

## **The Socio-Economic Consequences of Post-consumed Polythene: The Case of Western and Uva Province**

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**Keywords:** *Polythene; 3R Concepts; Waste Composition; Multi Criteria Decision Analysis and Incineration*

### **Introduction**

Rapid urbanization and changing income patterns lead to changes in consumption patterns and life styles resulting in the generation of plastic and polythene wastes which exceed the assimilation capacity of the environment for natural decomposition. It is estimated that about 160,000 tons of plastic raw materials and products are imported and out of this 30% has been exported as finished products, with the remainder used in the local market. In Sri Lanka, dumping takes place of one million sachet packets - be it with sauce, jam or shampoo – and 20 million polythene bags and 15 million lunch sheets landfill per day (Dangalla, Chandrasena, Semasingha, & Amarasingha, 2013). The Colombo municipal Council collects 700 tons of garbage on average per day and 10 percent of this is polythene and plastic waste. Although the share of polythene and plastics in Municipal waste is only about 10 per cent of the total solid waste, its environmental impact is much greater than the other waste material. In 2025 annual imports of plastic would reach 430,000 metric tons and out of that 310,000 metric tons would be consumed locally (Gunarathna, 2010). Also in 2025 the estimated recycling capacity would be around 220,000 tons with about 50,000 tons (23% of the wasted) would not being recycled (Kokusai Kogyo, 2016).

Local Government Authorities in Sri Lanka are statutorily responsible for the management of waste generated within their respective boundaries. Most of the post consumed plastic and polythene in local authorities becomes Municipal waste component due to the limitations of open dumping with limited home land in urban and municipal areas. The literature proposes

recycling to minimize the negative externalities of post-consumed plastic, and policy makers have taken some action to enhance the plastic and polythene recycling process in the country. However, most of the post-consumed plastic and polythene ends up with open dumping, land filling or open burning causing with many negative externalities to the environment. Further, local recyclers also not much motivated to enhance the recycling process due to a very slim profit margin. Thus the present plastic waste management system in Sri Lanka is not sustainable. However, research conducted in this area to explore sustainable plastic waste management in Sri Lanka is inadequate. Therefore, this study aims to develop a proper model for plastic waste management practices in Sri Lanka.

### **Objectives**

The main objectives of this study are to develop a predictive model for waste generation pattern, waste composition and waste management; and to accurately estimate the existing post-consumed plastic and polythene. In addition this study is observes the existing behavioral pattern of waste management practices and determinant factors which are affect current practices while examining how behavior change can take place among Sri Lankan consumers to ensure the disposal of plastic and polythene waste without harming the environment.

### **Methodology**

In this study the term “Solid Waste” is defined as nonliquid material that no longer has any value to the person who is responsible for it. According to this definition the materials still reflecting economic value are not considered as waste. Especially reusable and recyclable materials do not come under the waste category. Further, in this study the 3R concept, to reduce, reuse, and recycle, classified accrding their hierarchy level in waste management options, was employed. Waste management hierarchy is instrumental in the concept of sustainability and Integrated Solid Waste Management. The hierarchy of waste management principles has been set up as: waste prevention minimization, re-use, recycling, incineration and disposal (Kirkpatrick 1992). At the top of the hierarchy stands waste minimization as the most desirable option.

For this study, out of 235 local Authorities (23 Municipal Councils, 41 Urban Councils and 271 Pradeshiya Sabhas) 48 local authorities from Western Province and 28 local authorities from Uva Province were considered as the field research areas to collect primary data. The Western Province is the largest which accounts for 33% of total waste generation and Uva Province is the smallest which shares only 5% of the waste generation of the country. Sample size was 4,000 households and it was proportionately (based on number of households) distributed among 76 local authorities in Western and Uva provinces. Sample selection was done based on simple random sampling methods comprising high, low and medium-income levels. The study used Multi Criteria Decision Analysis (MCDA) tools for data analysis. MCDA tools utilize various optimization algorithms to rank options, selecting a single optimal alternative or differentiating between acceptable and unacceptable alternatives. (Kalini, 2013). The study used PROMETHEE (Preference Ranking Organization Method for Enrichment Evaluation) for finding the behavioral pattern of existing waste management practices. A multiple regression model was applied to determine the factors which currently affect present post consumed plastic and polyethene waste management practices. Descriptive statistics were used to develop a predictive model for waste generation pattern, waste composition, waste management, waste characteristics and accurate estimation of existing post-consumed plastic and polythene.

## **Results and Discussion**

Table 1 shows the average of polythene usage and sources of generation level of a household in both provinces. In Western Province (WP) more than 71% polythene was generated due to super market (SM) purchasing process and for the Uva Province (UP) that figure was only 21% and it shows that urban areas create more polythene wastes. In WP, per-household polythene usage was 0.32 kg per month and in UP, 0.22 kg per month. The major source of polythene generation is small scale boutiques in UP.

Table 1: Per HH polyethene usage and sources of generation

Province and District	Sample size	Per HH Polyethene Usage (kg/Month)	Sources of Generation					
			With food items buying from SM (%)	With textile item buying from SM (%)	With durable items buying from SM (%)	With small scale boutique (%)	Direct HH purchased (%)	Other sources (%)
Western Province	3,284	0.32	71	15	5	3	3	1
Gampaha	1,294	0.31	68	18	6	4	3	1
Colombo	1,303	0.34	74	14	5	3	2	1
Kalutara	687	0.29	70	15	7	3	3	1
Uva Province	716	0.21	22	21	13	34	6	2
Badulla	460	0.22	22	22	13	35	6	2
Moneragala	256	0.19	24	21	14	32	7	2

As described in Table 2, the study identified seven alternative management options for post-consumed polythene, with incineration being the most popular option in both provinces. The second management option was handing over to the local authorities and open dumping in WP and UP, respectively, while the third options were, respectively, open dumping and landfilling. Bad management practices, which are incineration, landfilling and open dumping comprise around 63% for WP and more than 80% in UP. These findings indicate how present practices in the post consumed polythene waste management process in the country damages the environment. According to the analysis, the household's attitudes and behavior on post consumed polythene management is backward, since the average score in 3R process (reduce, reuse, and recycle) is negative. The average score in bad practices reflects moving towards environmentally harmful management practices in both provinces. According to the regression analysis, good practices of polythene waste management (reduce, recycle and reuse) significantly depend on the level of education, knowledge on environmental protection, family income, size of the homestead and existing waste management facilities. Polythene usage by household significantly depends on family income, level of education, type of employment, purchasing behavior and distance to supermarket and main city.

Table 2: Existing management options of post consumed polythene

Province and District	Existing Management Options						
	Reuse (%)	Handing over to Recycling Centers (%)	Handing over to Local Authorities with home wastes (%)	Handing over to private collectors (%)	Incineration (%)	Land filling (%)	Open dumping (%)
Western Province	5	6	23	2.7	38	12	12
Gampaha	4	9	20	2	43	14	12
Colombo	5	5	28	4	31	9	18
Kalutara	4	4	21	3	43	13	12
Uwa Province	7	0	7	3	40	14	28
Badulla	6	0	8	3	39	15	28
Monaragala	7	0	6	2	41	14	29

## Conclusion

It is evident from the study that composting is a nationally attractive and practically implementable solution to the post consumed polythene waste management problem in Sri Lanka. Further, it is important to conduct a national level survey to identify the present usage of polythene, sources of generation and waste management practices which is timely to develop a national level policy framework for a post consumed polythene waste management model for each province. Since the attitudes on well known good practices such as reuse, reduce and recycle were significantly backward, relevant authorities must focus on possible awareness programmes for enhancing 3R related activities. Conversely, all bad practices, which are currently popular among households such as incineration, landfilling and open dumping need to be controlled in formulating a new law and order program and changing the consumption pattern of polythene with awareness programmes. In an environmental perspective, this problem will be one of the most challenging issues in the country during the next few decades.

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