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Estimation and Characterization of Municipal Solid Waste Generation in Alayadevembu Pradeshiya Sabha, Ampara District

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Abstract: This paper is an attempt made to estimate the generation and composition of Municipal Solid Wastes from different waste streams in Alayadevembu Pradeshiya Sabha, Ampara District. Solid wastes collected from different streams were quantified. Then, collected sample were separated into different material categories of wastes. The data were analyzed using Microsoft Excel Software. The average per capita waste generation was 0.48 ± 0.23 kg. This value is computed to give 12.54 tonnes/day. The composition analysis indicated that the biodegradable materials contributed the major portion in all waste streams.

Keywords: Municipal Solid Waste, Waste streams, biodegradable waste

Introduction

The generation of solid wastes has become a critical global issue over the last decade due to the escalating growth of population. This increase in solid waste generation poses numerous questions concerning the adequacy of conventional waste management systems and their environmental effects (Warith, 2003). Ultimate disposal method of Municipal Solid Wastes (MSW) in most of the urban and rural areas of developing countries (including Sri Lanka) is open dumping. This practice causes public health and environmental problems due to formation of large amount of highly polluted leachate and landfill gases, which will create a long term threat to public health, water resources, land resources, air, and biodiversity in the country (Visvanathan *et al.,* 2004; Nagendran *et al.,*

2006). Sustainable waste management implies less reliance on landfill and greater amounts of recycling and composting. Recycling is the reprocessing of discarded materials into new useful products, and it is usually a better alternative compared to burning or dumping wastes (Cunningham and Saigo, 1995).

Proper establishment of solid waste management systems require basic information on the nature of wastes, its composition, physical & chemical characteristics and generated quantities. Composition of Municipal Solid Waste provides a description of the constituents of the wastes and it differs widely from place to place. The most striking difference is the difference in organic content which is much higher in the low income areas than the high income areas. Generally wealthy individuals are toward to discard more recyclables and items that can be repaired or reused (Martin Medina, 2000). This reflects the difference in consumption pattern, cultural and educational differences. In higher income areas, disposable materials and packaged food are used at higher quantities. Alayadevembu Pradesiya Sabha consists of different waste streams and the composition of Municipal Solid Waste also differs from one stream to another. Though the hospitals, schools, institutions, etc. serve a vital role to public, the generation of solid waste is unavoidable. Since there is no reliable data on the quantum of solid waste generation and its composition, this study was conducted to estimate the quantum of solid waste generation and its composition in Alayadevembu Pradeshiya Sabha, Ampara District.

Materials and methods

The information on the nature of wastes, its composition and quantities generated are basic needs for the planning of a solid waste management system. Hence, a study was formulated to assess the generation and composition of wastes in Alayadevembu Pradeshiya Sabha to estimate quantum of daily collected waste, total number of collected waste loads within a day weighed for several days. A composite sample from each load was analyzed for composition.

Sampling methods for field survey

Alayadevembu Pradeshiya Sabha was divided into six sections based on similarity of demographics and geographic features. To ensure adequate representation, a statistically 10% were allocated with 3 replicates from each sector. Labeled bags were distributed among selected sampling points. For study purpose, the waste stream was divided into different sectors such as households, shops, markets and hospitals. Collected samples were weighed and recorded individually. Then samples were separated and weighed in order to find out its composition.

Per capita waste generation was calculated by using the sampling procedure and composition analysis, considering total population. In order to estimate the quantum of daily collected waste in Alayadevembu Pradeshiya Sabha, total number of collected waste loads within a day was weighed. Meanwhile, a composite sample from each load was analyzed for its composition. In addition to that, a composite sample of collected waste within a week was also analyzed. The composite samples were prepared by mixing the daily collected waste loads within a week at the dumpsite of Local Authority. The data analysis was carried out using Microsoft Excel (MS Excel) software.

Results and Discussion

Per capita waste generation and Household waste composition

The results indicated that the per capita waste generation was 0.48 ± 0.23 kg and this value is computed to give 12.54 tonnes/day. Household waste composition revealed that the higher percentage (67.7%) of long term biodegradable materials while 8.18 % of short term biodegradable wastes (Fig.1). In addition, the percentage of recyclable wastes such as paper, polyethylene & plastics, and cardboard wastes were 5.62%, 5.4% and 4.14% respectively. The wastes collected in this region are deposed as open dumping in bare lands without any treatment. It's polluting the ground water severely. Inefficient management of the solid waste along with increasing population becomes a cause of environmental degradation (Adeoye et al., 2011). Hence, proper management strategies should be implemented based on the composition of household wastes. Since the percentage of biodegradable solid wastes was high in waste loads, composting could be possible way to minimize the environmental problem in Alayadevembu Pradeshiya Sabha.

Fig. 1: Household waste composition
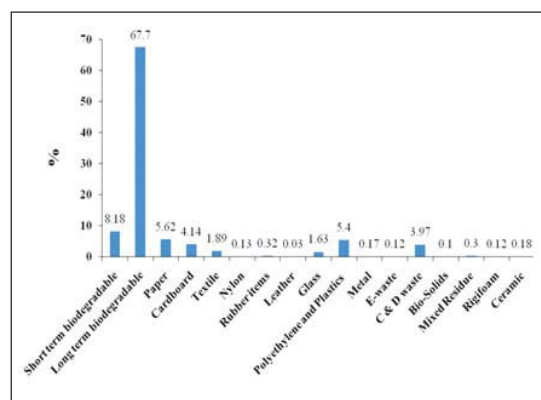
Shop waste composition

Study showed that long term biodegradable wastes and short term biodegradable wastes are the major types of waste generated in shops. In the collected waste loads, 61.98% was long term biodegradable wastes while 11.62% was short term biodegradable wastes (Fig.2). However, paper, cardboard and polyethylene were also significant. Improper dumping of these wastes creates health hazards and environmental degradation. Generation of leachate, gas, odour, and potential fire hazards are the common environmental problems in the existing dumping sites and cause threats to human and environment. The uncontrolled dumping of such

wastes have not only brought about increasing number of incidents of health hazards but also causing the ground water contamination and thus posing serious threat to the human being (Ramachandra and Bachamanda, 2007).

respectively. In practice, hospital wastes are being deposed off with the municipal wastes as open dumping but special attention should be given to treat infectious wastes in hospitals.

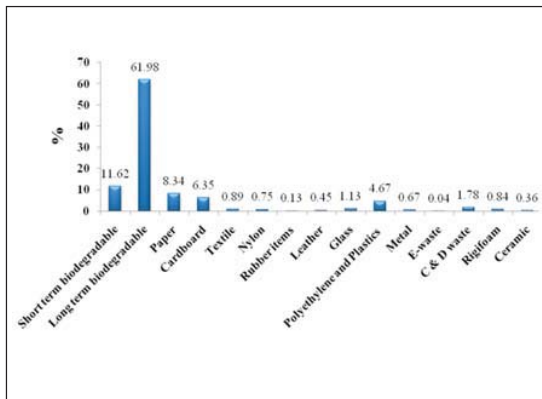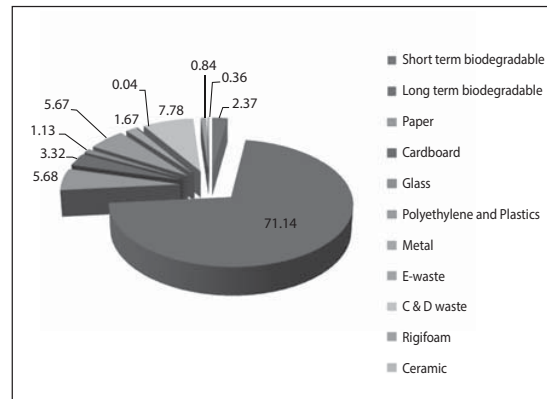### Fig. 2: Shop waste composition


Fig. 3: Hospital waste composition

Hospital waste composition

Details of composition of hospital wastes were given in Fig. 3. Based on this finding, the long term biodegradable wastes, paper and polyethylene & plastics were most prominent wastes in hospitals. The percentage of long term biodegradable wastes was 71.14% while construction & demolition wastes (C & D wastes) and paper wastes were 7.78% and 5.68%

Collected waste load composition

As expected, composition of collected waste loads had higher percentage (75.45%) of long term biodegradable (Fig.4). The delayed collections have resulted in low content of short term biodegradable materials as compared to long term. Furthermore, it was difficult to separate some of the short term biodegradable wastes due to mixing of wastes at household level.

Fig. 4: Collected waste load composition
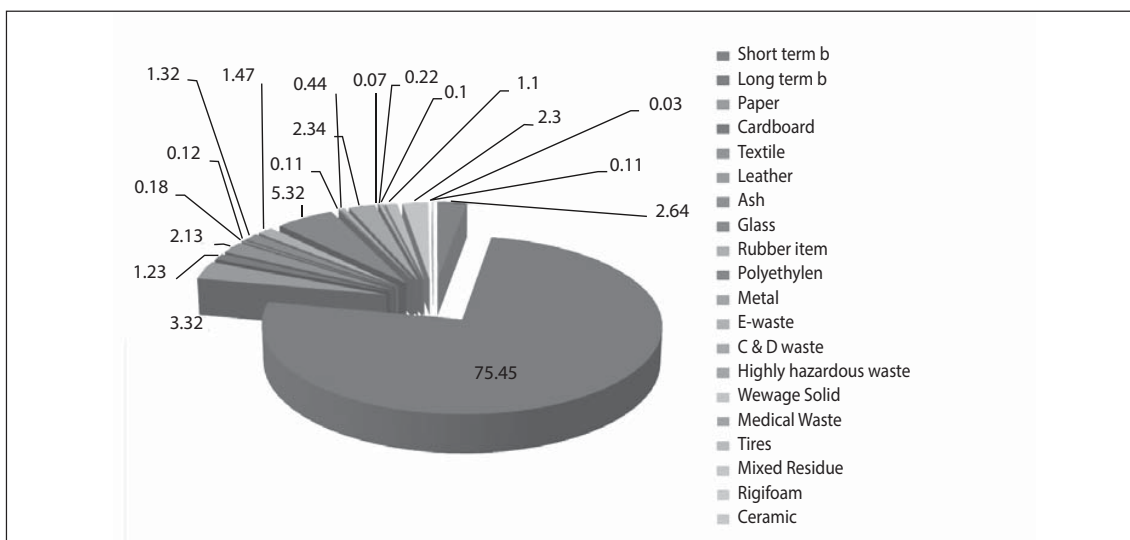
Conclusion

The composition study indicated that the generation of short term biodegradable materials was low in comparison to long term biodegradable materials. The percentages of long term biodegradable materials were similar in all streams studied. In household wastes, biosolids were present and it is a serious threat to human health. Another health issue is the presence of clinical wastes found in collected waste loads.

By using this basic data, it is possible to design the integrated solid waste management system to Alayadevembu Pradeshiya Sabha in order to prevent the environmental problems.

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