

Solid Waste Management Challenges in Urban Councils of Developing Countries

Case Study with special reference to Boralesgamuwa Urban Council, Sri Lanka

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Abstract

Solid waste has emerged as a critical concern in developing countries. In Sri Lanka unplanned settlements in suburban areas, particularly in the Colombo district, have emerged from migration from rural to urban areas. This paper gives an overview of the situation of Solid Waste Management (SWM) by Urban Councils in Sri Lanka. The objective of this paper is to identify the challenges that Sri Lankan local government institutions have managing their solid waste, with a particular emphasis on the Boralesgamuwa Urban Council. Further, this paper studies Solid Waste Management procedures in local governments, as well as approaches to feasible solutions that might be implemented to improve Urban Councils' Solid Waste (UCSW) services. This research is based on the primary data gathered through in-depth interviews. Accordingly, twenty (20) in-depth interviews were conducted with five officers, five waste collection workers, and ten civilians in the Boralesgamuwa area. The sample was chosen conveniently, and the Thematic analysis method was used to analyze the responses received from interviews. According to the findings, Boralesgamuwa Urban Council is in the stage of developing a Solid Waste Management strategy and there are various types of problems associated with existing practices. The Boralesgamuwa Urban Council's plan for garbage collection is not being carried out as intended. In this research, it was found under the category of structural problems. Several issues about servants have come up in the Boralesgamuwa urban council. These problems include low morale among the staff, a lack of workers, inadequate facilities, low attendance, health problems, and poor work ethics. Transportation-related problems have been identified as including vehicle flaws and maintenance concerns. Finally, remedies have been suggested for the issues in each category.

Keywords: Challenges, Developing Countries, Solid Waste, Solid Waste Management, Urban Council

Introduction

Sri Lanka is a "teardrop" shaped island nation pinned to India's southern point, and it is probably one of the most scenic physical settings in the world, owing to considerable geological faulting and erosion processes. The business capital of Sri Lanka is Colombo and it is home to almost a quarter of the country's population. Its economic and industrial operations account for roughly 44% of the country's GDP (Mackee, 2001). The growing

population and industrialization of Colombo and other dense urban cities have several negative effects on society and the economy. One of the most critical concerns is Solid Waste Management (SWM). Solid waste disposal is a major environmental concern in Sri Lanka and it has recently become a national phenomenon. A tragic incident occurred in Meethotamulla, which resulted in the death of several people due to the collapse of a mountain-shaped landfill that was 50 meters tall and occupied 40 acres. Chemicals, severe rain, and heavy rubbish loading all contributed to the fall, which occurred without posing any harm to the residents who live close by (Chathumani et al., 2019). Local governments are responsible for providing a wide range of public services to residents in that neighborhood, including social, economic, environmental, recreational, and community development. This research has been focused on the challenges that local governments face when providing environmental and sanitation services. Solid waste management, particularly in the Colombo district, might be considered a burning problem when it comes to the environmental services given by local governments (Fernando, 2019). Based on this situation, the purpose of this study is to identify the issues that local government institutions face in terms of solid waste management in Sri Lankan local government institutions, with a focus on the Boraesgamuwa Urban Council.

Local governments provide a wide range of services in areas such as social, economic, environmental, recreational, cultural, and community development. Because local governments provide a wide range of services to the public, the focus of this study has been narrowed to the challenges that local governments face when delivering environmental and sanitation services. Solid waste management, particularly in the Colombo area, might be considered a burning problem when it comes to the environmental services given by the local government. Solid waste has become a problem today. It is currently producing more solid trash than in the past. Households and manufacturing industries in developed countries generate tons of solid garbage daily, causing a slew of problems for all living things. The literature that is now accessible indicates that municipal councils are largely in charge of three tasks. Examples include community, amenities, and facilities. This suggests that as part of their environmental and sanitary services, municipal governments should offer trash management as a fundamental function. The National Solid Waste Management Support Center, the Western Province Waste Management Authority, the Ministry of Local Government and Provincial Councils, the Ministry of Mahaweli Development and Environment, the Ministry of Megapolis and Western Province Development, the Central Environmental Authority, the Urban Development Authority, the National Solid Waste Management Support Centre, and local governments are all involved in waste management to varying degrees. Among other things, local administrations are in charge of waste disposal and collection.

This is regarded as one of the worst man-made environmental disasters in Sri Lanka, demonstrating the need for Solid Waste Management in urban areas. At present, critical gaps may be detected in areas such as solid waste disposal, which has become a puzzle in urban administration (Munasinghe, 2018). In Sri Lanka, urban areas are divided into Municipal Council (MC) and Urban Council (UC) areas, with the remainder being under the Divisional Councils category (Pradeshiya Sabha). They were collectively referred to as local authorities. They oversee garbage collection and disposal. In Sri Lanka, there are 335 local authorities, including 23 municipal councils, 41 city councils, and 271 divisional councils (Pradeshiya Sabha) (Fernando, 2019). The term "waste" is defined as "any matter prescribed to be waste and any matter, whether liquid, solid, gaseous, or radioactive, which is discharged, emitted or deposited in the environment in such volume, constituency, or manner as to cause an alteration of the environment," according to section 33 of the National Environmental Act. Simply, "Solid Waste" refers to all of the rubbish generated by animal and human activities that are

dumped as undesirable and worthless. Waste management is something that every home and business owner on the globe requires. Solid Waste Management refers to the collection, treatment, and disposal of solid waste that has served its purpose or is no longer useful. Solid garbage is waste that has been collected. SWM is one of the critical issues in the majority of developing nations and they are using primitive methods to manage solid wastes (Tripathi et al., 2020; Ganguly & Chakraborty, 2021; Adipah & Kwame, 2019; Abdel-Shafy & Mansour, 2021; Debrah et al., 2021). Hence, developing countries need to pay clear attention to existing SWM practices to recognize issues and develop efficient practices for improving SWM in local authorities. This existing knowledge gap will be addressed through the current study.

Solid waste management is a huge challenge for many developing countries especially in managing municipal solid waste (Vongdala et al, 2019). As a developing country in Sri Lanka after the federal government and provincial councils, the local government is the third and lowest level of government administrative bodies. The local government bodies are referred to as local authorities collectively and they are in charge of a wide range of local public services, such as roads, sanitation, drains, housing, libraries, public parks, and recreational facilities. Municipal councils, urban councils, and divisional councils are the three types of local administrations (pradeshiya sabha). Urban areas in Sri Lanka are divided into Municipal council (MC) and Urban council (UC) areas, with 23 and 41 MCs and UCs, respectively. All the MCs and UCs listed above gather and dispose of waste. Sri Lanka generates approximately 6400 tons of solid trash every day, according to estimates (Visvanathan, 2006). Open burning, landfilling (not technical), and open dumping of garbage are the most widespread practices in practically all Sri Lankan municipalities. These techniques aren't thought to be environmentally friendly. In Sri Lanka, over 85% of collected rubbish is dumped in the open (Visvanathan, 2006). Furthermore, in most Sri Lankan councils, a very good solid waste management system has been built. However, these local authorities do not adequately implement the operation, maintenance, monitoring, and evaluations, resulting in a slew of solid waste challenges in Sri Lanka's urban areas. Furthermore, today's SWM difficulties have evolved into a major environmental issue as well as a national concern. The Municipal Council Ordinance No. 29 of 1947, the Urban Councils Ordinance No. 61 of 1939, and the Pradeshiya Sabha Act No. 15 of 1987 are the primary Acts dealing with local administration. As a result, the three forms of local governments have distinct competencies. Municipal councils have more authority than urban or divisional councils.

According to the available literature, municipal councils are primarily responsible for three functions. Community, amenities, and facilities are three examples. According to this, waste management is a basic service that should be provided by local governments as part of their environmental and sanitary services. The Ministry of Local Government and Provincial Councils, the Ministry of Mahaweli Development and Environment, the Ministry of Megapolis and Western Province Development, the Central Environmental Authority, the Urban Development Authority, the National Solid Waste Management Support Centre, the Western Province Waste Management Authority, and local authorities are all involved in waste management at various stages. Local governments are responsible for waste collection and disposal, among other things. The National Environmental Act No. 47 of 1981, as well as the Public Nuisance Ordinance, make provisions for garbage management and disposal. According to Vidanaarachchi (2006), trash management is considered to be the unique responsibility of local governments, and the public is not expected to contribute. The effectiveness of solid waste management is determined by some factors. There are numerous studies in the literature that have been undertaken on solid waste management in various contexts. Because solid waste management is such a burning topic in today's context, there is a plethora of research available even in the Sri Lankan setting. Municipal solid waste

management is acknowledged as a concern not only in Sri Lanka but also in many other developing-world townships (Laor et al, 2018). The issue is especially acute in areas where the urban population share and density are relatively large and rapidly expanding. For example, the issue has become acute in developing Asian countries where the urban population share is around 35 percent (for example, China and Thailand) and is still growing at a rate of around 4% per year, as well as in less developed Asian economies where population densities are high and increasing (Glawe, et al., 2005). Rapid economic expansion in many countries has exacerbated the problem, as it has resulted in higher living standards and altered people's purchasing patterns.

Literature Review

Solid Waste

Wastes are defined by the United Nations Environment Programme (UNEP) as objects or substances that the owner no longer wants, needs, or uses and that require treatment and/or disposal (McDougall et al, 2008). Solid waste is garbage that results from animal and human activities and is considered unwanted. Waste can be classified in several ways. Hazard potential and material base are two of them, depending on the waste's origin. Biodegradability is also another method of classifying waste, such as biodegradable, moderately degradable, and non-biodegradable (Ayilara et al, 2020). The most common sort of garbage is solid waste, which includes home, commercial, and industrial waste. Solid waste contributes greatly to environmental contamination by contaminating the primary elements (soil, water, and air). Hence, Solid waste should be carefully managed for the benefit of all living things. The most common sort of garbage is solid waste, which includes home, commercial, and industrial waste. Solid waste contributes greatly to environmental contamination by contaminating the primary elements (soil, water, and air)

Sources of Solid Waste

Houses are one Household is one of the primary contributors to solid waste generation. Food waste, plastics, polythene, glass, yard debris, and technological garbage are all generated due to household consumption. Garbage bins are used in most homes to dispose of waste. Apart from domestic waste, industrial solid waste and agricultural solid waste are the main sources of solid waste (Chen et al, 2020). Industrial waste has also caused a great deal of environmental damage. This can be viewed as one of the methods for generating a large amount of solid garbage. Industries are well-known for being one of the most significant sources of solid waste. Light and heavy manufacturing businesses, construction sites, fabrication plants, canning plants, power plants, and chemical plants are all examples. Commercial trash can also be classified as a source of solid waste. Trash can be disposed of when offering commercial services through restaurants, hotels, marketplaces, and other organizations. Construction sites are another source of solid waste generation source. Primarily it occurs due to new construction projects, such as buildings and roads, as well as building renovation and road maintenance sites. Environmentally hazardous circumstances are increasingly widespread because of these structures. Currently, most cities in most nations produce a lot of solid garbage, which contributes to the solid waste dilemma. The majority of municipal waste sources are street cleaning, waste generated from parks and beaches, landscaping wastes, and waste from recreational areas. Agriculture: Solid waste is generated on crop farms and feedlots. Agricultural wastes, pesticide wastes, damaged foods, and other special wastes are some of the common solid wastes generated by these locations. Hospitals, biomedical equipment, and chemical production companies are all sources of solid waste.

Bandages, paper, food wastes, syringes, medications, and chemicals are some of the hospital things that generate solid waste.

Solid Waste Management

Garbage management is another name for solid waste management. Solid waste management is defined as the science of regulating the generation, storage, collection, transportation, or transfer, processing, and disposal of solid waste materials in a way that best addresses public health, conservation, economics, aesthetics, engineering, and other environmental concerns. The world's top three municipal solid waste producers are the USA, China, and India (Nanda and Berruti, 2020). According to the Wisconsin Department of Natural Resources (2021), entails planning, organizing, financing, and implementing programs that affect the storage, collection, transportation, processing, recycling, or final disposal of solid wastes in a sanitary, nuisance-free way. The major purpose of solid waste management is to reduce and eliminate the negative effects of waste products on human health and the environment to promote economic growth and a higher quality of life.

Methods of Solid Waste Management

There are different methods available for managing municipal solid waste such as landfilling, recycling, incineration, waste-to-energy conversion, and composting (Nanda and Berruti, 2020). The approaches listed below are some of the most well-known. Sanitary Landfill: Sanitary Landfill is currently the most widely used solid waste disposal method and in the majority of the municipalities in developing countries the most preferred waste management option is landfilling. Garbage is laid out in thin layers, crushed, and then covered with dirt or plastic foam. Modern landfills are designed with an impervious liner that is usually made of multiple layers of thick plastic and sand covering the bottom of the landfill. The groundwater is protected by this liner against contamination due to leaching or percolation. To avoid water leakage, the landfill is covered with layers of sand, clay, topsoil, and gravel after it is full.

Incineration is the process of destroying solid waste by burning it. Incineration is the process of burning solid wastes at high temperatures until they are reduced to ashes. The advantage of this procedure is that it reduces the volume of waste by up to 20% or 30% of the original volume. Recycling is the process of repurposing previously used items. After being processed, these items are employed for a use. Composting: Biodegradable trash can be composted, which can be useful in agricultural applications. Biodegradable yard waste is mostly used to make compost and is environmentally favorable. Pyrolysis is a solid waste management technology in which solid waste is chemically destroyed by heat in the absence of oxygen. This frequently happens under high pressure and at temperatures of up to 430°C.

Significance of Solid Waste Management

The protection of the environment and the population's health are the most significant reasons for waste collection. Waste should be appropriately managed to safeguard the environment and reduce the difficulties that develop as a result of waste. Improper garbage management causes a slew of issues in society. Health difficulties, climate change, and environmental concerns are just a few of them. Managing solid waste will aid in the development of a healthier and wealthier country. The majority of the countries in the Asian context are suffering a lot because of lacking a proper solid waste management mechanism (Laor et al, 2018). Population increase has now become one of the world's most pressing challenges. The waste problem can also be seen as an issue that has arisen as a result of population growth. As

the world's population grows, so does the amount of waste produced. All living things produce waste daily. Hence, it's not possible to manage them easily. However, every people like to live in a pleasant environment. When the environment is clean, the people will also be happy in that residential area. The most important thing is the well-being of the people. Therefore, waste management will be much more important to make people happy in society. During the COVID-19 pandemic also people are doing their usual consumption and household waste generation is at a higher level. Therefore, proper waste management practices are needed to continue amidst the pandemic and also to maintain a pleasant environment, especially in urban areas (Nzeadibe & Ejike-Alieji, 2020). Solid waste management is much important to reduce the risk that may be raised in the future, because of waste. There have been happened very unfortunate incidents in Sri Lanka because of improper management of solid waste. Therefore, such things have to be reduced when it starts to manage solid waste properly.

Empirical Framework

For an instance, the Hambantota Municipal Council in Sri Lanka has been challenged to carry out sustainable Solid Waste Management due to a lack of financial and technical support, a lack of public awareness, inadequate information, and education, a lack of collaboration and public participation, and a lack of legal instruments and policies (Vitharana, 2016). According to Kumanayake (2013), inefficient local governments, poor national strategizing, insufficient funding, the spread of low-income settlements in urban areas, market forces that introduce cheap and unsustainable products, waste collectors' lack of environmental health and safety practices, old technology, and limited land for waste disposal are among the challenges for waste management in Sri Lanka. Due to financial constraints, municipalities have been unable to handle solid waste. The high cost of providing the service (Sharholly et al., 2007), the lack of financial support, limited resources, the users' unwillingness to pay for the service (Sujauddin et al., 2008), and the ineffective use of economic instruments have all hampered the delivery of proper waste management services. According to Sharholly et al. (2008), the private sector's involvement is a component that could increase the efficiency of the system.

The parts that follow describe some of the major issues that were discovered in another survey conducted in Thailand municipalities. Lack of garbage collection locations, irregular waste collection, insufficient waste collection vehicles, limited access to waste containers, an alternative to final waste disposal and unsuitable waste separation facilities are among the issues (Yukalang et al, 2017). Due to the bad practices of waste management with the increasing economic prosperity and increasing population Solid Waste problem is a crucial situation in Kandy MC. Inadequacy of proper disposal methods was identified as the main obstacle in waste management in the study area. According to Kumanayake (2013), inefficient local governments, poor strategizing at the national level, insufficient funding, the spread of low-income settlements, market forces that introduce cheap and unsustainable products, lack of environmental health and safety practices among waste collectors, old technology and

limited land for waste disposal have been identified as the barriers to solid waste management in Kandy Municipal Council (Vidanaarachchi et al, 2006).

Methodology

This paper explores the existing practices and challenges of SWM in Boraesgamuwa Urban Council. Interpretive constructionism guides this research, allowing researchers to uncover rich narratives from lived experiences (Saunders et al., 2012). As a result, a qualitative methodology was deemed appropriate for this study, and the justification for the technique is

motivated by a desire to fully comprehend the phenomenon under investigation (Creswell, 2013). Semi-structured interviews were conducted to explore the existing practices and challenges of SWM within the Boralessgamuwa Urban Council. Since it is a typical sample of the country's existing and future urbanization trends. The participants were selected from Boralessgamuwa Urban Council as a representation of officers and garbage collecting servants to ensure a representation of the gender, age, and job layers. Moreover, researchers conducted interviews with the citizens in the residential area who are taking the SWM service from the urban council to improve the confirmability of the collected data from the officers and garbage collecting servants. The current study has used a convenient sampling technique, which is one of the non-probability sampling techniques since the participants are often readily and easily available (Taherdoost, 2016). The interviews were conducted with five (5) officers, five (5) garbage collectors, and ten (10) residents from the residential area. Table 1 shows the demographic information about the participants in the current study.

Table 1: Participants' of Demographic Information

Type of Respondent	Label	Gender	Age (Years)	Experience (years)
Officers	A	Male	36	9
	B	Male	32	7
	C	Male	33	2
	D	Male	30	3
	E	Female	38	7
Waste collecting servants	A	Male	53	8
	B	Male	39	10
	C	Male	42	6
	D	Male	38	9
	E	Male	50	7
General Public	A	Female	33	N/A

	B	Female	39	N/A
	C	Male	27	N/A
	D	Male	58	N/A
	E	Female	55	N/A
	F	Female	54	N/A
	G	Female	32	N/A
	H	Female	26	N/A
	I	Female	40	N/A
	J	Male	23	N/A

Source: Field Data (2019)

The current study was conducted in three stages:

Stage 1: A desk study was conducted in which documents and records relating to the management of Urban Council Solid Waste (UCSW) in Sri Lanka and census and economic planning were examined to obtain background information and data for the development of an interview guide for the interviews.

Stage 2: Stage two included interviews with Boralesgamuwa Urban Council officers and waste collectors' residents in the region. This study used in-depth interviews with the support of a semi-structured interview guide to the open path for in-depth discussion from responses.

Stage 3: A site visit was made to the *Karadiana* dumping site at the end of the year 2019. *Karadiana* is a public area where a variety of municipal governments dispose of their waste. Scavenging participants were chosen at random and interviewed. The interview duration lied in between 45 to 50 minutes. All the interviews were recorded with the aid of the mobile phones of the researchers. Later, all the recorded interviews were transcribed word to word to use for the data analysis.

At stage 1 of the current study, researchers were able to identify existing practices of the SWM practiced by the Boralesgamuwa Urban Council by referring to the documents that they have provided. Further, the same practices were confirmed during the process of interviews also. To explore the challenges of UCSWM based on the collected data during stages 2 and 3 of the study, the thematic analysis technique was employed. Thematic analysis was used to analyze the data acquired from the semi-structured interviews. The analysis was conducted by becoming acquainted with the collected data. During the process of familiarizing themselves

with the interview transcripts and identifying relevant concepts, both researchers performed independent parallel coding to generate the first codes. Following this, all authors meet to discuss identified initial codes. When compiling the generated codes by all authors, it was able to determine that some codes were overlapping. The overlapped codes are the codes that have been selected for the subsequent processing of the analysis since the same method increases the reliability of the qualitative data analysis procedure. Finally, determined these aligning with the generated codes to recognize major challenges of SWM in Boralesgamuwa UC.

Results and Discussion

Boralesgamuwa Urban Council dumps rubbish at the *Karadiana* dumping site daily. There are compost packets available on the "*Pilisaru*" website. Garbage is typically separated into two categories: biodegradable and mixed waste. Biodegradable trash is used in the composting process. To make fertilizer, there is a separate compost yard. For landfilling, mixed trash is employed. They use landfilling as their primary technique of solid waste management. Garbage is strewn across the ground in thin layers. Soil or plastic has been used to cover it. When the landfilling is finished, it is covered with sand, clay, and gravel, in that order. When waste cannot be composted or buried, the next best alternative is to burn it within the dumping site. The *Karadiana* dumping site is a 25-acre tract in the Boralesgamuwa – Borupana wetlands that was utilized as an open pit for the Narayana waste dump. The waste dump is located near the Wears Ganga, which feeds into Bolgoda Lake. Moratuwa Municipal Council, Mount Lavinia – Dehiwala Municipal Council, Sri Jayawardanepura Kotte Municipal Council, Maharagama Urban Council, Panadura Urban Council, Kesbewa Urban Council, and Boralesgamuwa Urban Council are currently using the site. The Western Province Waste Management Authority is in charge of it (Environmental Foundation Limited (EFL), 2019). Furthermore, for the first time in Sri Lanka, a ceremony will be held to launch a project to generate electricity from waste in a dumping site.

The Waste Collecting Plan at Boralesagmuwa Urban Council

Boralesagmuwa urban council has a garbage collection plan in place. As a result, the garbage collection zones have been separated into four categories.

Table 2: Garbage Collection Zones

Provision A	Provision B	Provision C	Provision D
Boralesagmuwa A	Diulapitiya Eastern	Werahera North-Bodhirajapura	Bellanwila
Boralesagmuwa A	Raththanapitiya	Werahera-South	Diulapitiya-Western
Boralesagmuwa B	Egodawaththa	Katuwaawala-North Katuwawala-South	Papiliyana- Western
Boralesgamuwa C	Boralesagmuwa Eastern B	Neelammahara	Papiliyana-Eastern

Source: Primary data (2019)

The Existing Practices Related to Solid Waste Management in the Boralesamuwa Urban Council

The concept “*Parima Paadaka Malla*” is introduced with a vision of put the environment first. This is a black polythene bag for solid trash collection. Only non-biodegradable garbage, such as polyethylene, plastic, and paper, is collected by *Parima paadaka Malla*. However, if polythene, plastic, iron, coconut shells, glassware, and papers can be collected individually, there is no need to use this bag. If this is not practicable, it is required to use this bag; otherwise, mixed wastes collected in different color bags for day-to-day garbage collection will not be accepted by waste collectors. As a result of employing this *Parima paadaka Malla* to collect waste, there is the possibility to dispose of the waste at a dumping place for free. As a pilot test, this bag has been distributed to 1000 homes in the residential neighborhood. According to the current status, they intend to distribute this bag over the entire residential area. To bring this to the attention of the general public *Kasalapola*. This program creates a platform where people can sell and buy waste items. *Kasalapola* is held in a place called a yard. UC invites all people in the area who like to sell and buy the disposing items. This program is conducted for providing benefits to the people; indirectly it generates benefits for the UC. In addition, UC has implemented “*Lattalottadinaya*”, mainly this program is conducted in line with the dengue prevention programs. This date is designed for collecting unusual wastes like tires, coconut shells, glasses, etc. In this day waste collecting vehicles are utilized for the success of this program. Furthermore, UC has introduced “*distribution of compost bins*”, It is a bin that facilitates the creation of compost in-house by using degradable waste items. Citizens are encouraged to buy it for a very lower cost. Urban council provides it only about 1/10th of the market price. Nevertheless, The UC has initiated some training programs for waste-collecting servants. Urban Council offers training sessions for garbage collection personnel regularly. The garbage collecting Vehicles monitoring project was also introduced in parallel to improve the effectiveness of the SW collecting activities by the UC.

Hence, they introduced the GPS method for monitoring the garbage collectors and their vehicles. This innovation is going to be carried out using modern technology. Here, the small chip will be fixed to the tractor or the other vehicles which are used to transport the waste.

Then it facilitates monitoring vehicles anywhere. The purpose of introducing this technology is to monitor the garbage collectors and make efficient garbage collecting activities by reducing misuses of vehicles. Further, this idea will be mitigating several problems in the UC relating to the proper management of solid waste. As a result of this project, it will help to reduce the inefficiencies of waste management and the unethical behaviors of waste collectors. In addition to that, it supports saving costs of UC. Apart from that, some initiatives have been taken by UC to motivate garbage collectors, “*ParisaraMithuro*” is one of them and it is conducted for waste collecting servants. There are vaccination programs, leadership training programs, lectures, and entertainment activities during this event. The Boralesgamuwa UC has received enough funds from the government and UC is allocating a considerable amount of money annually for such programs. In this kind of program, they can gain knowledge on the segregation process of waste, identify the way of maintaining interpersonal relationships and improve communication skills. There are different types of programs to evaluate local authorities annually in the context of Sri Lanka. Boralesgamuwa UC also participates in them continuously. Most of the time those programs are held with the appetite of competition among the local authorities. These programs can enhance the competition among local authorities, and the outcome of the competition is a better service to the general public. Moreover, the UC is conducting awareness programs for residents in the UC area, and it will help to make people aware of the importance of proper waste management. UC distributed leaflets, and small handbooks to emphasize the people's criticality on Solid Waste Management issues.

Challenges of SWM in Boralesgamuwa Urban Council

The thematic analysis technique utilized for exploring the challenges of SWM in Boralesgamuwa UC. As per the interview results with the public officers as well as with the waste-collecting servants, the following themes were identified as shown in table 3. They are structural issues, garbage collectors-related issues, and garbage transportation issues prominent among others.

Table 3: Main Themes identified as Challenges of SWM

Codes	Themes
Improper waste-collecting plan	Structural issues
Ad hoc decision making	
No specific routes assigned for garbage collectors	
Demotivation among garbage collectors	Garbage collectors related issues
Deficiency of labors	
Lack of facilities	
Poor Attendance	
Health concerns	

Bad behavior	
Deficiency of vehicles	Garbage transportation issues
Maintenance problems of vehicle	
Frequent breakdowns	

Source: Authors Compilation

Structural Issues

There are several issues in the waste-collecting plan of the Boralesagmuwa urban council. There is a problem with the proper implementation of the waste collecting plan of the Boralesagmuwa urban council. Though there is a waste collecting plan at UC, it is not implemented properly. As an example, suddenly meetings are arranged for waste-collecting servants and it will destroy the waste-collecting plan of the day. One of the officers in the sample stated, *“Actually, at present, we are not performing duties according to a plan. Still, we have only a recently developed basic structure, still, we are developing that”* As there is no proper plan for waste management, one labor has to cover various locations on different days. Another officer mentioned, *“..... There are no specific roots assigned for servants. According to the requirement they have to cover various roots which they are not familiar with. But, if they cover the same root every day, the waste-collecting servants will be able to familiarize themselves with the people in the area and the people will also be encouraged to separate the waste properly.”* Accordingly, their first waste-collecting plan is this, and the officers related to waste management are expected to improve the efficiency of the waste management service. Throughout this project. Therefore, it is clear that there is a need for a proper waste management plan in Boralesagmuwa urban council and the imagination and concept should be put into practice.

Garbage Collectors Related Issues

Due to the existing demotivation among garbage collectors, UC has introduced some motivation programs for them. One of those suggested programs is a selection of the vehicle that collects a large portion of waste and rewards them and the proper maintenance of the vehicles. However, the suggested programs were limited only to the documents. Therefore, there is less motivation among garbage collectors. According to the respondent’s idea, there is a lack of demand for the occupation of waste collection. Therefore, there is a deficiency in this occupation. Hence, there is a labor deficiency. Although the existing waste collectors have some unethical and bad practices the local authority has been unable to address them, because of this lack of servants. If it takes the penalized action, the workers will not come to work and the negative consequences happen to have to be bear by the citizens in that residential area. *“Normally, one root is covering three servants including two waste collectors and a driver. If both laborers do not attend to the work, the driver is unable to provide the service lonely. Then, it will create many problems for the people who are in the root which the absent servants are representing.”* That statement indicates that the problems may arise because of the unavailability of an adequate number of servants related to waste management, in the Boralesgamuwa urban council. According to one respondent, *“At least any organization has there is a place to take food for servants. Therefore, they are also seeking at least the basic facilities for them to be motivated in their service. According to one public officer responsible for waste management, one of the main problems is the lack of required facilities for waste*

collection. The higher authority expects the service to be at the optimal level without considering the barriers it must be faced when carrying out the waste management service.

Another critical problem related to the waste-collecting servants is poor attendance among waste-collecting servants. According one of the officers stated during the interview *"Sometimes after getting the payment, about one week they do not report to the work..."* *".....some servants are not coming to the work at all. Then, we have to go to their homes and ask them to come to work."* Therefore, there is a necessity to increase the number of laborers to make efficient waste management in Boralesgamuwa urban council. The waste collecting servants often have various health problems as they are working with the waste throughout the day. The major reason for the lack of attendants is also health problems. Although they have been provided things like boots, masks, and helmets, they are reluctant to wear those things because of the high temperature. According to the details provided by the public officers, most of the waste collecting servants are dunkers. *"They cannot work without using alcohol, that's the way the waste collectors think"*. They think that using those things is acceptable, as they are working with "waste". One of the officers in charge of waste management has mentioned as follows. *"Most of the waste collecting servants are using alcohol. We always advise them not to use them in carrying out the work. But they use..."* One officer stated that, *"one time, a dunked waste collector had met with an accident and dead"*. Therefore, this behavior of servants negatively affects the waste collection and ultimately it will affect improper waste management in the area, creating challenges in garbage collection.

Garbage Transportation Issues

The collected data demonstrated that there are issues with the solid waste transportation service in the Boralesgamuwa urban council. The majority of sample participants noted vehicle deficiency and maintenance issues. One of these issues is the lack of sufficient vehicles, which frequently experience breakdowns. According to the respondent's viewpoint, waste-transporting vehicles tend to break down for a variety of reasons. A public official stated, *"Even in an emergency, no additional vehicles are available. This has become one of the most significant issues. There was a second vehicle, but it has now also broken down."* Sometimes, trucks break down because they are overloaded with garbage. Then it will be difficult to do the maintenance operation. That implies the vehicle cannot be repaired at any garage of our choosing. It should be maintained exclusively by the approved garage. Occasionally, it is not possible to be satisfied with the service of that garage. Due to these factors, there will be delays in the maintenance. And improper maintenance is the most significant issue among them. When the researcher arrived to interview them, four servants were waiting for the vehicle that had been dispatched for repairs.

Solid waste management is one of the major challenges in the context of Sri Lanka as a developing nation and daily waste management challenges involve 10 to 50 metric tons in several urban regions (Saja, Zimar & Junaideen, 2021). Though some problems are facing BUC when collecting solid waste in the residential area they are planning to implement some initiatives. One of the major questionable areas is the waste-collecting plan of the BUC. Even though there is a waste collecting plan at BUC, it is not implemented properly. Sudden meetings are arranged for waste-collecting servants, and it collapses the waste-collecting plan for the entire day. The administration officer's view on this is, *"Actually, we are not currently carrying out our responsibilities in a planned manner. We only have a newly built basic structure and are still working on it. Due to a lack of a sufficient waste collection plan, the same garbage collectors are required to cover different locations that are not assigned to them in different ways."* Further, they said that *"No specific roots have been given to*

recognized servants." According to the requirements, they must cover a variety of roots with which they are unfamiliar. However, if they cover the same root every day, they will be able to become acquainted with the people in the region and will be satisfied with the service." There is a need for a proper waste management plan for BUC and active participation of the people who are living in the residential area.

Garbage collectors are the ones who engage with the hardest part of the waste management process. They are facing several issues when performing their duties and those issues critically impact their work-life satisfaction. There is a lack of demand for the occupation of waste collectors. Therefore, there is a labor deficiency in this carder. Though there are visibilities of misconducting behaviors among existing laborers' UC is reluctant to address them due to this problem of labor deficiency. If UC addressed those laborers become penalized. As a result of that employee, absenteeism will occur. Finally, all the negative consequences have to bear by the citizens in the UC area. One officer mentioned, *"Normally, two garbage collectors and a driver are assigned to a single root. Unless both garbage collectors report to duty, the driver will be unable to perform service on his own. Then UC will be burdened with an unneeded weight."* Unavailability of the required workforce and also improper attendance of existing laborers create several issues for managing solid waste.

After getting the payment for around one week they are not reporting to their duties. However, some workers are not reporting at all; in such a case we have to go to their homes and ask them to come to work. Another primary reason for the demotivation of reporting to work is health-related issues. Since they are dealing with waste trough out the day UC is providing gloves, boots, masks, and helmets for their safety. Due to high temperatures, they randomly use them. Finally, that neglecting behavior ended up in health-related problems. Most of the garbage collectors are working under the influence of liquor. They are thinking that unless they use alcohol, they do not have enough capacity to deal with waste. They believe that alcohol usage is an acceptable practice since they are dealing with very unpleasant waste. There are some bad experiences in history due to the bad behaviors of waste collectors. *"A few years ago, a drunken waste collector had met with an accident and passed away."* Because of this, the activities of garbage collectors are beyond the control of UC, and they damage the proper functioning of the SWM process.

There are some issues with the transportation of SWM in Boralessgamuwa UC. Mainly due to the deficiency of vehicles and inefficient maintenance problems of vehicles. In some situations, vehicles are broken down, because of overloading waste that cannot bear by the vehicles. Can be seen numerous problems related to repair and maintenance. *"There are no additional vehicles to use even in an emergent situation."* The procedure of vehicle repair and maintenance is not easy. There are some internal controls for this process. Garbage collectors cannot repair the vehicles from any garage as they wish. They should necessarily be maintained from the authorized garage itself. On one hand, this procedure avoids the misuse of public resources, on the other hand, there can be seen huge delays in the process which badly impact the smooth function of waste collection. In addition to that lack of a proper maintenance crew in the UC become a vital issue for them. If so, they can reduce the delays in garbage collection to some extent. Due to these reasons, garbage collectors are waiting in the yard in UC very relaxed as the issue is beyond their control.

To improve the SWM process another most important party is people who are living in the residential area. The most common problem raised by the respondents is lacking enough space on their land to dispose of waste. The most feasible solution for this is to depend on the SWM service of BUC. Another very common problem identified from there is no proper collection

of waste by UC as per the interviews. We can be able to recognize that residential houses situated very near to the UC are not facing many problems if UC is not collected, they can complain very quickly and get the work done. People who live far away from the UC areas are severely impacted by this problem.

"When the garbage isn't collected, we have a lot of problems." Because we don't have an appropriate spot to deposit waste, we have no choice but to wait for the waste collection servants to arrive. However, because they do not appear in the movements, we have a negative attitude about them. We, too, have an antagonistic feeling against the city council."

As Boralessgamuwa is an urbanized area, most of the houses have limited space to dispose of the waste gathered daily. Because of this reason, that kind of resident must only be dependent on the waste-collecting service of the urban council. Because of this reason, delays of the waste collecting servants create many difficulties for them. Further climate changes also affect to provide the waste collection service. If it rained, there happen many difficulties in collecting the waste. However, the servants stated that they are willingly conducting their work in any environmental situation. Most of the waste-collecting servants in the sample had years' experience in this occupation. Therefore, they said that they are familiar with such things. According to the existing literature also, it can be concluded that most local governments face challenges when it comes to managing solid waste. The most common hurdles to solid waste management in Sri Lankan local governments include a lack of collaboration and public participation, insufficient money, outdated technology, a lack of infrastructure facilities, and a shortage of land for garbage disposal. The findings of the current study also align with some literary findings. In contrast, during the current study, it was recognized some specific challenges such as,

Conclusion and Recommendations

Developing countries should create area-specific solutions to their difficulties with Municipal Solid Waste Management despite their poverty. When the ideas of the respondents who made up the sample were considered, every single one of them had good thoughts about trash management in the Boralessgamuwa metropolitan council. Despite some issues with Solid Waste Management procedures, it was able to disclose that the overall status of the Boralessgamuwa urban council is favorable. The activities that demonstrate the current state of trash management in the Boralessgamuwa city council are training programs, servant monitoring projects, health programs for waste collection servants, citizen awareness initiatives, and waste collection performance evaluation programs. This article's purpose is to outline the challenges Sri Lankan local government organizations face in managing their solid waste, with a focus on the Boralessgamuwa Urban Council. Accordingly, several challenges were able to identify as a result of conducting this study. There are issues with the Boralessgamuwa urban council's rubbish collection plan being properly implemented. It was discovered in this investigation under the heading of structural issues. In the Boralessgamuwa urban council, several issues relating to servants have been highlighted. Those issues include demotivation of servants, labor shortages, lack of facilities, poor attendance, health issues, and labor misbehavior. Vehicle deficiencies and maintenance issues have been noted as Transportation-related issues. The biggest issue found concerning the people was the lack of waste collection by waste collection servants.

To make garbage management more efficient in local governments, citizens and collecting servants will be the most significant resources. More than half of the problem m will be solved if they are made aware of the importance of trash management. Both citizens and servants should be assembled in one location and allowed to exchange ideas and issues, as well as

solutions. It is preferable to carry out this program under the supervision of waste management officers. The officers who are a part of the decision-making process will then be made aware of the real issues. The researcher proposes that the municipal council use all the people's thoughts and suggestions for garbage management. Trash collection employees should be actively involved in waste management decisions. The researcher personally felt the developed and realistic solutions they have regarding the matters that the higher authorities are trying to fix throughout time when conducting interviews with the waste-collecting personnel. Waste collection officers should be motivated. They should be given adequate physical resources. For example, an office space where they can stay, fans, and recreational facilities, among other things. Recruiting garbage collection workers should be a priority. This is an issue that the government should address. One of the sample's responder officers proposed enlisting the help of police officers to deal with contentious situations while conducting rubbish collection services. To address the issue of demotivation among waste collection workers, motivational activities should be held regularly. Because the vehicle maintenance service has some inefficiencies, it should be employed much more competitive techniques rather than calling for quotations, and approved maintenance sites should be enlarged as much as feasible. Moreover, local governments should be provided with a suitable number of vehicles of the required quality, as well as additional vehicles for use in an emergency. Further, it should be stressed to the public that no discrimination is made against them when providing this service, regardless of their level of power. It was possible to pinpoint the challenges that garbage collection personnel have when going about their work.

Limitations

Because it only investigated the Boralesgamuwa Urban Council, the study had a limitation in terms of generalizing its conclusions. Researchers in the future can duplicate the study in a variety of circumstances to gain a broader understanding. The researchers were only able to acquire the voluntary cooperation of 20 respondents due to accessibility concerns throughout the data collection. Future researchers are invited to enlist the help of more people to corroborate the reliability of the research.

References

- Ayilara, M. S., Olanrewaju, O. S., Babalola, O. O., & Odeyemi, O. (2020). *Waste management through composting: Challenges and potentials*. Sustainability, 12(11), 4456.
- Chathumani, D., Singhe, D. W., & Gunarathna, I. (2019). *Decades to Accumulate, Seconds to fall : A Case Study on Meethotamulla Garbage Dump Collapse in Sri Lanka. April 2017, 2017–2020*.
- Chen, Y., Xu, Y., & Wang, K. (2020). Spatial Classification and Environmental Treatment Protocols of Solid Waste Sources—A Case Study of Shengzhou, China. Sustainability, 12(9), 3594.
- Creswell, J.W. (2013), *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, Sage publications, Thousand Oaks, California.
- Fernando, R. L. S. (2019). *Solid Waste Management of local governments in the Western Province of Sri Lanka: An implementation analysis*. Waste management, 84, 194-203.
- Glawe, U., Visvanathan, C. & Alamgir, M., 2005. *Solid Waste Management in the least Developed Asian Countries-A Comparative Analysis*. s.l., s.n., pp. 5-7.

- <http://www.ft.lk/2013/09/13/future-of-hambantota-as-a-hub-progress-sofar-and-unfolding-new-opportunities/>
- http://www.worldbank.org/urban/solid_wm/erm/Annexes/US%20Sizes/Annex%20B.3.pdf
- http://www.worldbank.org/urban/solid_wm/erm/CWG%20folder/conceptualframework.pdf
- <https://www.scsengineers.com/wp-content/uploads/Wisconsin-Department-of-Natural-Resources-Waste-Characterization-Study-Reveals-Increase-in-Food-Waste-and-Opportunities-for-Waste-Reduction-Waste-Advantage-Magazine.pdf>
- <https://www.parliament.lk/uploads/documents/researchjournals/prj-1-3-2013.pdf>
- Laor, P., Suma, Y., Keawdunglek, V., Hongtong, A., Apidechkul, T., & Pasukphun, N. (2018). Knowledge, attitude, and practice of municipal solid waste management among highland residents in Northern Thailand. *Journal of Health Research*.
- Mackee, J. O. (2001). *Environmental Assessment In Sri Lanka: Its Status And The Potential For The Introduction Of Strategic Environmental Assessment*. *Journal of Environmental Assessment Policy and Management*, 209-240.
- McDougall, Forbes & White, Peter & Franke, Marina & Hindle, Peter. (2001). Integrated Solid Waste Management: A Life-Cycle Inventory. *The International Journal of Life Cycle Assessment*. 6. 10.1007/BF02978794.
- Munasinghe, J. (2018). *Policies and issues in urban development in Sri Lanka: an examination of the inter-domain gaps*. *Policies and issues in urban development in Sri Lanka: an examination of the inter-domain gaps*. September 2014. <https://doi.org/10.4038/sljss.v35i1-2.7298>
- Nanda, S., & Berruti, F. (2021). Municipal solid waste management and landfilling technologies: a review. *Environmental Chemistry Letters*, 19(2), 1433-1456.
- Saunders, M., Lewis, P., and Thornhill, A. (2012), *Research Methods for Business Students*, 6th ed., Prentice Education, London.
- Saja, A. M. A., Zimar, A. M. Z., & Junaideen, S. M. (2021). Municipal solid waste management practices and challenges in the southeastern coastal cities of Sri Lanka. *Sustainability*, 13(8), 4556.
- Sharholly, Arvind & Singh, S. & Singh, G & Gupta, Prabhat. (2011). Sustainable municipal solid waste management in the low-income group of cities: A review. *Tropical Ecology*. 52. 123-131.
- Sujauddin, Mohammad & Huda, Syed & Hoque, A.T.M. (2008). Household solid waste characteristics and management in Chittagong, Bangladesh. *Waste management (New York, N.Y.)*. 28. 1688-95. 10.1016/j.wasman.2007.06.013.
- Tripathi, A., Tyagi, V. K., Vivekanand, V., Bose, P., & Suthar, S. (2020). *Challenges, opportunities, and progress in Solid Waste Management during the COVID-19 pandemic*. *Case Studies in Chemical and Environmental Engineering*, 2, 100060.
- Taherdoost, H. (2016). Sampling methods in research methodology; how to choose a sampling technique for research. *How to Choose a Sampling Technique for Research (April 10, 2016)*.

- Vongdala, N., Tran, H. D., Xuan, T. D., Teschke, R., & Khanh, T. D. (2019). Heavy metal accumulation in water, soil, and plants of a municipal solid waste landfill in Vientiane, Laos. *International journal of environmental research and public health*, 16(1), 22.
- Visvanathan, C. and Glawe, U. (2006) Domestic Solid Waste Management in South Asian Countries. A Comparative Analysis. 3 R South Asia Expert Workshop, Kathmandu, 30 August-1 September 2006.
- Vitharana, A.D. (2016). Solid Waste Management In Hambantota Municipal Council, Sri Lanka: Current Practices, Challenges, and Prospects.
- Vidanaarachchi, Chandana & Yuen, Samuel & Pilapitiya, Sumith. (2006). Municipal solid waste management in the Southern Province of Sri Lanka: Problems, issues, and challenges. *Waste management* (New York, N.Y.). 26. 920-30. 10.1016/j.wasman.2005.09.013.
- Yukalang, Nachalida & Clarke, Beverley & Ross, Kirstin. (2018). Solid Waste Management Solutions for a Rapidly Urbanizing Area in Thailand: Recommendations Based on Stakeholder Input. *International Journal of Environmental Research and Public Health*. 15. 1302. 10.3390/ijerph15071302.