PRELIMINARY SOLID WASTE MANAGEMENT (SWM) DATA SURVEY AND ASSESSMENT OF TOWN, TREATMENT SITE AND DISPOSAL SITE CONDITIONS; CASE STUDY SOUTHERN PROVINCE OF SRI LANKA

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Abstract

In case of southern province of Sri Lanka, Solid Waste Management (SWM) can be an aggravated problem in future with respect to the present development activities in the area. To find a sustainable solution for this problem is very important to aware about present situation of SWM in the province. But there is no SWM data survey has been carried out in the province recently. Therefore under this research work a preliminary SWM data survey has been conducted in all 49 Local Authorities (LA) in Southern province. Research work was basically carried out at LA level since LA is the responsible administration body for solid waste management within its territory. Further town condition, waste treatment and disposal site conditions of each local authority were visited and assessed according to an accepted assessment criteria. Total daily waste collection in the province is 231.65 tons and it is only a 20% of total daily waste generation in the province. Composting is the most adopted waste treatment method in the province as 19 LAs out of 49 have already established composting facilities. Waste disposal is the major problem for most of the LAs as it contributes to create many socio-environmental issues. When consider waste disposal methods in southern province, 29 LAs have adopted open dumping while other LAs are burying. According to the assessment it was found that SWM in 96 percent of LAs is not up the acceptable level. The findings and results of the study have been presented in this research paper in detail.

Key words: Southern province, Solid Waste Management, Local authority

1. Introduction

Southern is third populated province in Sri Lanka and it has total land area of 5544 km^2 hosting a population of 2,476,744 (Statistics: Southern province2010).The province has been subdivided to three administrative districts of Galle, Matara and Hambantota. Though largest district in the province is Hambantota, the most populated district is Galle. There is a considerable climate variation within the province as Galle and Matara districts are located in the wet zone of the country while

Hambantota district is located in the arid zone. In present the province has undergone to a heavy development program with respect to the other provinces of the country. An international airport, Harbour, sport complexes and extension of highways and railways are few major activities among this program. As a result of that rapid urbanization is predicted in the province. Solid Waste has become a growing problem in urbanize areas not only in Southern province of Sri Lanka but also in most of the developing countries. In case of southern province SWM can be an aggravated problem in future with respect to the present development activities in the area. To find a sustainable solution for this problem it is very important to know the present situation of SWM in the province. But there was no SWM data survey was carried out in the province recently. Therefore under this research work a preliminary SWM data survey has been conducted in all local authorities in southern province. Further town condition, treatment and disposal facilities of each local authority were visited and assessed according to an accepted assessment criteria.

As Local Authority (LA) is the responsible administration body for solid waste management within its territory, research work was basically carried out in LA level. All 49 LAs in the Southern province were visited to study their SWM system. Further their waste treatment facilities and disposal sites were visited. Daily waste collection in the province in 2011 was 231 tons/day and it was only 19% of total waste generation of the province. Annual increase of daily waste collection is about 6.7ton/year. Daily waste collection of 25 LAs out of 49 LAs reported in between 1 to 5 tons while highest daily waste collection of 28 tons reported from Galle and Matara municipal councils. About 1095 Employees involve in the waste management processes of the province while highest of 160 employees in Galle MC. Composting is the most adopted waste treatment method among LAs of the province and 39% of LAs have already established composting facilities. Waste disposal in the province is a big environmental concern as 29 LAs use open dumping to dispose their collected waste. According to the assessment all local authorities are graded to four categories to identify that which local authorities require priority when improving the SWM facilities.

2. Methods and Materials

A preliminary data survey has been carried out for all 49 Local Authorities (LAs) Southern province of Sri Lanka. These 49 LAs consist of 3 Municipal Councils (MC), 4 Urban Councils (UC) and 42 Pradeshiya Sabhas (PS). Figure 1 describes the study area and distribution of LAs in each district in the province.

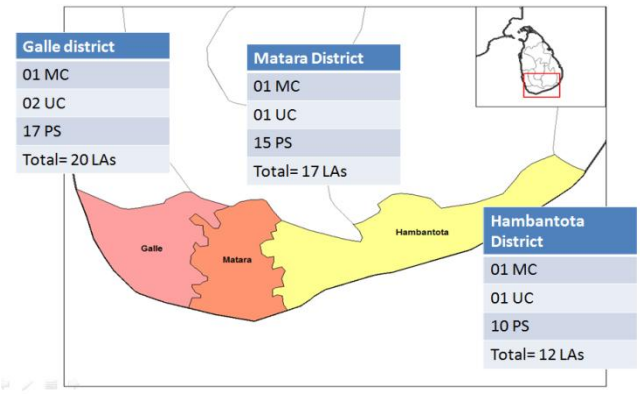


Figure 1: Target area of the study and LA distribution in each district

2.1 Data collection

A responsible person for SWM from above each and every local authority was interviewed to collect preliminary data on solid waste management. Chairman or secretary was also met to collect their views. A survey sheet was used to collect data from LA officers. Basic SWM data, assessment criteria, a general description and photos that describe the present situation of particular LA is included to the survey sheet. Existing documents, Interviews and observations were used to sort out necessary data to fill the survey sheet. The hygiene conditions of town areas were observed as town area is the main waste collection area in a particular LA. Further treatment site and disposal site conditions were also observed in order to understand the hygiene condition and negative impacts on natural and living environment. .

2.2 Assessment of present SWM condition

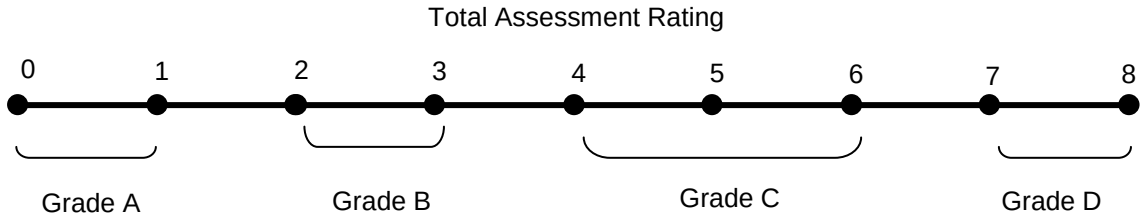
From observations present SWM condition of all LAs were assessed in the survey sheet according to the following criteria (Action plan,NSWMSC-2008).After observe present SWM conditions of local authorities, these are categorized into the four grades. Grade is determined by rating four aspects (hygiene condition of town, hygiene condition, and negative impact on natural environment and on living environment of disposal site).Each aspect is given points (0: Good, 1: Fair, 2: Serious) as shown in table 1.

Table 1: Assessment criteria

Assessment aspect	*Assessment item*	*Rating*
Town condition	*Hygiene condition*	*Good: 0* *Fair :1* *Serious :2*
Waste disposal and treatment site condition	*Hygiene condition*	*Good: 0* *Fair :1* *Serious :2*
	Negative impact on natural environment	*No impact: 0* *Little: 1* *Severe:2*
	Negative impact on living environment	*No impact: 0* *Little: 1* *Severe:2*
Total		*0 to 8*

The rating score is the sum of these points:

- Grade A: Good, rating 0 - 1
- Grade B: Fair, rating 2 - 3
- Grade C: Bad, rating 4 - 6
- Grade D: Very bad. rating 7 – 8



Collected data was analyzed to identify present aspect of SWM in Southern province. Further present aspect was compared with the past situation. For that the SWM data published by environmental ministry in 2004 was also used.

3. Result and discussion

3.1 Waste generation and collection

Waste generation in the province is increasing with the urbanization because the per capita solid waste generation rate varies among different categories of people. According to AIT (2004) the per capita per day waste generation on the average was 0.85 kg in Colombo Municipal Council (CMC), 0.75 kg in other Municipal Councils (MC), 0.60 in Urban Councils (UC) and 0.4 kg in Pradeshiya Sabhas (PS). This clearly shows the relationship between the amount waste collection and urbanization or population density. In less urbanized areas people have enough land space to dispose their waste in a manner such as burying or piling till decomposes which are suitable methods for waste with higher percentage of organic matters.

Few previous studies (Al-Momani, 1994) shows that some socio-economic factors additionally influence on waste generation rate are as follows

-Cultural patterns of people

-Education and personal attitudes

- Income level,

-Living standards of people,

-No of members in a household,

-No of employed members in a house hold, etc.

In case of Southern province, total waste generation was calculated by using the bellow equation.

Totall waste generation = (Population) x (Waste generation rate)

Waste generation rates- PS-0.4 UC-0.6 MC-0.8 (Kg/Person/Day), Source: NSWMSC

By using above equation total waste generation in Southern province was calculated and shown in the table 2. Waste collection is one of the major sections of any SWM system. In the case of Southern province all the LAs were collecting waste without segregation. Though their intention was to collect segregated waste from source it is not implementing due to reasons such as lack of support from public and shortage of resources. As shown in Table 2, total waste collection in the province was 231.65 tons/day and is a 12.5 percentage from the total waste collection in the country. Waste

collection to generation ratio was calculated and it is highest in Matara district while lowest reported from Galle district.

Table 2 Waste Generation and collection, Southern province, Aug 2011

District	Total Waste Generation. (Ton/day)	Waste Collection (Ton/day)	Collecting percentage
Galle	528.48	93.4	17.7
Matara	374.57	89	23.8
Hambantota	267.54	49.25	18.4
Total	**1170.59**	**231.65**	**19.94**

Furthermore graphical representation of district wise waste generation and collection amounts in southern province is shown in figure 2.

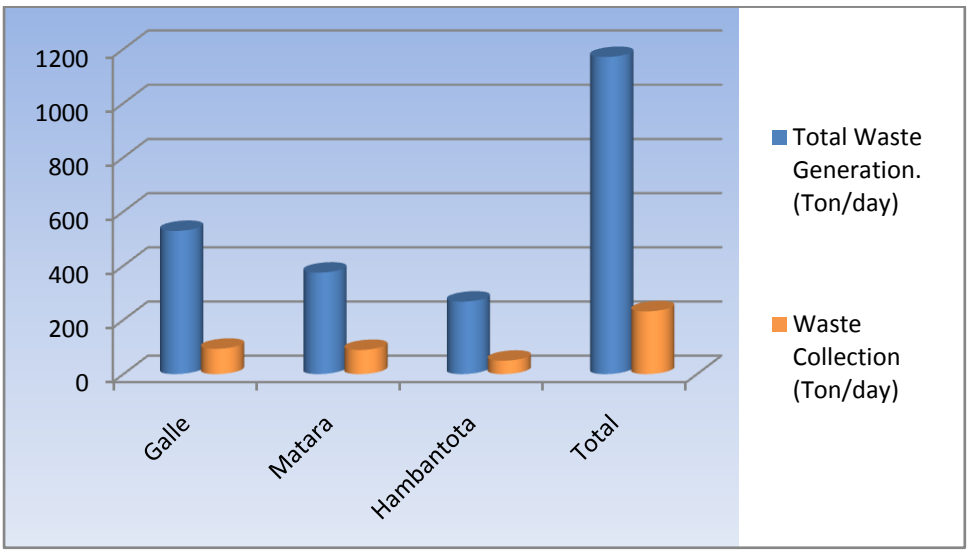


Figure 2: Waste generation and collection, Southern Province, Aug 2011

3.1.1 Distribution of LAs according to the daily waste collection

Distribution of LAs according to the daily waste collection is exploited in figure 3. In 35 LAs daily waste collection is bellow or equal to 5 tons. Two Municipal Councils Galle and Matara are the only LAs in the province that daily waste collection is over 20 ton. But with respect to the developing activities in the area it would be rapidly increased.

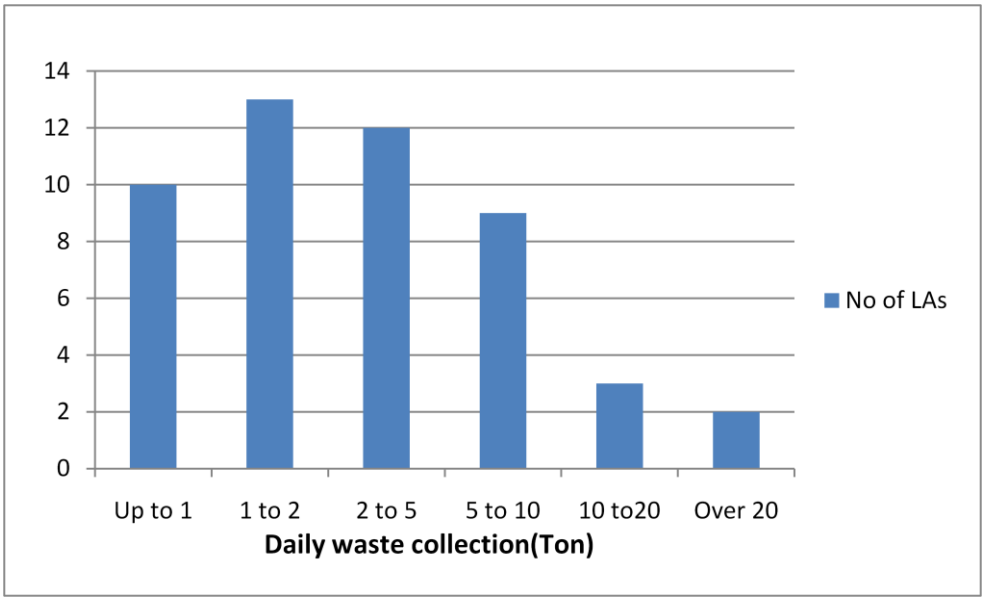


Figure 3: Southern Province, Aug 2011

3.1.2 Timely changes in waste collection from 1998 to 2011, Southern province

Waste collection varition in Southern province from 1998 to 2011 is described in the figure 4.When consider the overall increse of daily waste collection from 2004 to 2011 shows low value with respect to the rate from 1998 to 2004.In district level Galle district denote a significance reduce in 2011 with respect to the 2004.Hambantota district illustrate a increse in daily waste collection from 2004 to 2011.The rapid development and urbanization in the district after 2004 may be a reson for this increse.

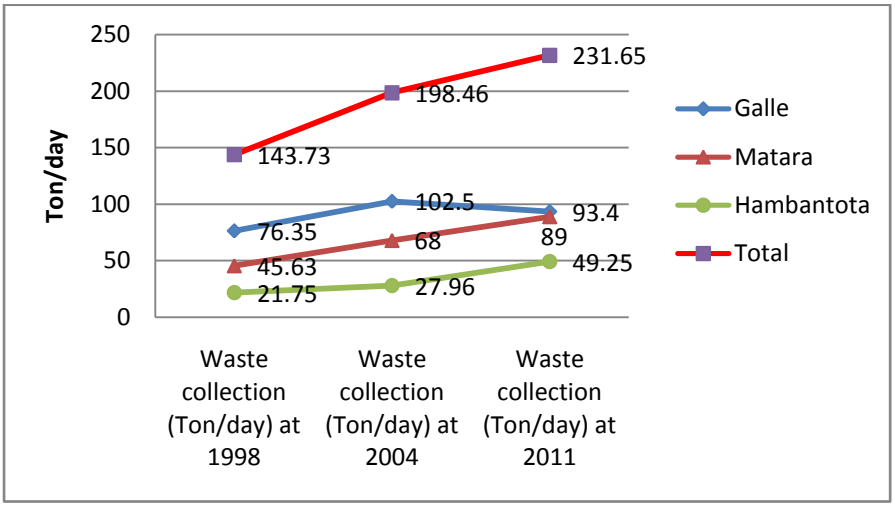


Figure 4: Timely changes in daily waste collection amount from 1998 to 2011

3.2 Waste treatment in Southern province

Waste treatment plays a big role in any waste management system to reduce the amount to be disposed and to minimize nagative impacts.The most adopted waste treatment methoed in sourthern province was composting and 39 pecentage of LAs have already estabilished composting facilities.As high percentage of waste is biodegradable composting is a acceptable and effective way of waste treatment.But in case of Sourthern province,most of the composting facilities are running with low

efficiency.The major reson is all the local authorities collect waste without segragation.The current practice was to segregate mix waste at compost yard.It reqires large workforce and time to sort out biodegradable portion for composting.As a result of that high percentage from the collected waste is disposed without segeregation. Few composting facilities in the province such as in Thissmarama PS and Dikwella PS have been already abandoned due various resons.Distribution of waste treatment facilities in the sourthern province are described in the table 3.

Table 3: Availability of waste treatment facilities in sourthern province.

District	No of LAs	No of LAs having treatment facility	Percentage
Galle	20	8	40%
Matara	17	6	35%
Hambantota	12	5	42%
Overall	49	19	39%

3.3 Waste disposal pattern, Southern province, Aug 2011

Waste disposal has become a major problem in most of the developing countries as open dumping is adopted method. In case of Southern province open dumping and burring of waste are more common practices. The table 4 shows the present disposal methods and number of LAs practicing that particular method. Only Galle MC maintain a manage dump site where daily soil layer is applied for cover the waste.

Table 4 Distribution of waste disposal methods in Southern province

District	Compost and manage dump	Compost and open dump	Compost and residue bury	Open dump	Bury
Galle	1	8	2	5	4
Matara	0	3	2	7	5
Hambantota	0	4	1	1	6
Total	1	15	5	13	15

3.3.1 Land use pattern for waste disposal sites, Southern province, Aug 2011

Unsystematic land selection for waste disposal is a common problem in study area. Even environmentally sensitive areas such as river banks, beaches, forest reserves and marshy lands are used for waste disposal. As shown in figure 5, Thirty nine LAs in southern province use ordinary inlands to dispose waste by using both the open dump and bury method. Meanwhile ten LAs use environmentally sensitive areas for disposing their waste. Most of these sites are close to residential areas and create many socio-environmental issues.

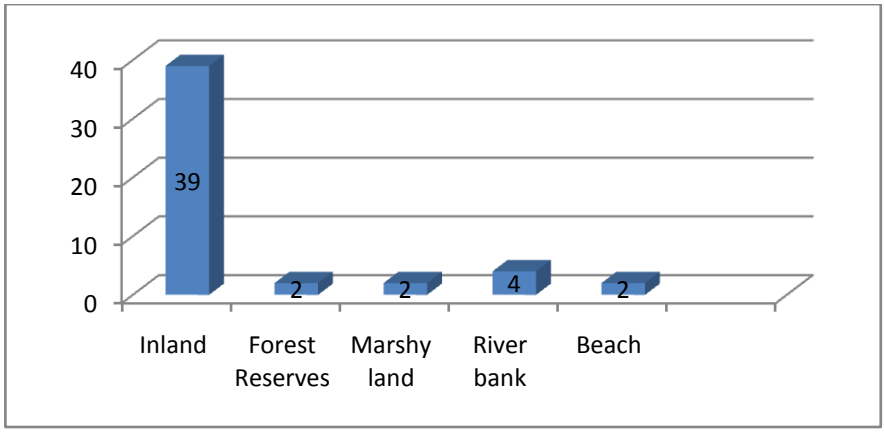


Figure 5: Land use pattern for waste disposal sites, Southern province, Aug 2011

3.4 Results of the Assesment .

Accorging to the Assesment it was found that 96% of LAs are in grade D and C zones.The figure 6 shows the percentage distribution of LAs according to their grade.31% of local authorities are in grade D range and priority to be given to these LAs during improving the SWM system in southern province.

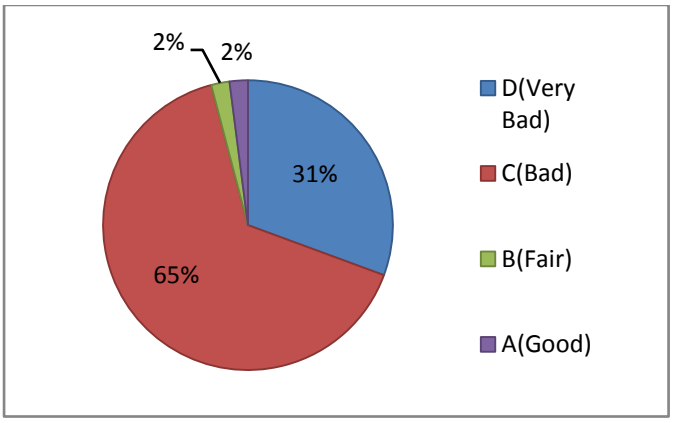


Figure 7: Percentage distribution of LAs according to their grade.

4. Conclusions

From this study it was mainly found that Solid Waste Management in Southern Province has also faced many problems. Unsystematic solid waste management procedures have become a serious threat to both humans and environment. Mainly present waste disposal practices such as typical open dumping directly involve to raise most of the socio-environmental issues as 29 LAs in the province is maintaining open dump sites.

This study also revealed that present daily waste collection in the province is only a 20 percent from the total waste generation of the province. It means most of the people especially in rural areas still use own disposal methods such as pilling till decompose in own lands. But with the rapid urbanization in the province, it is expected that the waste amount which to be collected by LAs can be significantly increased.

According to the assesment made by this research study it is very clear to identify SWM in most of the LAs is far bellow from the satisfactory level.

5. Acknowledgement

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