

A Study on the Plastic Waste and Environmental Degradation

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ABSTRACT

Plastic waste component of the urban solid waste is quite problematic. As it is non-biodegradable, it can stay in the environment for a longer time causing severe environmental degradation. Unless it is properly disposed of, environmental degradation is unavoidable. The environmental degradation would potentially harm the human and biological wealth. The study has made an attempt to understand the extent of usage of plastic materials and the mode of disposal thereof by the people. It is an empirical study based upon the data collected from the Tiruchirappalli City of Tamil Nadu, India. The data collected for the study are from 515 residents of the city who are selected through multi-stage random sampling method. The first step is, identification of wards (the sub divisions of the Zone of an urban community in India) from the zones of the city and secondly, the identification of households at random. From the selected households, the researcher identified the available senior most adult members as the respondents and by using the tool of interview-schedule, (a tool which is having a set of questions can be employed among literate and illiterate respondents for the collection of primary data) the data collected from them. The disposal pattern of each income group is having association with the attitude towards the disposal and the level of environmental awareness.

Keywords: Plastic Wastes, Annual Family Income, Environmental Concern, Attitude, Disposal of Plastic Wastes

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INTRODUCTION

Gigantic Multi-storied buildings, pleasant and healthy suburbs, parklands as forests and beautiful wider streets with trees featured Indian cities' environment some years ago. But, the condition in India, today, is contrasting to its previous self. The upward rate of urbanization all over the world has resulted in the creation of mounting amounts of waste and this in turn creates greater complexities for disposal (Heynen, 2003). Strengthened Solid Waste Management is an essential issue for not only the developing countries but also for the developed countries. Mammoth of Waste is getting generated all over the world, and the

important critical issue is how effectively and efficiently these wastes can be managed for the sustenance of the mankind and the environment. Many urban localities continue to struggle with the trouble of Solid Waste Management and the Corporation of Tiruchirappalli, India is not an exception.

Due to the biodegradability the Organic part of the Municipal Solid Waste may not be a giant issue. But, the Plastic Waste part of the Municipal Solid Wastes is always troublesome due to their non-biodegradability. The Plastic Waste elements can stay for a significant period of time in the environment and causing the entire nuisance. Plastics are petroleum-based products, derived from non-renewable resources. The plastic bag has become an indispensable part of Indian shopping. The plastic shopping bag is resource efficient, cheap, lightweight, moisture resistant, and functional. For its weight it is extraordinarily strong. At supermarkets quick and easy packing is possible with the plastic bags. Even though, the apparent repercussions of plastic waste have increased the community concern.

India Business (2013) gives a report that in India during 2012-13 the polymer industries' per capita consumption was low (9.7 kg) when compared to USA (109 kg), China (45 kg), and Brazil (32 kg). Based on a report the Plastic News (2013) says that by 2016-17 the polymers demand will rise up to 16.5 million metric tonnes from 11 million tonnes during 2012-13, ensuing in consumption increase by 10.8 per cent compound annual growth rate. The report expects that India's demand set will arrive at \$24 billion in packaging by 2016 with which India will be one of the top 10 consumers of packaging at global level.

A large amount of plastics that we use are becoming waste in no time. A high percentage of the plastics being produced ends up in litter streams rather quickly and does not serve long-term needs. Most plastics used in India are in the packaging sector. In fact, almost 52 per cent of all plastics is used in packaging (Chintan, 2010).

Due to the depressing repercussions of plastic wastes on environment, the global community has placed a focus on it since they are: generally given more in numbers at free of cost; single-use and dispose products; resulting in unpleasant visual- and environmental litter impacts due to the non-biodegradability; having chances to be replaced by substitutes and methods; and ignored by recycling programmes. It is said that the plastic bags take between 20 and 1,000 years to degrade fully in the environment (Parliament of New South Wales, 2004). The plastic wastes in the environment resulting into various impacts i.e., useful materials sheltered in the landfills become wasted resources; water bodies and landscapes turn ugly and unhygienic; fear to wildlife; and open burning emits toxic gas (Zero Waste New Zealand, 2002).

The plastic wastes, thrown on the sides of road, open areas, riverbanks, in drainage canals, and common places resulted in death and health problems of cattle. Besides, the intake of plastic items resulted in the reduction of yield of milk (Ramasamy and Sharma, 2011). The 2003 International Coastal Cleanup says that the plastic wastes have become a serious threat to the aquatic life. The plastic bag waste holds second and third positions in India and South Africa respectively as one of the items in the marine debris (ICC, 2003).

The nuisance of plastic waste has many root causes in Nairobi. The production and consumption as externality is the prime one. This means that nobody is paying for the undesirable impacts on the environment caused by the plastic waste. There are no collection and disposal costs included in the materials' product cost. Hence, plastic bags have become cheaper and overly used, by the way leading to the throw away consumerism. In addition to that low level of awareness among public on the disposal of wastes is also an important factor. Recycling of plastic bags becomes difficult due to the co-disposal of plastic bags (Girum Bahri, 2005).

Even though the plastic bags have good things on functional and environmental aspects, the carefree means of production and consumption have become an important issue today. People consume trillions of plastic bags, and after use they end up in litter stream. Almost all the countries at global level (for instance, India, South Africa, Australia and Ireland) have realised the intensity of the environmental impact of plastic wastes to take strategic measures (Girum Bahri, 2005).

OBJECTIVES

The present study attempts to understand the ground reality through the following objectives.

- To assess the level of environmental concern of the public.
- To measure the intensity of attitude of the public towards disposal of plastic wastes.
- To ascertain the mode of disposal of plastic wastes by the public.

MATERIALS AND METHODS

Area of the Study

Data for this study was collected in Tiruchirapalli City Corporation of Tamilnadu. Tiruchirapalli City was selected as the area of study as it is one of the fast growing cities in Tamilnadu as well as in India, with a number of industrial units and commercial activities. It is also one of the leading municipal corporations in Tamilnadu registering higher rate of urban growth, thus serving an ideal location for conducting the present study.

Sampling Design

The study is conducted in Tiruchirapalli Municipal Corporation area which is divided into four zones viz., Ponmalai, Ariyamangalam, Srirangam, and K. Abhishekapuram for administrative purpose. Each zone comprises 15 wards. Thus, Tiruchirapalli City Corporation comprises 60 wards. For the present study from each zone one ward was selected randomly- from Srirangam zone ward number 12; from Ariyamangalam zone ward number 14; from Ponmalai zone ward number 34; and K. Abishekapuram zone ward number 53. From each ward households were selected at random as units of study at the rate of 5 per cent. The sampling method adopted for the study is multistage sampling method. The tools interview schedule supplemented by observation used for the collection of primary data.

Table I
Sample design

Name of the Zone	Ward's Number	No. of Households	Size of Sample
Srirangam	12	2636	132
Ariyamangalam	14	2497	125
Golden Rock	34	2555	128
K.Abishekapuram	53	2594	130
Total			515

Secondary Data

The Documents, Reports, and Records available in the Tiruchirappalli Municipal Corporation Administration, District Pollution Control Office, Tamilnadu Water supply and Drainage - Tiruchirappalli Branch Office, and Public Health Department are the main sources of the Pre-data needed for the study.

RESULTS AND DISCUSSIONS

The data reveal that the respondents fell in three economic (income) classes, viz., low, middle and high. Based upon the average (1,97,571.26) and standard deviation (1,22,609.66), those who have the annual income of Rs. 75,000 and below fall in low income group; those who have annual income of Rs. 3,20,000 constitute high income group; and those who have the annual income ranging from 75,000 to 3,20,000 constitute middle income group. Of the total respondents 47.8 per cent fall in low income group; 27.2 per cent middle income group; and 25.0 per cent the high income group.

Table II
Annual Family Income of the Respondents

Annual Family Income	No. of Respondents	Per cent
Low Income (< Rs. 75,000)	246	47.8
Middle Income (Rs. 75,000 to Rs. 3,20,000)	140	27.2
High Income (>Rs. 3,20,000)	129	25.0
Total	515	100

The data show that invariably all income groups use plastic materials at least a couple of times. After using the plastic materials sufficiently, they become a waste, and such wastes find their way towards disposal.

The disposal pattern of the respondents appears to be related to their attitude. By using the scaling technique, the attitude of the respondents was quantitatively measured. The data analysis for the calculation of average score (44.95) and Standard deviation (10.77) yields three levels of attitude, viz., low (34 and below (i.e., average - Standard deviation), high (55 and above (i.e., average + Standard deviation) and moderate (between 34 and 55 (i.e., the scores between low and high). The three levels of attitude are distributed in the three income groups as shown in the following table.

Table III
Annual Family Income and Attitude towards Disposal of Plastic Wastes of the Respondents

Annual Family Income	Attitude towards Disposal of plastic wastes			Total
	Low	Medium	High	
Low	95 (38.6%)	85 (34.6%)	66 (26.8%)	246
Middle	40 (28.6%)	61 (43.6%)	39 (27.9%)	140
High	30 (23.3%)	47 (36.4%)	52 (40.3%)	129
Total	165 (32.0%)	193 (37.5%)	157 (30.5%)	515 (100.0%)

The table above illustrates that the low-income group has the low level of attitude; the middle-income group, the moderate level of attitude; and high-income group, the high level of attitude. Thus, there seems to be a significant difference in the levels of attitude towards disposal among the three income groups. The difference is statistically significant in the application of the chi-square test.

Table IV: Chi-Square Test
Annual Family Income and Attitude towards Disposal of Plastic Wastes

	Value	Df.	Asymp. Sig. (2 Sided)
Pearson Chi-Square	14.421 ^a	4	.006
Likelihood Ratio	14.187	4	.007
No. of valid cases	515		

Table V
Annual Family Income and Mode of Disposal of Plastic Wastes

Annual Family Income	Mode of Disposal of plastic wastes			Total
	Throwing in the open space	Dumping in the Waste bin	Others	
Low	122 (49.6%)	110 (44.7%)	14 (5.7%)	246
Middle	65 (46.4%)	61 (43.6%)	14 (10.0%)	140
High	35 (27.1%)	83 (64.3%)	11 (8.5 %)	129
Total	222 (43.1%)	254 (49.3%)	39 (7.6%)	515 (100.0%)

The attitude is reflected in the mode of disposal of plastic wastes. In the case of those having low level of attitude towards disposal, the disposal pattern is not environmental friendly. It is the low-income group that has predominantly the low level of attitude has such environment unfriendly mode of disposal. They throw away the plastic wastes mostly in the open space. The middle income group, even though they have moderate level of attitude, also throw away the plastic wastes mostly in the open space. The high-income group which has the high level of attitude towards disposal, dispose of plastic wastes in the environment-friendly manner. They put the plastic wastes in the waste bins provided by the corporation. The data show that 64.3 percentage of the respondents of the high income group throw the plastic wastes in the waste bins, as against 47.6 percentage in the middle income group and 44.7 percentage in the low income group. Thus, there exists a difference in the mode of disposal of plastic wastes between the three income groups. The chi-square demonstrates that the difference is statistically significant.

Table VI: Chi-Square Test
Annual Family Income and Mode of Disposal of Plastic Wastes

	Value	Df.	Asymp. Sig. (2 Sided)
Pearson Chi-Square	20.688 ^a	4	.000
Likelihood Ratio	21.292	4	.000
No. of valid cases	515		

The mode of disposal of the respondents reflects the extent of their concern over the environment and need its improvement. The data show that the respondents have varying levels of concern over the environment and that their economic condition (Annual income level) has a bearing on the level of environmental concern. As per the data there are three levels of environmental concern as measured in terms of the average (40.44) and Standard deviation (10.80) of the scores obtained on the scale seeking to measure the concern. The score of 29 and below (average of 40.44-Standard deviation 10.80) signifies low level of

environmental concern; the score of 51 and above (average of 40.44+ standard deviation of 10.80), high level of environmental concern; and the score of between 29 and 51, moderate level of environmental concern.

Table VII
Annual Family Income and Environmental Concern

Annual Family Income	Environmental Concern			Total
	Low	Medium	High	
Low	113 (45.9%)	102 (41.5%)	31 (12.6%)	246
Middle	58 (41.4%)	63 (45.0%)	19 (13.6%)	140
High	31 (24.0%)	73 (56.6%)	25 (19.4%)	129
Total	202 (39.2%)	238 (46.2%)	75 (14.6%)	515 (100.0%)

The low income group is found to have mostly low level of environmental concern; the middle and high income groups are found to have mostly moderate level of environmental concern each.

The chi-square test confirms that the distance of difference between the three income groups in environmental concern and notifies it to be statistically significant. However, the table number 7 indicates that the high and middle-income groups come together in having a higher frequency percentage of moderate environmental concern. It appears to be so. Indeed on the application of the chi-square test it seems that there is a statistically significant difference between the high and middle-income groups in environmental concern.

Table VIII: Chi-Square Test
Annual Family Income and Environmental Awareness

	Value	Df.	Asymp. Sig. (2 Sided)
Pearson Chi-Square	17.640 ^a	4	.001
Likelihood Ratio	18.398	4	.001
No. of valid cases	515		

Table IX: Chi-Square Test
Middle and High Income vs Environmental Awareness

	Value	Df.	Asymp. Sig. (2 Sided)
Pearson Chi-Square	9.310 ^a	2	.010
Likelihood Ratio	9.428	2	.009
Linear-by-Linear Association	7.722	1	.005
No. of valid cases	269		

The statistically significant difference between high and middle-income groups in environmental concern is due to the fact that the moderate level of environmental concern is more pronounced in high income group than in middle income group as shown by the frequency in the table number 7.

CONCLUSION

Thus the study shows that the economic status i.e., income level has a bearing on the usage and disposal of plastic materials. The low income group stands low in attitude towards

disposal and environmental concern. They dispose the plastic wastes in the open area in such a way as to cause environmental degradation. The observation points to the need for shaping the attitudes of the low group people towards the proper disposal of plastic wastes and creating environmental concern among them so that the environment will remain graded and clean.

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