. Mean age is 41.96 years. About 38 per cent of the women respondents' family size is three to four members.

Influence of Socio-Economic Conditions of Respondents in Generating and Disposing of Household Solid Waste

The study reports that 45.3 per cent of the rural women generate below three kilograms of household solid waste in their home per week.

Concerning the major components of household solid waste is kitchen waste (45.8 %) in the study area.

Best parts (63.8 %) of the rural women use dustbin for collecting their domestic solid waste. Among the dustbin users, most of them (39 %) keep plastic dustbin in their home. It indicates their attitude of proper household waste disposing method.

Among the dustbin users, less number (26.4%) of them use separate dustbin for bio-degradable and non-bio degradable household solid waste.

More number of the women (56.5%) state that they have household solid waste collection service in their residential areas. Greater portions (65.3%) of them report that sanitary workers engage in the household solid waste collection service. Thirty two per cent of them say that waste is collected once in two days in their premises. The study demonstrates that the household solid waste collection service is not followed regularly in the study area.

Regarding the street bin availability, majority (73%) of the women respondents opine that they have the street bins in their premises for disposing of their household solid waste. About 28 per cent of them have pointed out that the collection of household solid waste from the street bins almost emptied once in four weeks.

Only thirty one per cent of women know about composting and its benefits. It indicates that there is a need for concerned officials and non-officials to engage residents of rural areas to create awareness about composting of bio-degradable waste.

Regarding the responses on household solid waste found outside their houses, a high proportion (98%) of the respondents state that they will inform the non-officials (elected representatives) to take proper action for cleaning the street.

About the suggestions with regard to payment of fee for the purpose of household solid waste collection, a great number (100%) of the rural women respondents suggest that nominal fee may be fixed for the purpose of disposal of household solid waste. It shows their attitude in involving proper household solid waste collection and disposal.

AWARENESS OF SOLID WASTE AND ENVIRONMENTAL DEGRADATION

Less than half of the respondents (47%) are in low level followed by 29 per cent of them with moderate awareness and 24 per cent of them with high level of awareness. Religion, community, education, occupation, family income, family type and monthly income of the respondents are significantly associated with the awareness on solid waste.

Regarding the awareness on environmental degradation, less than half (45%) of the women respondents are in low level in the study area. Age, religion, education, occupation, family income, family type and monthly income of the respondents are significantly associated with the awareness on environmental degradation.

IMPACT OF SOLID WASTE ON ENVIRONMENT AND HEALTH

About 38 per cent of the respondents state that the distance between residential area and dumpsite ranges from 101metres-300 metres.

Regarding the emissions of odour and the frequency of spread of odour from the dumpsite, majority (65.4%) of the respondents feel the emissions of the odour from the dumpsite and 32 per cent of them report that the emissions from dumpsite is felt frequently. About the time and season of emissions of odour from dumpsite, which is intolerable, forty eight per cent of the respondents report that the emissions of stench from dumpsite is intolerable during rainy season.

Greater portion (97.9%) of the respondents refer to dumping of greater quantity of household solid waste in the dumpsite and irregular treatment of the household solid waste dumped as one of the major environmental problems met by them in their residential areas.

Majority (69.9%) of the respondents say that they are affected by diseases during three months period prior to the investigation by the researcher in the study area. Thirty one per cent of the respondents report that cold and cough have affected them. The result indicates that little less than three fourths of rural women have been affected by various diseases.

Regarding the family members affected by diseases, half (50.8%) of the respondent's family members are affected by diseases during three months period prior to the investigations of the researcher in the study area. More number (72%) of the family members of the women respondents are suffered from cold, cough and fever.

Fifty three per cent of the women respondents express that their children are affected by diseases due to their being near to the dumping yard. Vomiting is reported by twenty per cent of the women respondents in the study area.

Regarding the medical facilities in the study area and the distance between hospital and homes, about 47 per cent of the women respondents visit government hospital for treatment. The distance between the place of medical facilities and residences of women respondents ranges from four to seven kilo meters for more number (44.4%) of women respondents.

Minimum number (39.4%) of the women respondents have health insurance. Among those who have health insurance, sixty five per cent of the rural women respondents have registered under the chief minister's comprehensive health insurance scheme. Among those who do not have health insurance, 36.4 per cent of the women respondents report that it is a long progress to get benefited under the government health insurance scheme.

Related to the sources of drinking water, half (52%) of the women respondents say that they are accessing water from public taps, which supply water from panchayats over head tank. Regarding the taste of water, more than half (57%) of the women respondents state that the taste of drinking water is soft.

Greater numbers (99%) of the women respondents report that mixing of household solid waste with water bodies affects the nature due to corrosion of water quality thereby making water unsuitable for human consumption.

Twenty seven per cent of the women respondents selected for the study attribute 'excrete of insects in the bathroom and rest room

taps where especially women and children lay their hands for caring out domestic activities' to the affected hygiene of family members of women respondents. It indicates that the hygiene of the family members of women respondents in their residences is affected by keeping and dumping of household solid waste in dustbin in their premises uncared for.

Concerning the mode of transport used for disposal of household solid waste from the residential street bins to dumping yard, thirty seven per cent of the women respondents report that bicycle is used for transporting the waste materials form the residential street bins to dumpsite.

With regard to the dumpsite for the collected household solid waste, more number (64%) of the women respondents state that along the site of the panchayat road and the purampokku land (Village waste land) are used as a dumpsite by the waste collectors.

Forty one per cent of the women respondents report that improper cleaning is main problem during the transportation of household solid waste materials from village to dumpsite.

Greater portion (99%) of the women respondents express that the social life of village get affected by the burning of waste creates smog and ashes affecting the environment as well as human health.

Around 36 per cent of the women respondents report that the smelling of odour leading to vomiting sensation in the day to day routine life because of presence of household solid waste.

Regarding the precautious measures of village panchayats, great portions of the women respondents state that precautious measures like team of sanitary inspectors visiting the village door to door for checking water tank and drainage are to be taken for the purpose of preventing the health of the people from getting affected by the problem of household solid waste in the study areas.

Regarding the opinion about the collection and disposal of household solid waste service in the residential areas, less than half (46%) of the women respondents opine that the waste collection service is moderate in the study area.

Perception of women respondents about the efforts taken by the government bodies on solid waste collection and disposal

An index for the village panchayat efforts on household solid waste collection and disposal have been developed comprising 18 aspects and categorized into three groups as moderate (below 30), Good (31-60) and Excellent (above 61). About forty four per cent of the respondents state that the village panchayat efforts are moderate while thirty three per cent report that it is good. Only 24 per cent have said that the efforts of village panchayat are excellent.

SUGGESTIONS

In recapitulation, while accumulating the findings as tabulated in the suggestions Table (4.2. &4.2.) and verdicts of the respondents and considering them at a positive insight, they are very eager to have a system of proper maintenance of dumpsite and surroundings by promoting door to door regular collection of solid waste and disposal at a suitable and convenient out- yard with keen involvement of the Panchayat authorities supported and volunteered by NGOs/ CBOs at their possible level to make the entire area neat clean, which will facilitate eradication of diseases and epidemics besides uplifting the health- care and hygiene of the residents.

CHI-SQUARE TEST ANALYSIS

An index is developed for the awareness of solid waste using 20 aspects and categorized into three groups as Low (below 35), Moderate (36-70) and High (above 71).

The null hypothesis that "Social, economic and age factors do not associate with the awareness on solid waste" is rejected in the case of religion, community, education, occupation, family income, family type and monthly income of the women respondents. It indicates that age and marital status are not significantly associated with the awareness on solid waste.

The awareness on solid waste is significantly associated with ($p<0.05$) the religion of the women respondents. The Hindu religion women have higher awareness on solid waste than other religious groups.

Community of women respondents is significantly ($p<0.05$) associated with the awareness on solid waste. The backward and most backward communities have more awareness as compared to SC and other caste (OC).

The awareness on solid waste is significantly associated with ($p<0.05$) the education of the women respondents. The literates are more likely to be aware of the solid waste compared to illiterates.

The occupation of women respondents is significantly ($p<0.05$) associated with the awareness on solid waste.

Monthly income of the women respondents is significantly associated ($p<0.05$) with the awareness on solid waste. The awareness level is higher in the income group of Rs.9001-12000 (50%) than others.

The awareness on solid waste is significantly associated ($p<0.05$) with family type. Nuclear family members have higher awareness than others.

Monthly income of the family members are significantly associated ($p<0.05$) with the awareness on solid waste. The high level income groups are more likely to be aware of the solid waste.

The level of awareness on environmental degradation is at low for 45 per cent, medium for 32 per cent and high for 23 per cent. The null hypothesis that background characteristics of respondents are not significantly associated with the awareness of respondents is rejected in the case of community, education, occupation, family income, family type and monthly income of the respondents. It implies that caste and marital status are not significantly associated with the awareness on environmental degradation.

RECOMMENDATIONS

The findings of the study suggest following recommendations

- Make use of self help groups (SHGs) and non- governmental organizations (NGOs) to create awareness about environmental degradation and its impact on environment and human health.
- Government should give more preference for effective enforcement of environmental rules and acts.
- Promote non-governmental organizations, self help groups, community based organizations and mass media in creating awareness towards water borne diseases and proper disposal of household solid waste.
- Conduct outreach programmes for making awareness about the significance of health and sanitation and environmental protection among rural communities.
- Encourage rural women to participate in the activities of the local bodies to make green and clean environment.

- Find new ways to reduce household solid waste.
- The local authorities may use scientific techniques for proper and safe disposal of household solid waste.
- Provide separate street bins for degradable and non- degradable household solid waste.
- Sanitary workers may avoid improper dumping of municipal solid waste on roadsides, river banks and nearby residential areas.
- Composting of bio-degradable household solid waste at household and community level may be promoted through the mass media and non - governmental organization.
- Supply safety and waste handling equipments to the waste collectors.
- Penalty may be imposed on people who dump and burn their domestic waste on roadsides, nearby water sources and residential areas.
- Create awareness among women about existing acts available to safeguard the environment.
- Develop village people to fight against the violators of environment and report to the village panchayat for necessary actions.
- Nominal fee may be collect on the basis of quantity of waste and frequency of waste collection.
- Announce incentives for the householders to generate less quantity of household garbage.
- Create awareness the impact of improper handling of waste on health and environment through the voluntary organizations, self help groups (SHGs) and community based organizations (CBOs).
- Make bio-gas plant in every village panchayats.
- Provide subsidies and incentives for home composter.
- Construct resource recovery park in every village panchayats.
- Implement eco- club in every village panchayats.
- The household garbage should be disposed of by incinerator.
- Wealth from waste may follow in village level.
- Encourage the people to buy recyclable products.
- Try to change the people's attitudes towards improper disposal of household solid waste through youth club volunteers.

- Support the utilization of compost for gardening and agriculture purposes.
- Inform the people about the regular door- to –door household waste collection.
- Create awareness among the village women about the different colours of dustbins for bio-degradable, non-bio degradable and hazardous waste respectively.
- Open dumping should be restricted in every village panchayats.
- Monitoring cell is required to be created to watch the practices of municipal solid waste collection and disposal in every district.
- Include environment and sanitation education in the school curriculum.
- Support public and private partnership on solid waste collection, disposal and recycling process.
- Educating the slum dwellers about degradable and non- degradable waste segregation and proper disposal of household solid waste and hazardous waste.
- Need scientific environment friendly waste disposal systems and landfill site.
- Encourage the people to participate in recycling programmes.
- Local bodies' involvement in the process of evaluation and monitoring of municipal solid waste collection and disposal.
- Implement waste recycle platform in every district.
- Conduct environmental awareness programmes among school students.
- Organize capacity building programmes for municipality staff.

CONCLUSION

The collection and disposal of household solid waste generated has been influenced by the socio-economic characteristics of the families living in the villages to a large extent. The study reflects that the efforts on the part of the local bodies and the health authorities in implementing an effective solid waste disposal service is inadequate, though majority of the village people use dustbin in their homes for storing domestic solid waste and also are ready to pay a minimum

fee ranging from 10-20 rupees for the services related to systematic collection and disposal of household solid waste. The awareness level among those belonging to the higher strata of the society by way of caste, economic levels and education are found to be high, pointing out the fact that more efforts have to be taken to create awareness regarding the hazards of improper household solid waste disposal among those in the lower strata of the society mainly among the scheduled caste people and people belonging to other castes (Pillai Caste).

The study highlights the risk on the health of the people living in the areas near to dumpsite. Infections giving rise to cough, cold, fever and skin allergies are found to be common among the majority of the women and children of those living near the dumpsite. River bank, nearness of pond, village panchayats roads and waste land of the village are used as dumpsite. The adverse effects on the health of the families due to the contaminated drinking water sources, smog and pollution resulting from burning of waste, breeding of flies, insects and rodents because of unscientific and improper dumping of household solid waste with little medical facility and less health insurance coverage emphasizes on the requirement of the local bodies and the government to bring about stringent measures to enforce proper waste collection and service using the modern technology for proper household waste disposal.

The women in the study area have suggested that the local bodies have to conduct intensive campaigns regarding the impact of the improper disposal of solid waste collection on health and environment of the villagers, implement outreach programmes for the sanitary workers, motivate the village people towards the use of cloth bags instead of plastic bags, promote door to door collection of household solid waste, provide adequate safety equipments to the sanitary workers, enhance the number of proper vehicles for waste collection and disposal services, maintain the dumpsite properly and conduct short term social survey on the waste collection and disposal practices. The effective implementation of the various schemes of the central and state health and sanitation schemes are the need of the hour. Though the policies regarding waste collection and disposal are in place yet it is the implementation of the clean India (Swacch Bharath Mission) scheme that has to be stepped up.

FURTHER RESEARCH

- The investigation can also conducted a comparative study on people's attitudes, awareness and practices on household solid waste disposal in rural and urban areas.
- The study on socio-economic and health status of rag pickers can be done in large scale survey adopting stratification on geographical areas in Tamil Nadu.
- Socio-economic factors influencing on household solid waste generation and disposal in urban areas.
- Knowledge, awareness and practices of bio-medical waste among the rural health care workers.
- Assessment of municipal solid waste and environmental awareness among Tribal communities.

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