R4D PROJECT:

CHALLENGES OF MUNICIPAL WASTE MANAGEMENT: LEARNING FROM POST-CRISIS INITIATIVES IN SOUTH ASIA

PROJECT WORKING PAPER #5

WASTE PRACTICES IN DEHIWALA-MOUNT LAVINIA MUNICIPAL COUNCIL AND BORALESGAMUWA URBAN COUNCIL AREAS, SRI LANKA: A PRELIMINARY STUDY OF SELECTED URBAN WARDS

AUTHORS: NISHARA FERNANDO,MALITH DE SILVA

SOCIAL POLICY ANALYSIS AND RESEARCH CENTRE
UNIVERSITY OF COLOMBO

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AUTHORS: Nishara Fernando, Malith De Silva

CO-EDITORS: René Véron, Pia Hollenbach

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LIST OF ABBREVIATIONS

BUC	Boralesgamuwa Urban Council
CPHI	Chief Public Health Inspector
DMMC	Dehiwala – Mt. Lavinia Municipal Council
GN	Gramasewa Niladari Division
MoH	Medical Officer of Health
PHI	Public Health Inspector
SARS COV-2	Severe Acute Respiratory Syndrome Corona Virus 2
SWMD	Solid Waste Management Department
SWMEPSC	Solid Waste Management & Environment Protection Standing Committee

1. Introduction

The Department of Sociology of University of Colombo conducted a household survey in selected wards of the Dehiwala-Mt. Lavinia Municipal Council (DMMC) and Boralesgamuwa Urban Councils (BUC). It was conducted as part of the project "Challenges of Municipal Solid Waste Management - Learning from Post Crisis Governance Initiatives in South Asia" funded by the **Swiss Programme for Research on Global Issues for Development (r4d programme).** The survey explored the waste management practices of households of the wards; focusing on waste generation, composition, segregation and disposal, waste collection activities of the local councils, the impact of the collapse of the Meethotamulla dumping site and the spread of SARS COV 19 virus. The following sections of the report discuss the findings of the survey.

1.1 Objectives

The key objective of the survey is to gain a comprehensive understanding about waste management activities of households located in selected wards of the DMMC and BUC in the Colombo district. The specific objectives are given below.

- To understand the waste generation patterns, management and disposal of waste among households and the services offered by the waste management divisions of the local councils.
- To explore the impact of the collapse of the Meethotamulla dumping site on waste management practices of households.
- To comprehend the impact of the spread of SARS-COV-19 on waste management practices of households.

1.2 Locations

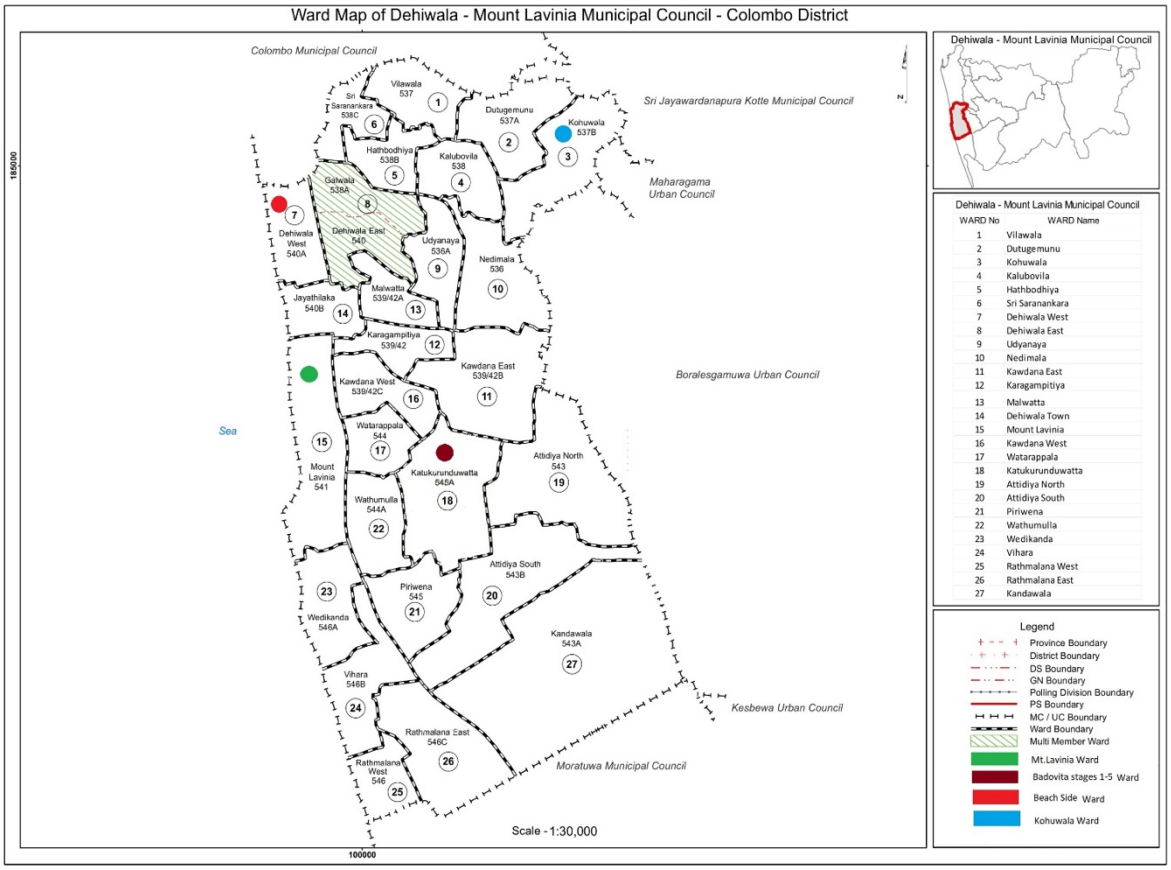
Dehiwala Mt. Lavinia Municipal Council (DMMC)

Dehiwala –Mt. Lavinia Municipal Council (DMMC) is the second largest municipal in the country after the Colombo Municipal Council. The Municipal Council is located in the Colombo District, the most populated district in Sri Lanka (Dehiwala-Mt. Lavinia Municipal Council, n.d.). The municipal council area provides residence to over 889,000 citizens and the ethnic composition of the area is 70% Sinhalese, 15% Sri Lanka Moor, over 11% Tamil

and nearly 4% other groups such as Burgher (Dehiwala-Mt. Lavinia Municipal Council, n.d.).

DMMC is one of the oldest municipal councils in Sri Lanka and achieved its municipal status in December 1959.The administrative area has changed over time starting from 16.3 Sq. Km in 1937 with 6 wards[1] , 19 wards in year 1959 and finally in 1967 29 wards as it exists today was delineated to the municipal council area (Wijepala, 2003, p. 2).

Map 01. Ward map of Dehiwala – Mount Lavinia Municipal Council



Source: DMMC, 2013

[1] A "ward" is an Electoral Area of a given Local Council delineated by the National Delamination Committee established by Local Council Election Ordinance of 1947.

The Municipal Council area consist of two major cities: Dehiwala city and Mt. Lavinia city area. Dehiwala City is controlled under the Dehiwala Divisional Secretariat which has an administrative area of 8.71square kilometers (Divisional Secretariat of Dehiwala, n.d.). The Dehiwala city area lies alongside the AA002 Galle Road (one of the major highways in Sri Lanka). This location has contributed to the rapid growth of the city, which is a highly urbanized and commercialized. The city also houses the largest zoological garden of South Asia and one of the major hospitals in Sri Lanka: the Colombo South Teaching Hospital (Divisional Secretariat of Dehiwala, n.d.) Mt. Lavinia is the second major city area of the municipal council the specific characteristics of the city is discussed in the section 1.3.3.

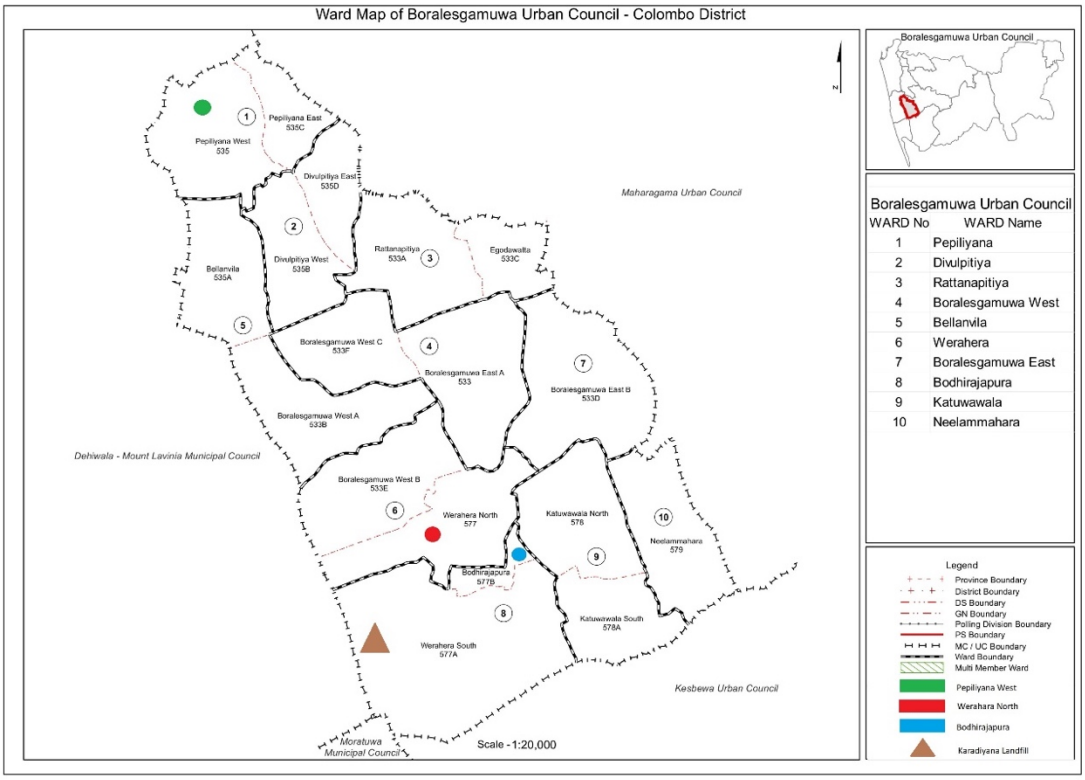
Boralesgamuwa Urban Council Area

Boralesgamuwa Urban Council (BUC) is a relatively new local council, established on 15th of April 2006 by Special Gazette notification 1426/15 issued by the Government of Sri Lanka (Kesbawa Urban Council, n.d.). BUC spans through an area of 13.5 Square Kilometers and has 10 wards. The Urban Council area is a developing suburb of the Colombo city, and it houses large amount of residential areas and commercial buildings.

The local council area has a population of 62,545 inhabitants (Boralesgamuwa Urban Council, n.d.). The BUC area houses the Karadiyana open dumping site, one of the major dumping site in Colombo district. The unsanitary landfill is used by six local councils, including BUC and DMMC. [2]

[2] The other local councils using the Karadiyana site are Moratuwa Municipal Council, Sri Jayawardanepura Kotte Municipal Council, Maharagama Urban Council, Panadura Urban Council and Kesbewa Urban Council (EFL, 2016).

Map 02. Ward map of Boralesgamuwa Urban Council



Source: Survey Department of Sri Lanka, 2013

1.2.1 Current municipal waste management mechanism

This section briefly discusses the waste management mechanism of the local council referring to its institutional architecture, responsibilities and activities. For further information on the waste management infrastructure of the two local councils please refer to Fernando, Silva & Véron (2020a) and Fernando & Silva (2020b).

The formal waste management activities of the DMMC is managed and supervised by the Solid Waste Management & Environment Protection Standing Committee (SWMEPSC) established under the Solid Waste Management Division of the Council. The Committee is headed by the Deputy Commissioner and the other members include Medical Health Officers of the Dehiwala and Rathmalana divisions, Additional Medical Health Officials, Ayurveda Doctors, the Chief Public Health Officer, Public Health Officers, and Health Education Officers, Development Officers (Waste Projects) and Labourers (Dehiwala-Mt. Lavinia Municipal Council, n.d.).The responsibilities of the Solid Waste Management Division are waste collection and

transportation services, public health activities (dengue prevention, mitigation and awareness activities), road sweeping, and public awareness on waste separation (Fernando et al, 2020a).

Similarly in the Boralesgamuwa Urban Council the waste management mechanism is managed by the Solid Waste Management Committee. The Committee is headed by the chairman of the Urban Council and the other members of the committee are Secretary of the council, Public Development Officer, Public Health Officer, Assistant Manager, Project Supervisor, Health Controller, Drivers of waste collection vehicles and waste Collection Labourers (Fernando et al, 2020).

Waste Collection, Intermediate Management and Disposal

The waste collection, intermediate management and the final disposal of the two local councils are similar in nature. They provide door-to-door waste collection to their residents. Since 2015, DMMC and BUC have introduced domestic waste segregation. Accordingly, waste generated at the households should be segregated into bio-degradable and non-biodegradable waste. The residents ought to collect waste into separate polythene bags and hand them over to the collection trucks of the local councils on designated days. Biodegradable waste is collected on two designated days a week and non-biodegradable waste on two other days (Fernando et al, 2020). The overall waste generation in the DMMC was 170 metric tons per day in 2016 (Fernando et al, 2020 p. 24). According to Kariyawasam et al. (2019), over 29 tons of polythene and plastic waste is generated in the DMMC area on a daily basis. Waste generation rates of the BUC are significantly less than in the DMMC. The daily waste generation rate of BUC is approximately 34 tons (BUC, 2018).

The DMMC has two small-scale recycling centers and a bio-gas center owned and operated by the local council. One of the recycling centers is located in Badovita, a low-income settlement. The recycling center was established in 2000 by the SEVANATHA non-governmental organization as a community-based waste management project (SEVANATHA, 2002 p.1). The recycling center was mainly established to collect waste from the five stages of the Badovita relocated community.

However, the recycling center does currently not collect waste from the settlement but a small percentage of recyclable waste from other areas of the local council is brought there. The other recycling center was established under a DMMC project in Srigal Mawatha (Wijepala, 2003 p.23). In addition, to the two recycling centers, the municipal waste workers segregate the economically viable wastes, which they later sell to informal waste workers to gain an additional income (Fernando et al, 2020).

The majority of waste generated in the local councils is disposed at the Karadiyana open dumping site, which is managed by the Western Province Waste Management Authority (Fernando et al, 2020). The dumping site was established in 1996 in the riverine flood plain of the Weras River. The dump, spreading across 15 hectares, has two active dumping areas referred to as “Site A” and “Site B”. The waste brought from seven local councils to Karadiyana currently amounts to 500-600 tons a day on average. It is estimated that approximately 3 million tons of waste has been disposed to the site over more than 20 years (Karunarathne et al, 2018).

1.3 Methodology

1.3.1 Type of data

The survey collected primary and secondary data from selected wards of DMMC and BUC. As the study sought to comprehend the waste management practices of households secondary data was used to obtain an overview and a general understanding of MSWM in the selected locations. Primary data was collected to look more specifically at waste composition and current waste management practices (including segregation and disposal) at the household level and at the challenges experienced by residents.

In accordance with the objectives, the survey collected qualitative and quantitative information from the respondents. Apart from demographic information, the quantitative data relates to waste generation. waste segregation, disposal and management practices. The qualitative data provides details on experienced problems, opinions on efficiency, the impact of the collapse of the Meethotamulla dumping site and the impact of the SARS-COV19 pandemic on waste management.

1.3.2 Research Method

The survey method was deemed the most suitable method to be used for this study. The method permitted the research team to collect primary data from a large number of respondents (600) efficiently. It enabled the simultaneous collection of qualitative and quantitative data from respondents.

1.3.3 Data Collection

Review of secondary data

The review of secondary data consisted of a document analysis. Specific data on existing waste management systems, practices, waste generation and the composition of waste was gathered from the review.

Primary Data Collection Technique

- ***Questionnaire with residents***

A questionnaire was administered to the selected sample of residents living in DMMC and BUC. The questionnaire included close and open-ended questions that covered dimensions such as cleanliness, waste management, disposal, waste collection, issues, impact caused by the collapse of the Meethotamulla dumping site and the impact of SARS-COV-19 pandemic on MSWM.

The questionnaire was originally developed in English language and was revised and coordinated with the members of the r4d project team. Once the revisions were fully incorporated, the questionnaire was translated to Sinhala language and printed.

Sample Selection Criteria

The sample was selected using a mixed sampling method. This method was utilized as the research team intended to collect data from different income groups of the selected municipal councils. These income groups were;

1. Low income earning residents
2. Middle income earning residents
3. High income earning residents

As the research team did not possess data on the income of residents, the officials of the local councils were invited to propose sample locations that align with the above-mentioned income categories. Once the local councils suggested the wards, the research team conducted a preliminary investigation of the locations and eventually chose the study sites. In the DMMC area, we selected city areas, such as Mt.

Lavinia and the Kohuwala, the Station Road middle income community, the Badovita relocated low-income community, the Beach side coastal low-income community of illegal squatters from DMMC. In BUC, we chose the high-income gated community, the Werahara North middle-income GN division and the Bodhirajapura low-income area. (see Table 1.1).

Table 1.1 Selected study sites

Local Council	Selected locations
Dehiwala-Mt. Lavinia Municipal Council	**High income earning areas**
	1. Mt. Lavinia City Limit
	2. Kohuwala
	Middle income earning areas
	1. Station Road – Land Side
	Low income earning areas
	1. Badovita stage 1-5
	2. Beach Side - Station Road
Boralesgamuwa Urban Council	**High income earning areas**
	1. Papiliyana West (Keels Housing)
	Middle income earning areas
	1. Werahara North
	Low income earning areas
	1. Bodhirajapura

Brief account of selected locations

- **Mt. Lavinia City** - Mt. Lavinia is the second major city area of the municipal council. The city area is mostly a residential suburb, similar to Dehiwala City. It lies alongside the Galle Road. The researchers selected condominiums situated in the city center for the study.
- **Kohuwala** - Kohuwala is a highly urbanized suburb of the Colombo district. The city is home to a large number of condominiums and high-rise buildings. The residential areas in the very center of the city was selected for the study.
- **Station Road** – Station Road is a middle-income community located in the Dehiwala city limits. The area is a collection of middle-income residential suburbs.
- **Badovita** - Badowita is a low-income community that was formed to house 1140 families that were displaced as a result of the Greater Colombo Flood Control and Canal Development project implemented in 1990 (SEAVANATHA,2002. P. 1). Initially, the DMMC did not manage solid waste generated within the 5 stages of the low income settlement as the residents of Badovita did not pay Assessment tax to the council (SEAVANATHA, 2002. P. 1). As a result of this situation the cleanliness and hygiene within the community reduced drastically. In this context, the United Nations Development Programme established the Badovita community waste management project in 2000 with the support of SEAVANATHA, a local non-governmental organization (Wijepala, 2003). Unfortunately, this project is currently inactive and the DMMC has begun to manage the waste generated within the community.
- **Beachside** – The Beachside area is a coastal low-income community located near Dehiwala city. The neighborhood is made up of illegal squatters who are living on the land owned by the Railway Department of Sri Lanka. The DMMC does not collect waste generated in the community (Roar, 2016).
- **Pepiliyana West** (gated housing scheme) - The gated housing scheme is a high-income gated community located within the Pepiliyana West ward of the Boralesgamuwa Urban Council area.

- **Werahera North** - The location is a middle-income suburban ward of the Boralesgamuwa Urban Council which houses important administrative, educational and health facilities such as the Department of Motor Traffic, the General Sir John Kothalawala Defence University Hospital and the General Sir John Kothalawala Defence University.
- **Bodhirajapura** - Bodhirajapura is a low-income settlement located. The statistics of Boralesgamuwa Urban Council (2018) reveal that Bodhirajapura has the highest number of Samurdhi[3] recipients (low-income families) in the council area.

Sample Size

The sample size was pre-determined by the research team. Six hundred respondents were equally divided between the two local councils.

- Dehiwala-Mt. Lavinia Municipal Council - 300 respondents
- Boralesgamuwa Urban Council - 300 respondents

The sample selection criteria within the selected locations was based on the previous research experiences and observations of the researchers. The researchers had conducted multiple research activities within the DMMC and BUC areas on municipal solid waste management and other research topics. These activities revealed that the low-income communities of the local councils experience more issues and challenges compared to middle income and high-income settlements. Accordingly, the researchers decided to select the larger portion of the sample from the low-income settlements and to select the respondents from the middle- and high-income settlements.

Primary Data collection

Primary data collection was carried out by trained research assistants. Prior to the initiation of the data collection process, the research assistants were trained at a

[3] The 'Samurdhi' (or Prosperity) Programme was launched in 1995 by the government of Sri Lanka as a poverty alleviation programme. The eligibility threshold was calculated to be approximately one-third of the national poverty line (Goonasekera & Gunetilleke, 2005).

workshop to familiarize themselves with the data collection tools. The data collection was carried out from the 10th of October 2020 to the 15th of December 2020. The data collection process was supervised by the co-authors. The authors decided to conduct the questionnaire with the primary waste managers of the households to obtain the most accurate data on MSWM. Each questionnaire was conducted by the research assistants for approximately 40-45 minutes.

1.3.4 Data Analysis

Both qualitative and quantitative analysis methods were applied to obtain a comprehensive understanding of the situation in the field locations. Data collected from the questionnaire was entered into the Statistical Package for Social Sciences (SPSS) after editing, cleaning and coding data. Both Univariate and Bi-Variate statistical analysis tests were applied as necessary and appropriate. These findings are presented using tables. The qualitative data collected in the survey coded by hand and were later analyzed using the thematic analysis techniques (Helene, 2012).

1.4 Challenges

The research team had to endure multiple challenges when conducting the survey. The key challenges included:

I. **Obtaining approval from the local councils**

The research team had to obtain approval from Boralesgamuwa and Dehiwala-Mt. Lavinia Municipal Councils to carry out data collection activities. After requesting for due permission officially, the research team had to wait for a period of two months until permission was granted. This delay impacted the research in multiple ways. The research team originally recruited 10 research assistants to carry out the data collection and the delay in obtaining approvals made it difficult to retain research assistants as they had other engagements.

Eventually, some research assistants left the research team and four new research assistants had to be recruited and trained to collect data.

II. Spread of SARS COVID-19 virus in the selected locations

The second wave of the COVID-19 virus spread across Sri Lanka in late June of 2020. The research team had originally planned to collect data from June to August of 2020. However, with the spread of the virus, the administration of University of Colombo issued instructions to refrain from engaging in any data-collection activities. Therefore, the research team had to further postpone data collection to the period between September and December of 2020.

III. Reluctance of some respondents to participate in the survey due to health concerns

Due to the spread of the COVID-19 virus some respondents, especially respondents living in condominiums and gated communities, were reluctant to participate in the survey. As a counter measure, the research team officially liaised with the elected members of the welfare societies and management committees of the concerned housing schemes and assured them that all health precautions recommended by the health services will be followed by the research assistants.

IV. Travel restrictions imposed by the government

The government of Sri Lanka imposed long-term travel restrictions and police curfews throughout the island as a measure to stop the spread of the virus. As a result, the research team had to temporarily halt data collection activities. We resumed the data collection activities once the restrictions were lifted. However, we faced challenges due to travel restrictions by end of November and December 2020 again. The research team carried out data entry and analysis during this period. It was difficult to supervise data entry physically

and, therefore, the authors arranged multiple Zoom meetings with the research assistants who entered the collected data into the SPSS software .

2. Socio-economic &demographic information of the respondents Introduction

This chapter discusses the demographic data collected for the study with reference to a number of factors such as ethnicity, religion, number of family members, education, and decision makers of the household, source of income, monthly income and nature of housing of the selected local councils.

2.1 Number of questionnaires conducted from each division

Table 2.1. Number of cases in the Dehiwala-Mt. Lavinia Municipal Council area

Local Council Area	Frequency	Percent	Valid Percent	Cumulative Percent
Low Income Settlements	124	41.3	41.3	41.3
Middle income Settlement	113	37.7	37.7	79.0
High Income Settlements	63	21.0	21.0	100.0
Total	300	100.0	100.0	

Source: 2021 Survey Data

From the Dehiwala Mount Lavinia Municipal Council area, the highest number of questionnaires were administered in the low-income settlements (over 41%) and the second highest amount of questionnaires were administered in the middle-income settlement amounting to nearly 38% (113) of the total number of case studies. 21% (63) of questionnaires were administered in the high-income settlements.

Table 2.2. Number of cases in the Boralesgamuwa Urban Council area

Local Council Area	Frequency	Percent	Valid Percent	Cumulative Percent
Low Income Settlement	108	36.0	36.0	36.0
Middle Income Settlement	98	32.7	32.7	68.7
High Income Settlement	94	31.3	31.3	100.0
Total	300	100.0	100.0	

Source: 2021 Survey Data

From the Boralesgamuwa Urban Council Area, the highest number of questionnaires were administered in the low-income settlement amounting up to 36% (108) of the total questionnaires. Nearly 33% (98) and over 31% (94) of the questionnaires were administered in the middle-income settlement and the high-income settlements, respectively.

2.2 Ethnicity

Table 2.3. Dehiwala-Mt. Lavinia Municipal Council area by ethnicity

Local Council Area	Sinhala	Tamil	Muslims	Burgher	Total
Low Income Settlement	104	18	1	1	124
	[4]83.9%	**14.5%**	**0.8%**	**0.8%**	**100.0%**
	[5]44.4%	66.7%	2.8%	33.3%	41.3%
Middle income Settlement	82	8	23	0	113
	72.6%	**7.1%**	**20.4%**	**0.0%**	**100.0%**
	35.0%	29.6%	63.9%	0.0%	37.7%
High Income Settlement	48	1	12	2	63
	76.2%	**1.6%**	**19.0%**	**3.2%**	**100.0%**
	20.5%	3.7%	33.3%	66.7%	21.0%
Total	**234**	**27**	**36**	**3**	**300**
	78.0%	**9.0%**	**12.0%**	**1.0%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

[4] The percentages give in the second row of the table are the Row percentages. Row percentages are calculated by dividing the count of a cell by the total sample size for that row (Research software, n.d.). The row percent here shows the proportion of respondents in a column category from among those in a given community.

[5] The percentages given in the third row of the table are the Column percentages. Column percentages are calculated by dividing the counts for an individual cell by the total number of counts for the column (Research software, n.d.). The column percentages here shows the proportion of respondents in each row from among those in the column.

From the total number of respondents of the Dehiwala-Mt. Lavinia Municipal Council area, 78% are Sinhalese, 12% are Muslims and 9% are Tamils.

Table 2.4. Boralesgamuwa Urban Council area by ethnicity

Local Council Area	Sinhala	Tamil	Muslims	Burgher	Total
Low Income Settlement	103	2	1	2	108
	95.4%	**1.9%**	**0.9%**	**1.9%**	**100.0%**
	35.8%	50.0%	20.0%	66.7%	36.0%
Middle Income Settlement	98	0	0	0	98
	100.0%	**0.0%**	**0.0%**	**0.0%**	**100.0%**
	34.0%	0.0%	0.0%	0.0%	32.7%
High Income Settlement	87	2	4	1	94
	92.6%	**2.1%**	**4.3%**	**1.1%**	**100.0%**
	30.2%	50.0%	80.0%	33.3%	31.3%
Total	**288**	**4**	**5**	**3**	**300**
	96.0%	**1.3%**	**1.7%**	**1.0%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

A significant proportion of respondents of the Boralesgamuwa Urban Council area are Sinhalese (96%) and only 4% of the respondents belong to other ethnicities such as Tamil, Muslim and Burgher.

The data reveals that a significant percentage of respondents of the two local councils are Sinhalese and a small percentage of respondents are from other ethnic communities.

2.3 Religion

Table 2.5. Dehiwala-Mt. Lavinia Municipal Council area by religion

Local Council Area	Buddhism	Hinduism	Islam	RC Christian	Non RC Christian	Total
Low Income Settlement	94	17	1	9	3	124
	75.8%	**13.7%**	**0.8%**	**7.3%**	**2.4%**	**100.0%**
	44.8%	70.8%	2.8%	50.0%	25.0%	41.3%
Middle income Settlement	74	6	23	5	5	113
	65.5%	**5.3%**	**20.4%**	**4.4%**	**4.4%**	**100.0%**
	35.2%	25.0%	63.9%	27.8%	41.7%	37.7%
High Income Settlement	42	1	12	4	4	63
	66.7%	**1.6%**	**19.0%**	**6.3%**	**6.3%**	**100.0%**
	20.0%	4.2%	33.3%	22.2%	33.3%	21.0%
Total	**210**	**24**	**36**	**18**	**12**	**300**
	70.0%	**8.0%**	**12.0%**	**6.0%**	**4.0%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

In terms of religion 70% of the respondents of the DMMC area are Buddhists devotees. 8% (24) practice Hinduism, 6% (18) of respondents are Roman Catholics and 4% (12) are Non-Roman Catholics.

Table 2.6 Boralesgamuwa Urban Council by religion

Local Council Area	Buddhism	Hinduism	Islam	RC Christian	Non RC Christian	Total
Low Income Settlement	98	0	2	0	8	108
	90.7%	**0.0%**	**1.9%**	**0.0%**	**7.4%**	**100.0%**
	35.9%	0.0%	33.3%	0.0%	61.5%	36.0%
Middle Income Settlement	93	2	0	3	0	98
	94.9%	**2.0%**	**0.0%**	**3.1%**	**0.0%**	**100.0%**
	34.1%	66.7%	0.0%	60.0%	0.0%	32.7%
High Income Settlement	82	1	4	2	5	94
	87.2%	**1.1%**	**4.3%**	**2.1%**	**5.3%**	**100.0%**
	30.0%	33.3%	66.7%	40.0%	38.5%	31.3%
Total	**273**	**3**	**6**	**5**	**13**	**300**
	91.0%	**1.0%**	**2.0%**	**1.7%**	**4.3%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

91% (273) of the respondents in the BUC area are Buddhist while only 9% of respondents follow other religions such Islam, Hinduism and Christianity.

The findings suggest that majority of the respondents of the local councils practice Buddhism and only a small percentage of respondents practice other religions. In Sri Lanka majority of the Tamils practice Hinduism which evident in these particular findings.

2.4 Education

Table. 2.7. Dehiwala Mt-Lavinia Municipal Council area by highest level of education

Local Council Area	No formal education	Primary Level education	Secondary level education	Degree Level	Post graduate level	Vocational Training	No idea	Total
Low Income Settlement	25	46	45	3	2	3	0	124
	20.2%	**37.1%**	**36.3%**	**2.4%**	**1.6%**	**2.4%**	**0.0%**	**100.0%**
	59.5%	63.0%	45.0%	5.6%	13.3%	25.0%	0.0%	41.3%
Middle income Settlement	15	21	41	26	5	3	2	113
	13.3%	**18.6%**	**36.3%**	**23.0%**	**4.4%**	**2.7%**	**1.8%**	**100.0%**
	35.7%	28.8%	41.0%	48.1 %	33.3%	25.0%	50.0%	37.7%
High Income Settlement	2	6	14	25	8	6	2	63
	3.2%	**9.5%**	**22.2%**	**39.7%**	**12.7%**	**9.5%**	**3.2%**	**100.0%**
	4.8%	8.2%	14.0%	46.3%	53.3%	50.0%	50.0%	21.0%
Total	**42**	**73**	**100**	**54**	**15**	**12**	**4**	**300**
	14.0%	**24.3%**	**33.3%**	**18.0%**	**5.0%**	**4.0%**	**1.3%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

The findings reveal that 14% of the respondents in the DMMC area do not have a formal education while over 33% have completed secondary level education and over 24% (73) have completed education up to primary level. In addition, 18% (54) have completed degree level education and 5% (15) have completed education up to postgraduate level.

Table. 2.8. Boralesgamuwa Urban Council area by highest level of education

Local Council Area	No formal education	Primary Level education	Secondary level education	Degree Level	Post graduate level	Vocational Training	No idea	Total
Low Income Settlement	12	59	35	1	0	1	0	108
	11.1%	**54.6%**	**32.4%**	**0.9%**	**0.0%**	**0.9%**	**0.0%**	**100.0%**
	75.0%	58.4%	31.3%	3.7%	0.0%	4.0%	0.0%	36.0%
Middle Income Settlement	3	20	44	11	3	16	1	98
	3.1%	**20.4%**	**44.9%**	**11.2%**	**3.1%**	**16.3%**	**1.0%**	**100.0%**
	18.8%	19.8%	39.3%	40.7%	20.0%	64.0%	25.0 %	32.7%
High Income Settlement	1	22	33	15	12	8	3	94
	1.1%	**23.4%**	**35.1%**	**16.0%**	**12.8%**	**8.5%**	**3.2%**	**100.0%**
	6.3%	21.8%	29.5%	55.6%	80.0%	32.0%	75.0 %	31.3%
Total	**16**	**101**	**112**	**27**	**15**	**25**	**4**	**300**
	5.3%	**33.7%**	**37.3%**	**9.0%**	**5.0%**	**8.3%**	**1.3%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100. 0%	100.0%

Source: 2021 Survey Data

Among the respondents of the BUC area, over 5% of respondents have not received any formal education while over 37% have received secondary level education. Nearly 34% of respondents have completed Primary education and only 9% of respondents have completed education up to degree level.

The findings suggest that a significant proportion of respondents of the study have received some form of formal education and that the respondents in middle income and high-income areas have achieved a high level of education, compared to low-income settlements. Only a small proportion of respondents have not received formal education and majority of them hail from the low-income settlements of the local council areas.

2.5 Decision maker in the household

Table.2.9. Dehiwala Mt-Lavinia Municipal Council area by decision maker of the household

Local Council Area	Husband	Wife	Jointly	Grandfather/ Grandmother	Total
Low Income Settlement	49	27	30	18	124
	39.5%	**21.8%**	**24.2%**	**14.5%**	**100.0%**
	39.2%	48.2%	33.0%	64.3%	41.3%
Middle income Settlement	55	19	32	7	113
	48.7%	**16.8%**	**28.3%**	**6.2%**	**100.0%**
	44.0%	33.9%	35.2%	25.0%	37.7%
High Income Settlement	21	10	29	3	63
	33.3%	**15.9%**	**46.0%**	**4.8%**	**100.0%**
	16.8%	17.9%	31.9%	10.7%	21.0%
Total	**125**	**56**	**91**	**28**	**300**
	41.7%	**18.7%**	**30.3%**	**9.3%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

In nearly 42% (125) of the households of the Dehiwala-Mt. Lavinia Municipal Council area, the husband is the major decision maker. Moreover, in over 30% of households, the husband and wife jointly take major decisions and majority of these households are from the middle-income Ssettlement (over 35%). In nearly 19% of the households, the wife takes major decisions. In over 9% of the households, grandparents make major decisions of the households and the majority of these households are from the low-income settlements (Over 64%).

Table. 2.10. Boralesgamuwa Urban Council area by decision maker of the household

Local Council Area	Husband	Wife	Jointly	Grandfather/ Grandmother	No idea	Total
Low Income Settlement	34	22	46	6	0	108
	31.5%	**20.4%**	**42.6%**	**5.6%**	**0.0%**	**100.0%**
	32.4%	57.9%	33.8%	30.0%	0.0%	36.0%
Middle Income Settlement	41	10	40	6	1	98
	41.8%	**10.2%**	**40.8%**	**6.1%**	**1.0%**	**100.0%**
	39.0%	26.3%	29.4%	30.0%	100.0%	32.7%
High Income Settlement	30	6	50	8	0	94
	31.9%	**6.4%**	**53.2%**	**8.5%**	**0.0%**	**100.0%**
	28.6%	15.8%	36.8%	40.0%	0.0%	31.3%
Total	**105**	**38**	**136**	**20**	**1**	**300**
	35.0%	**12.7%**	**45.3%**	**6.7%**	**0.3%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

In the Boralesgamuwa Urban Council area, major decisions are taken jointly by the family in over 45% (136) of the households. Another 35% respondents stated that the husband makes major decisions of the household and in nearly 13% of the houses the wife makes major decisions of the family.

The findings reveal that in majority of the households of the two selected local councils, major decisions are taken jointly. This finding is in line with a recent study carried out by Chandradasa, Withanage, & Ananda, (2021) carried out on women's autonomy in household purchasing decision making in Sri Lanka. The study revealed that when it comes to major decision making in households of Sri Lanka, such as major purchasing decisions and daily purchasing decisions, all most half of the households take decisions jointly.

2.6 Source of income

Table. 2.11. Dehiwala Mt-Lavinia Municipal Council area by main source of income

Total	Salaried employment	Daily Paid Labor	Self-employment	Business	Pension	Total
Low Income Settlement	42	48	4	17	13	124
	33.9%	**38.7%**	**3.2%**	**13.7%**	**10.5%**	**100.0%**
	28.4%	100.0%	28.6%	30.4%	38.2%	41.3%
Middle income Settlement	69	0	5	30	9	113
	61.1%	**0.0%**	**4.4%**	**26.5%**	**8.0%**	**100.0%**
	46.6%	0.0%	35.7%	53.6%	26.5%	37.7%
High Income Settlement	37	0	5	9	12	63
	58.7%	**0.0%**	**7.9%**	**14.3%**	**19.0%**	**100.0%**
	25.0%	0.0%	35.7%	16.1%	35.3%	21.0%
Total	**148**	**48**	**14**	**56**	**34**	**300**
	49.3%	**16.0%**	**4.7%**	**18.7%**	**11.3%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

Majority (over 49%) of households in DMMC are engaged in salaried employment. In addition, nearly 19% of respondents are engaged in business activities. In addition, 16% of the respondents are engaged in daily paid labor and all of these households are from the Low Income Settlement. Further, over 11% of respondents of the DMMC area are pensioners.

Table. 2.12. Boralesgamuwa Urban Council Area by main source of income

Location	Salaried employment	Daily Paid Labor	Self-employment	Business	Pension	Total
Low Income Settlement	30	55	2	13	8	108
	27.8%	**50.9%**	**1.9%**	**12.0%**	**7.4%**	**100.0%**
	24.8%	100.0%	14.3%	20.0%	17.8%	36.0%
Middle Income Settlement	48	0	6	27	17	98
	49.0%	**0.0%**	**6.1%**	**27.6%**	**17.3%**	**100.0%**
	39.7%	0.0%	42.9%	41.5%	37.8%	32.7%

High Income Settlement	43	0	6	25	20	94
	45.7%	**0.0%**	**6.4%**	**26.6%**	**21.3%**	**100.0%**
	35.5%	0.0%	42.9%	38.5%	44.4%	31.3%
Total	**121**	**55**	**14**	**65**	**45**	**300**
	40.3%	**18.3%**	**4.7%**	**21.7%**	**15.0%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

From the respondents of the Boralesgamuwa Urban Council Area, over 40% (121) are engaged in salaried employment and over 18% (55) are daily paid labourers and all these respondents are from the Low-Income Settlement. In addition, nearly 5% (14) are engaged in self-employment activities. 15% (45) of BUC residents are pensioners.

The findings suggest that a large percentage of the residents in the two locations are engaged in salaried employment and business activities to earn an income. All the respondents engaged in daily paid labor come from low-income settlements in both locations. This finding justifies the selection of the low-income settlement in DMMC and the low-income settlement in BUC to be studied under the study as a large portion of the residents are engaged in low income earning activities.

2.7 Monthly income

Table. 2.13. Dehiwala Mt-Lavinia Municipal Council area by monthly income

Location	Low income class	Middle income class	High income class	Total
Low Income Settlement	114	10	0	124
	91.9%	**8.1%**	**0.0%**	**100.0%**
	100.0%	7.8%	0.0%	41.3%
Middle income Settlement	0	96	17	113
	0.0%	**85.0%**	**15.0%**	**100.0%**
	0.0%	74.4%	29.8%	37.7%
High Income Settlement	0	23	40	63
	0.0%	**36.5%**	**63.5%**	**100.0%**
	0.0%	17.8%	70.2%	21.0%
Total	**114**	**129**	**57**	**300**
	38.0%	**43.0%**	**19.0%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

According to the monthly income of the respondents of the DMMC area, 38% (114) belong to the lower income class, of which all hail from the Low Income Settlement. Further, 43% (129) of respondents belong to the middle income class.19 % (57) of respondents belong to the high income class.

Table 2.14 Boralesgamuwa Urban Council area by monthly income

Location	Low Income Class	Middle Income Class	High Income Class	Total
Low Income Settlement	97	11	0	108
	89.8%	**10.2%**	**0.0%**	**100.0%**
	90.7%	11.3%	0.0%	36.0%
Middle Income Settlement	10	84	4	98
	10.2%	**85.7%**	**4.1%**	**100.0%**
	9.3%	86.6%	4.2%	32.7%
High Income Settlement	0	2	92	94
	0.0%	**2.1%**	**97.9%**	**100.0%**
	0.0%	2.1%	95.8%	31.3%
Total	**107**	**97**	**96**	**300**
	35.7%	**32.3%**	**32.0%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

According to the monthly income of the respondents of the BUC, nearly 36% (107) belong to the low-income class. Over 32% of the respondents belong to the middle-income Settlement and nearly 32% (96) of respondents belong to the high-income class.

3. Municipal Solid Waste Management in the selected locations

This chapter discusses the status of waste management in the two selected local council areas; the Dehiwala - Mt. Lavinia Municipal Council and the Boralesgamuwa Urban Council. It explores the dimensions of cleanliness, reasons for cleanliness or unclean nature of the neighbourhood, satisfaction of residents pertaining to the waste management activities, waste management mechanisms including collection, segregation and disposal. Nevertheless, it is important to keep in mind that these two local councils have completely different characteristics as discussed in the previous section. They have differences in

population, land mass income groups, facilities available to the local councils, waste management capabilities of the local councils etc.

When analyzing data in the proceeding chapters the authors initially utilized the locations or the settlements as the independent variable. This study uses settlement category or income class as the independent variable. The data presented in the following chapters were also tabulated using religion, ethnicity and the highest education level as the independent variable. However, the tabulations revealed that the dependent variables relating to cleanliness and solid waste practices are not significantly influenced by religion, ethnicity or education level.

3.1 Cleanliness of the Neighborhood

The findings suggest that majority of the respondents in the two local councils were satisfied with the overall cleanliness in their areas. The responses provided by the respondents are depicted in the following tables.

Table 3.1. Boralesgamuwa Urban Council area by opinion on Cleanliness of the neighborhood

Location	Clean	Dirty	Total
Low Income Settlement	96	12	108
	88.9%	**11.1%**	**100.0%**
	35.8%	37.5%	36.0%
Middle Income Settlement	85	13	98
	86.7%	**13.3%**	**100.0%**
	31.7%	40.6%	32.7%
High Income Settlement	87	7	94
	92.6%	**7.4%**	**100.0%**
	32.5%	21.9%	31.3%
Total	**268**	**32**	**300**
	89.3%	10.7%	100.0%
	100.0%	100.0%	100.0%

Source: 2021 Survey Data

Over 89% (268) of the total respondents from the Boralesgamuwa Urban Council area stated that their neighbourhood is clean. Nearly 11% (32) of respondents felt that their neighbourhood is unclean. Nevertheless, the respondents who stated that the neighbourhood is clean are almost equally divided between all the local council areas.

Table 3.2 Dehiwala-Mt. Lavinia MC area by opinion on cleanness of the neighborhood

Location	Clean	Dirty	Total
Low Income Settlement	100	24	124
	80.6%	**19.4%**	**100.0%**
	41.2%	42.1%	41.3%
Middle income Settlement	87	26	113
	77.0%	**23.0%**	**100.0%**
	35.8%	45.6%	37.7%
High Income Settlement	56	7	63
	88.9%	**11.1%**	**100.0%**
	23.0%	12.3%	21.0%
Total	**243**	**57**	**300**
	81.0%	19.0%	100.0%
	100.0%	100.0%	100.0%

Source: 2021 Survey Data

81% (243) of the total respondents from the Dehiwala-Mt. Lavinia Municipal Council area stated that their neighbourhood is clean. 19% (57) stated that their neighbourhood is unclean.

The respondents of the two local councils mentioned factors that contribute to the cleanliness of their neighbourhood. A majority (over 53%) of respondents from the Dehiwala-Mt. Lavinia Municipal Council area, ascribed the cleanliness of their area to proper waste management practices of the residents. Meanwhile over 41% stated that cleanliness is a result of systematic collection of waste by the Municipal Council. 6% stated that the increased concern of residents about the spread of Dengue fever and the preventive measures adopted by the residents and the local councils.

It is interesting to see how the residents living in both locations identify that keeping the neighborhood clean is a responsibility of the community. In DMMC only 41% had stated that cleanliness is a result of proper waste collection by the local authority. This is also true for the BUC. This indicates that respondents consider themselves to be the most significant stakeholders of MSWM. This should be identified as a positive trend that local councils and policy makers can capitalize on to further improve the contribution of the general public to the waste management system.

In addition, the study suggests external factors other than the nature of the waste management service, and facilities available to the local councils for MSWM. In the case of DMMC cleanliness was influenced by the spread of the dengue pandemic in the area. The Dengue pandemic has wreaked havoc in the urban and semi-urban regions of Colombo including DMMC. According to an official of the DMMC the Dengue fever spreads across the council area in the period between June to December every year (Fernando, 2016; Silva, 2006). The government and the local councils took measures to introduce new laws to prosecute public littering and to destroy breeding places of mosquitos. The Public Health Inspectors (PHI), Medical Officer of Health (MoH) and the members of the Health and Waste management committees are responsible for upholding these laws. The officers of the local council visit and observe the overall cleanliness of neighborhoods on a monthly basis with the support of the Grama Sewa Niladari, the administrative officer in charge of a given Gramasewa Niladari Division (GN). Moreover, volunteer groups visit all wards of the local council and inspect the cleanliness of the gardens and identify and destroy breeding places of mosquitos (Silva, 2006). The findings suggest that the government's decision to implement new laws have had a positive impact on the overall cleanliness of the DMMC area.

3.2 Nature of Waste Management

3.2.1 Level of satisfaction of current waste management activities

Table 3.3 Dehiwala-Mt. Lavinia Municipal Council area by satisfaction of waste management

Location	Satisfied	Dissatisfied	Total
Low Income Settlement	98	26	124
	79.0%	**21.0%**	**100.0%**
	38.9%	54.2%	41.3%
Middle income Settlement	94	19	113
	83.2%	**16.8%**	**100.0%**
	37.3%	39.6%	37.7%
High Income Settlement	60	3	63
	95.2%	**4.8%**	**100.0%**
	23.8%	6.3%	21.0%
Total	**252**	**48**	**300**
	84.0%	**16.0%**	**100.0%**
	100.0%	100.0%	100.0%

Source: 2021 Survey Data

84% (252) of the total respondents of the Dehiwala-Mt. Lavinia Municipal Council area were satisfied with waste collection in their neighbourhood. It is evident that respondents from High income settlements were the most satisfied group of respondents (over 95%) when compared to Middle income (over 83%) and Low income settlement (79%).

Majority (52%) of the total respondents from the Dehiwala-Mt. Lavinia Municipal Council area were satisfied with waste collection because the Municipal Council lorry arrives on time and collects garbage properly.12 % were satisfied because segregation of waste is carried out as organic and non-organic. 16% were dissatisfied with the tardiness of the Municipal Council lorry and, 5% complained that the Municipal Council lorry does not collect their waste.

All the respondents from the Low Income Settlement who said that they are dissatisfied with the waste collection system claimed that the waste management system has intentionally neglected cleaning the canal running through their neighourhood. The authors noticed that the canals were blocked in the Low Income Settlement because of dilapidated

banks caving into the canal and, in general, the canals are in a state of disrepair. Though not directly related to solid waste management, the authors believe that it is important to bring this issue up, as the blocked, murky and smelly canal clearly seems to impact the hygiene and health of the residents.

(48%) of the respondents from the Beach side (low income settlement) area were completely dissatisfied with waste collection as the Municipal Council did not collect waste in their area. The Beach side area comprises mostly illegal settlers who live on the beach and on land owned by the Department of Railways and DMMC. Therefore, the Beach side settlements do not have paved roads. This has made it difficult for municipal waste collectors to reach these houses. Currently, the residents are expected to carry the waste and place iton the roadside which is located around 700 meters away from the settlement to be collected by the municipal council waste trucks. The municipal council has tried, in many instances, to remove the settlers from the encroached lands with little success due to ongoing lawsuits and political influences. It will be interesting to see whether the municipal council is intentionally refraining from collecting waste in the beachside road, as a tactic to motivate residents to relocate elsewhere. This would imply that the municipal council is using waste management as a weapon.

Table 3.4 Boralesgamuwa Urban Council area by satisfaction of waste management

Location	Satisfied	Dissatisfied	Total
Low Income Settlement	90	18	108
	83.3%	**16.7%**	**100.0%**
	34.6%	45.0%	36.0%
Middle Income Settlement	89	9	98
	90.8%	**9.2%**	**100.0%**
	34.2%	22.5%	32.7%
High Income Settlement	81	13	94
	86.2%	**13.8%**	**100.0%**
	31.2%	32.5%	31.3%
Total	**260**	**40**	**300**
	86.7%	**13.3%**	**100.0%**
	100.0%	100.0%	100.0%

Source: 2021 Survey Data

Nearly 87% (260) of the total respondents of the Boralesgamuwa Urban Council area were satisfied with waste collection while over 13% (40) were dissatisfied. 78% of the

respondents from the Boralesgamuwa Urban Council area stated that they are satisfied with waste collection because the Urban Council Lorries arrive on time and collects garbage properly. 22% were satisfied because of the segregation of waste as organic and non-organic. Out of the respondents who were dissatisfied, 67% were dissatisfied with the breakdowns of the council lorry while 33% believed that the council lorry should visit more frequently.

The findings correlate with the findings of a previous study carried out on the waste management infrastructure of Boralesgamuwa Urban Council (Fernando et al, 2020. In a structured interview, an official of the BUC mentioned that the local council is struggling to provide an efficient service to the locals due to the limited number of vehicles the council has at its disposal.

“We have very limited funds, we always use lease facilities to buy new vehicles and often we don’t have enough money to maintain them. As the tractors carry toxic waste, storage compartments rust very quickly and start to leak. Because of this situation almost every day one of our vehicles breaks down and disrupts the waste collection process” (Key informant interview, April 2020).

The findings suggest that the majority of the respondents of the two local councils were satisfied with the existing waste management mechanisms. However, the findings also indicate a clear disparity in the MSWM services provided between the low income settlements and middle or high income settlements. In addition, there are concerns about the efficiency of the services and adequacy of the facilities available to the local councils. Moreover, the finding about the unclean canal affecting the lives of respondents of the Badowita low income settlement reveal that municipal waste management activities should be modified or adopted to cater to the needs of specific communities.

3.2.2 Improvements in the waste management system

Table 3.5. Dehiwala-Mt. Lavinia Municipal Council area by improvements in the past five years

Location	Yes	No	Total
Low Income Settlement	102	22	124
	82.3%	**17.7%**	**100.0%**
	44.5%	*31.0%*	*41.3%*
Middle income Settlement	81	32	113
	71.7%	**28.3%**	**100.0%**
	35.4%	*45.1%*	*37.7%*
High Income Settlement	46	17	63
	73.0%	**27.0%**	**100.0%**
	20.1%	*23.9%*	*21.0%*
Total	**229**	**71**	**300**
	76.3%	**23.7%**	**100.0%**
	100.0%	*100.0%*	*100.0%*

Source: 2021 Survey Data

Over 76% (229) of the total respondents from the Dehiwala-Mt. Lavinia Municipal Council area believe that waste collection has improved over the past five years. Respondents from the low income settlements have seen a greater improvement when compared with the Middle (nearly 72%) and (73%) High income settlements. Nearly 24% (71) of respondents stated that it has not changed. Respondents who stated there has not been a notable improvement of waste collection are high (over 28%) in the middle and (27%) high income settlements.

66% of the total respondents from the Dehiwala-Mt. Lavinia Municipal Council area believe that waste collection has improved because of the introduction of mandatory waste segregation. 23% of the respondents stated that the improvement took place due to the improvements in the waste collection activities of the Municipal Council. Another 11% stated that the improvements are a result of the hard work of waste collectors. Out of the respondents who stated that waste management has not improved, over 76% stated that the municipal council has not updated the waste management system with new technology. Majority of these respondents are from the Middle income Settlement. Nearly 24% of respondents stated that the vehicles used for waste management services still

break down often. The findings suggest that within the DMMC area the low income settlements have more improvements in waste collection over the past five years. The qualitative data collected from the respondents reveal that the frequency and the quality of waste management services offered by the local council has improved in the Badowita low income settlement. The respondents have stated that the majority of the waste workers working for the DMMC are residents of Badowita low income settlement. Therefore, the waste workers always give priority to collect waste from Badowita to avoid backlash from fellow residents. In addition, the respondents said that having a large number of waste workers from the community has allowed them to directly inform the council about their waste related needs and issues without going through officers.

These findings reveal how waste workers living i have given the residents a voice or even an ability to raise concerns with regards to the MSWM within their community. Often residents of low income settlements such as Badowita are discriminated based on their social class, education and livelihoods. This discrimination often makes them and their issues/concerns invisible to governments, officials and other income classes. This lack of voice can create issues and also increase the intensity of issues. This can be further confirmed by comparing the MSWM situation of the Badowita low income settlement to the Beachside low income settlement. As depicted in the previous table the respondents of Beachside were highly dissatisfied with the MSWM services as the council does not collect waste from their settlement. The respondents stated that over the years they have appealed to politicians and the officials of the local council without any success. It can be assumed that as the community is made up of squatters, they have become invisible to the local council. However, the Badowita low income settlement has managed to utilize the large representation in the MSWM workforce to their advantage and gain some level of visibility. This finding suggests the importance of practicing equity within the MSWM system of the local councils to provide greater representation to the disadvantaged and discriminated communities.

Table 3.6. Boralesgamuwa Urban Council area by improvements in the past five years

Location	Yes	No	Total
Low Income Settlement	76	32	108
	70.4%	**29.6%**	**100.0%**
	34.1%	41.6%	36.0%
Middle Income Settlement	73	25	98
	74.5%	**25.5%**	**100.0%**
	32.7%	32.5%	32.7%
High Income Settlement	74	20	94
	78.7%	**21.3%**	**100.0%**
	33.2%	26.0%	31.3%
Total	**223**	**77**	**300**
	74.3%	**25.7%**	**100.0%**
	100.0%	100.0%	100.0%

Source: 2021 Survey Data

Over 74% (223) of the total respondents from the Boralesgamuwa Urban Council area believe that waste collection has improved compared to the past 5 years, while over 25% (77) believe that it has not improved. Out of the respondents who stated that there is an improvement, 54% stated that the introduction of mandatory waste segregation is a key improvement.46% of the respondents stated that the improvement is a result of an increase in the number of days allocated for waste collection. The findings suggest that the Boralesgamuwa Urban Council has successfully improved its MSWM facilities in the past five years as the positive responses are divided among all localities almost equally (Low Income Settlement – over 70%, Middle Income Settlement – over 74% and Pepiliyana high income area –nearly 79%).

These findings suggest that according to the residents of the two local councils, waste management activities in their respective local areas improved in the period between 2016 - 2020. The respondents identified the introduction of mandatory waste segregation as a major improvement. This is an interesting finding as officials of the local councils mentioned that they had to endure a significant amount of resistance to segregation of waste from the residents initially in previous interviews. It would be interesting to further explore the rationale behind the initial resistance shown by the residents and how the resistance changed to identifying segregation as a positive outcome.

3.3 Waste Management at the household level

This section explores the waste management practices in households in the two selected local council areas with specific attention to waste generation, the primary waste manager and waste segregation practices.

3.3.1 Primary waste manager

Table 3.7 income classes in DMMC area by primary household waste manager

Income Class	Wife	Husband	Husband and wife jointly	Domestic worker (Maid)	Domestic Worker (Male)	Daughter	Son	Total
Low income class	94	8	7	0	0	3	2	114
	82.5%	**7.0%**	**6.1%**	**0.0%**	**0.0%**	**2.6%**	**1.8%**	**100.0%**
	46.8%	*36.4%*	*25.9%*	*0.0%*	*0.0%*	*75.0%*	*100.0%*	*38.0%*
Middle income Class	79	10	14	9	17	0	0	129
	61.2%	**7.8%**	**10.9%**	**7.0%**	**13.2%**	**0.0%**	**0.0%**	**100.0%**
	39.3%	*45.5%*	*51.9%*	*47.4%*	*68.0%*	*0.0%*	*0.0%*	*43.0%*
High income Class	28	4	6	10	8	1	0	57
	49.1%	**7.0%**	**10.5%**	**17.5%**	**14.0%**	**1.8%**	**0.0%**	**100.0%**
	13.9%	*18.2%*	*22.2%*	*52.6%*	*32.0%*	*25.0%*	*0.0%*	*19.0%*
Total	201	22	27	19	25	4	2	300
	67.0%	**7.3%**	**9.0%**	**6.3%**	**8.3%**	**1.3%**	**0.7%**	**100.0%**
	100.0%	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*	*100.0%*

Source: 2021 Survey Data

In 67% (201) of the households in the Dehiwala-Mt. Lavinia Municipal Council area, it is the wife who primarily deals with waste in the house. This is comparatively high in the low income class households (Over 82%). In 9% (27) of the households, the husband and wife jointly deal with waste. In over 8% (25) of the households it is a male domestic worker who primarily deals with the waste and it is a female domestic worker who deals with the waste in over 6% of the households. All the domestic waste workers work in Middle income and high income class households.

Table 3.8. Boralesgamuwa Urban Council Area by primary waste household manager

Location	Wife	Husband	Husband and wife jointly	Domestic worker (Maid)	Domestic Worker (Male)	Daughter	Son	Total
Low income class	94	5	4	0	0	2	2	107
	87.9%	**4.7%**	**3.7%**	**0.0%**	**0.0%**	**1.9%**	**1.9%**	**100.0%**
	44.5%	22.7%	19.0%	0.0%	0.0%	18.2%	33.3%	35.7%
Middle income Class	63	11	6	8	5	3	1	97
	64.9%	**11.3%**	**6.2%**	**8.2%**	**5.2%**	**3.1%**	**1.0%**	**100.0%**
	29.9%	50.0%	28.6%	50.0%	38.5%	27.3%	16.7%	32.3%
High income Class	54	6	11	8	8	6	3	96
	56.3%	**6.3%**	**11.5%**	**8.3%**	**8.3%**	**6.3%**	**3.1%**	**100.0%**
	25.6%	27.3%	52.4%	50.0%	61.5%	54.5%	50.0%	32.0%
Total	211	22	21	16	13	11	6	300
	70.3%	**7.3%**	**7.0%**	**5.3%**	**4.3%**	**3.7%**	**2.0%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

A majority of over 70% (211) of respondents from the Boralesgamuwa Urban Council area stated that it is the wife who primarily deals with waste in the house. This proportion is particularly high in the low-income households (nearly 88%). The husband primarily deals with waste in over 7% (22) of the households. In 7% of the cases the husband and wife jointly deal with waste; over 11%in high-income households. In over 4% (13) of the households, it is a male domestic worker who primarily deals with waste and a female domestic worker deals with the waste in another 5% of households. All of these households are from the Middle income and High income classes. In nearly 6% of the households, it is the daughter or son, who primarily deals with waste.

In the two selected local council areas, the majority of the primary waste managers are the wives of the households. This is most pronounced in low-income households . The findings suggest that waste management activities of the local councils are still closely linked to orthodox gender norms that define women as home makers and care takers. The findings identify wives as the key actor of waste management at the household level. Any activity or intervention aiming to introduce sustainable waste management in these locations

should consider wives of the households as a key stakeholder. However, it is also important to note that in a significant number of middle income and high income class households, female and male domestic waste workers carry out domestic waste management activities. This finding reveals the importance of taking the class differences into consideration when introducing waste related interventions to the local councils.

3.3.2 Waste composition

Table 3.9. Amount of organic waste generated in households per week by income classes in DMMC

Income Class	1 KG	1- 2.5 KG	2.6 -3.5 KG	3.6 - 4.5 KG	Over 4.6 KG	Total
Low income class	0	82	13	13	6	114
	0	**71.9%**	**11.4%**	**11.4%**	**5.3%**	**100.0%**
	0	36.8%	39.4%	56.5%	28.6%	38.0%
Middle income class	0	93	19	8	9	129
	0	**72.1%**	**14.7%**	**6.2%**	**7.0%**	**100.0%**
	0	41.7%	57.6%	34.8%	42.9%	43.0%
High income class	0	48	1	2	6	57
	0	**84.2%**	**1.8%**	**3.5%**	**10.5%**	**100.0%**
	0	21.5%	3.0%	8.7%	28.6%	19.0%
Total	**0**	**223**	**33**	**23**	**21**	**300**
	0	**74.3%**	**11.0%**	**7.7%**	**7.0%**	**100.0%**
	0	100.0%	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

A majority of over 74% of households in the DMMC generate 1-2.5 kg of waste per week and it is evident that these households are higher in low-income class compared to middle and high-income class. Also 11% of households produce 2.6 - 3.5 Kg of waste, these households are comparatively high (nearly 15%) in Middle income households. Nearly 8% of households produce 3.6-4.5 kg a week and a higher percentage of these house hail from the low income class households (over 11%). While 7% of the respondents stated that their households produce more than 4.6 Kgs a week, these households are comparatively high (over 10%) amongst the high income class households.

Table 3.10. Amount of organic waste generated in households per week - BUC

Location		1- 2.5 KG	2.6 -3.5 KG	3.6 - 4.5 KG	Over 4.6 KG	Total
Low income class	0	63	23	16	5	107
	0	**58.9%**	**21.5%**	**15.0%**	**4.7%**	**100.0%**
	0	42.6%	25.8%	38.1%	23.8%	35.7%
Middle income class	0	50	25	11	11	97
	0	**51.5%**	**25.8%**	**11.3%**	**11.3%**	**100.0%**
	0	33.8%	28.1%	26.2%	52.4%	32.3%
High income class	0	35	41	15	5	96
	0	**36.5%**	**42.7%**	**15.6%**	**5.2%**	**100.0%**
	0	23.6%	46.1%	35.7%	23.8%	32.0%
Total	0	148	89	42	21	300
	0	**49.3%**	**29.7%**	**14.0%**	**7.0%**	**100.0%**
	0	100.0%	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

All most half (49%) of the of households in the BUC generate 1-2.5 Kg of waste a week and compared to the middle income and high income households the higher percentage of these households are from the low income class households (nearly 59%). Nearly 30% of the households produces 2.6 - 3.5 Kg of waste and Over 14% of households produce 3.6-4.5 Kgs a week while 7% of the respondents stated that their households produce more than 4.6 Kgs a week. The findings suggest that the higher percentage of households that produce higher amounts of waste hail from the middle and high income settlements.

Table 3.11 Amount of inorganic waste generated in households per week by income classes in DMMC

Income Class	1KG	1- 2.5 KG	2.6 -3.5 KG	3.6 - 4.5 KG	Over 4.6 KG	Total
Low income class	0	111	3	0	0	114
	0	**97.4%**	**2.6%**	**0.0%**	**0.0%**	**100.0%**
	0	39.1%	42.9%	0.0%	0.0%	38.0%
Middle income class	0	119	3	3	4	129
	0	**92.2%**	**2.3%**	**2.3%**	**3.1%**	**100.0%**
	0	41.9%	42.9%	60.0%	100.0%	43.0%
High income class	0	54	1	2	0	57
	0	**94.7%**	**1.8%**	**3.5%**	**0.0%**	**100.0%**
	0	19.0%	14.3%	40.0%	0.0%	19.0%

Total	**0**	**284**	**7**	**5**	**4**	**300**
	0	**94.7%**	**2.3%**	**1.7%**	**1.3%**	**100.0%**
	0	100.0%	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

The large majority (nearly 95% -284) of the houses in the DMMC area produce 1-2.5 Kg of inorganic waste on a weekly basis. Only nearly 5% of households produce over 2.6 Kg of inorganic waste.

Table 3.12 Amount of inorganic waste collected in households per Week – BUC

Location	1- 2.5 KG	2.6 -3.5 KG	3.6 - 4.5 KG	Over 4.6 KG	Total
Low income class	102	3	1	1	107
	95.3%	**2.8%**	**0.9%**	**0.9%**	**100.0%**
	36.6%	17.6%	50.0%	50.0%	35.7%
Middle income class	88	8	1	0	97
	90.7%	**8.2%**	**1.0%**	**0.0%**	**100.0%**
	31.5%	47.1%	50.0%	0.0%	32.3%
High income class	89	6	0	1	96
	92.7%	**6.3%**	**0.0%**	**1.0%**	**100.0%**
	31.9%	35.3%	0.0%	50.0%	32.0%
Total	279	17	2	2	300
	93.0%	**5.7%**	**0.7%**	**0.7%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

In the Boralesgamuwa Urban Council area majority 93% (279) of household produces 1-2.5 Kg. Over 6% (17) of the households produced 2.6-3.5 Kg of inorganic waste. Only over 1% (4) of the households produced over 3.6 Kgs of inorganic waste. The higher percentage of house that produces more than 2.5 KG are from the Middle (over 8%) and high income households (over 6%).

The findings suggest that the vast majority of households in the two local councils produce 1-3.5 Kgs of waste approximately. Nevertheless, the large majority of households that produces a significantly large amount of waste (over 4.6 Kgs) a week are from the middle income class households of the DMMC area. This could be a result of the increase in the quality of life of the middle income households. This finding reveals that majority of the

waste accumulated in households is significantly small, which reveals the possibility of introducing household level waste management activities such as Bokashi Buckets[6] , Tumbler Method composting[7] and recycling. As the two local councils are highly populated and experience a large influx of internal migrants from rural regions, it is beneficial for the local councils to explore the possibility of introducing alternative and household level waste management activities to reduce the pressure on the MSWM mechanism.

3.3.3 Segregation

Table 3.13 Dehiwala-Mt. Lavinia Municipal Council area by segregation of waste

Income Class	Yes	No	Total
Low income class	103	11	114
	90.4%	**9.6%**	**100.0%**
	36.0%	78.6%	38.0%
Middle income class	127	2	129
	98.4%	**1.6%**	**100.0%**
	44.4%	14.3%	43.0%
High income class	56	1	57
	98.2%	**1.8%**	**100.0%**
	19.6%	7.1%	19.0%
Total	**286**	**14**	**300**
	95.3%	**4.7%**	**100.0%**
	100.0%	100.0%	100.0%

Source: 2021 Survey Data

Over 95% (286) of the respondents from the DMMC area segregate waste in their houses. Less than 5% (14) of the respondents do not segregate waste. It is evident that compared to the middle and High income class households in the DMMC low income class households have a higher percentage of households that do not segregate waste (nearly 10%).

[6] Bokashi is a fermentation technique popular in Japan food waste is turned into pre-compost. This technique is highly suitable for pre composting in small spaces (Zublin, 2018)

[7] The tumbler composting method is a mechanism which uses a fully sealed rotatable container which can be rotated to mix the composting materials (Eartheasy, n.d.)

Table 3.14. Boralesgamuwa Urban Council area by waste segregated in households

Location	Yes	No	Total
Low income class	105	2	107
	98.1%	**1.9%**	**100.0%**
	35.2%	100.0%	35.7%
Middle income class	97	0	97
	100.0%	**0.0%**	**100.0%**
	32.6%	0.0%	32.3%
High income class	96	0	96
	100.0%	**0.0%**	**100.0%**
	32.2%	0.0%	32.0%
Total	**298**	**2**	**300**
	99.3%	**0.7%**	**100.0%**
	100.0%	100.0%	100.0%

Source: 2021 Survey Data

Over 99% (298) of the respondents from the Boralesgamuwa Urban Council area segregate waste in their houses. Less than 1% (2) of the respondents, from the Boralesgamuwa Low Income class households, do not segregate waste.

The findings suggest that the large majority of respondents segregate waste at households. However, the percentage of households that segregate waste identified in the study is far higher than the official rates issued by the DMMC and the BUC in year 2019. The current study was conducted in year 2020 while the official statistics are from 2019. Therefore the discrepancy between the official statistics and the finding of the research could be a result of a drastic increase in the segregation in the period between 2019 and 2020. Another explanation could be the reluctance of residents to admit that they do not segregate waste. Nevertheless, it is important to further explore this situation to understand the factors that has cause the discrepancy.

3.3.4 Disposal

Table 3.15 income class of DMMC area by the primary method of disposal (Organic waste)

Income Class	Brought to a collection point in the neighbourhood	Brought to a collection point in the building (compound)	Collected by the local council	Burnt	Buried	Total
Low income class	0	0	110	1	3	114
	0.0%	**0.0%**	**96.5%**	**0.9%**	**2.6%**	**100.0%**
	0.0%	0.0%	40.3%	16.7%	100.0%	38.0%
Middle income class	1	5	118	5	0	129
	0.8%	**3.9%**	**91.5%**	**3.9%**	**0.0%**	**100.0%**
	100.0%	29.4%	43.2%	83.3%	0.0%	43.0%
High income class	0	12	45	0	0	57
	0.0%	**21.1%**	**78.9%**	**0.0%**	**0.0%**	**100.0%**
	0.0%	70.6%	16.5%	0.0%	0.0%	19.0%
Total	**1**	**17**	**273**	**6**	**3**	**300**
	0.3%	**5.7%**	**91.0%**	**2.0%**	**1.0%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

91% (273) of respondents from the Dehiwala Mt. Lavinia Municipal Council area primarily dispose of organic waste by handing it over to the Municipal Council.. Nearly 6% (17) of respondents handed organic waste to the collection point of the flat they lived in. All of these respondents are from the high income class households (gated communities.

Table 3.16 Boralesgamuwa Urban Council area by the primary method of disposal (organic waste)

Location	Brought to a collection point in the neighbourhood	Brought to a collection point in the building (compound)	Collected by the local council	Burnt	Buried	Total
Low income class	11	0	94	1	1	107
	10.3%	**0.0%**	**87.9%**	**0.9%**	**0.9%**	**100.0%**
	68.8%	0.0%	34.3%	50.0%	20.0%	35.7%
Middle income class	4	3	86	1	3	97
	4.1%	**3.1%**	**88.7%**	**1.0%**	**3.1%**	**100.0%**
	25.0%	100.0%	31.4%	50.0%	60.0%	32.3%
High income class	1	0	94	0	1	96
	1.0%	**0.0%**	**97.9%**	**0.0%**	**1.0%**	**100.0%**
	6.3%	0.0%	34.3%	0.0%	20.0%	32.0%
Total	**16**	**3**	**274**	**2**	**5**	**300**
	5.3%	**1.0%**	**91.3%**	**0.7%**	**1.7%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

Over 91% (274) of the respondents from the Boralesgamuwa Urban Council area said that they dispose of organic waste by handing it over to the Municipal Council and compared to middle and low income class house holds a higher percentage of these households are from the low income class households (nearly 98%). Over 5% (16) mentioned that they littered organic waste, majority of these respondents are from the Low Income Settlement (nearly 94%). 1% said they bury the waste and another 1% stated that they give it to animals as food.

Table 3.17 DMMC area by the primary method of garbage disposal (Inorganic waste)

Income Class	Collected by an informal collector	Brought to a collection point	Collected by the local council	Burnt	Total
Low income class	9	0	97	8	114
	7.9%	**0.0%**	**85.1%**	**7.0%**	**100.0%**
	50.0%	0.0%	39.8%	34.8%	38.0%
Middle income class	9	4	109	7	129
	7.0%	**3.1%**	**84.5%**	**5.4%**	**100.0%**
	50.0%	26.7%	44.7%	30.4%	43.0%
High income class	0	11	38	8	57
	0.0%	**19.3%**	**66.7%**	**14.0%**	**100.0%**
	0.0%	73.3%	15.6%	34.8%	19.0%
Total	**18**	**15**	**244**	**23**	**300**
	6.0%	**5.0%**	**81.3%**	**7.7%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

Over 81% (244) of the respondents from the Dehiwala Mt. Lavinia Municipal Council area primarily dispose of inorganic waste by handing them over to the Municipal Council. Nearly 5% (15) of the respondents, from the high income class households bring the inorganic waste to a collection point in the building (compound). The inorganic waste of 6% is collected by informal waste collectors these respondents are equally distributed between middle income and low income households.

Table 3.18 BUC area by the primary method of garbage disposal (Inorganic waste)

Location	Collected by an informal collector	Brought to a collection point	Collected by the local council	Burnt	Total
Low income class	12	0	93	2	107
	11.2%	**0.0%**	**86.9%**	**1.9%**	**100.0%**
	70.6%	0.0%	33.9%	50.0%	35.7%
Middle income class	2	0	95	0	97
	2.1%	**0.0%**	**97.9%**	**0.0%**	**100.0%**
	11.8%	0.0%	34.7%	0.0%	32.3%
High income class	3	5	86	2	96
	3.1%	**5.2%**	**89.6%**	**2.1%**	**100.0%**
	17.6%	100.0%	31.4%	50.0%	32.0%
Total	17	5	274	4	300
	5.7%	**1.7%**	**91.3%**	**1.3%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

Over 91% of the respondents from the Boralesgamuwa Urban Council area primarily dispose of inorganic waste by handing it over to the local council. Higher percentage of these households are from the middle income class (nearly 98%), nearly 6% (17) of inorganic waste is collected by informal waste collectors and majority of these respondents are from the Low Income class households (12 – nearly 71%).

The findings suggest that majority of the households are heavily dependent on municipal waste management services provided by local councils irrespective of the type of generated waste. Only few of the households have utilized alternative (unsustainable) methods such as littering, burning or burying to dispose waste. The qualitative data of the survey revealed that Colombo Port City Project carries out waste collection activities in the Middle Income Settlement and the Beachside area. The project was initiated in a bid to keep the 5 Km beach strip between Mount Lavinia and Wallawatta clean. The Clean Tech Company carries out cleaning activities on a daily basis from morning until evening as a daily routine. Low income communities of the DMMC Beachside benefit from this service. It would be interesting to explore whether the project adheres to the mandatory waste segregation regulations practiced by the DMMC.

The qualitative data also revealed that the services of informal waste workers are not really used as a primary method of disposing inorganic waste on a regular basis. Rather a small percentage of respondents have utilized the services of the informal workers to get rid of selected types of inorganic waste. A respondent from the DMMC area stated “The informal waste collector does not accept polythene, plastic bags, plastic items. They only accept valuable items such as used paper, newspapers, tin cans, white glass bottles, aluminum, copper”.

3.3.5 The type of service providers

3.19 Income classes in Dehiwala Mt. Lavinia Municipal Council area by the type of service provider

Income Class	Local council	Informal waste collectors	Total
Low income class	110	4	114
	96.5%	**3.5%**	**100.0%**
	38.1%	36.4%	38.0%
Middle income class	122	7	129
	94.6%	**5.4%**	**100.0%**
	42.2%	63.6%	43.0%
High income class	57	0	57
	100.0%	**0.0%**	**100.0%**
	19.7%	0.0%	19.0%
Total	**289**	**11**	**300**
	96.3%	**3.7%**	**100.0%**
	100.0%	100.0%	100.0%

Source: 2021 Survey Data

Over 96% (289) of respondents from the Dehiwala Mt. Lavinia Municipal Council area, depend on the Municipal Council as the service provider in disposing waste. While nearly 4% (11) use the services offered by informal waste workers.

3.20 Boralesgamuwa Urban Council area by the primary method of disposal garbage by the type of service provider

Location	Local council	Informal waste collectors	Total
Low Income Settlement	100	7	107
	93.5%	**6.5%**	**100.0%**
	35.7%	35.0%	35.7%
Middle Income Settlement	89	8	97
	91.8%	**8.2%**	**100.0%**
	31.8%	40.0%	32.3%
High Income Settlement	91	5	96
	94.8%	**5.2%**	**100.0%**
	32.5%	25.0%	32.0%
Total	280	20	300
	93.3%	**6.7%**	**100.0%**
	100.0%	100.0%	100.0%

Source: 2021 Survey Data

Over 93% of respondents from the Boralesgamuwa Urban Council area depend upon the Municipal Council as the service provider irrespective of the income class. Nearly 7% use the services of informal collectors to dispose of waste. However, it is important to note here that in reality it is difficult to define informal waste collectors as a main service provider as they collect selected types of inorganic waste that too in irregular intervals. Even the households who hand over selected inorganic waste to informal waste workers still depend on the services of the local council to dispose of remaining inorganic waste and organic waste.

As previously identified, it is clear that households heavily depend on the services offered by the local councils irrespective of income class. In addition to the local council services, informal waste workers provide services to a significant number of households. This heavy dependence on municipal waste management services can have two key influences on the overall waste management system. Firstly, heavy dependency on the local council's services reveals the monopoly exercised by authorities in managing waste disposal activities. Thus, the authorities should utilize this opportunity to educate and train the residents to further segregate waste. When exploring international examples of sustainable and cyclical waste management mechanisms, it is evident that further segregation according to color, type and density (plastics and polythene) etc. is of utmost importance. However, this monopoly enjoyed by the local councils also has a negative impact on the system. If the local councils fail to implement scientifically sound, empirically proven and most importantly pragmatic waste collection and disposal mechanisms over time, serious issues can emerge ultimately leading to disasters such as the Meethotamulla disaster. Unfortunately, this characteristic is already evident in the Sri Lankan waste management system where politically motivated, ineffective waste management have led the country to a pothole of trouble.

Secondly, such high dependence can exert an enormous pressure on the municipal waste management system. Higher dependency demands acquisition of new technologies, mobile and immobile assets such as vehicles, equipment, acquisition of land for the disposal and management and adaptation to changing needs. Higher dependency also commands the services of a large waste collection and management workforce. In the

context of the selected local councils where waste collection is carried out as a free service, adaptation of new technology, services and maintenance of a large labor force has put a large strain on the annual budgets of the local councils. In the current context, the central government does not subsidize any expenses borne by the councils. Therefore, the councils have no other option but to maintain the services with the existing facilities and an ill-trained workforce.

3.21. Dehiwala Mt. Lavinia Municipal Council area by the number of days waste is collected

Income Class	**2 days a week**	**4 days a week**	**Total**
Low income class	45	69	114
	39.5%	**60.5%**	**100.0%**
	40.5%	36.5%	38.0%
Middle income class	46	83	129
	35.7%	**64.3%**	**100.0%**
	41.4%	43.9%	43.0%
High income class	20	37	57
	35.1%	**64.9%**	**100.0%**
	18.0%	19.6%	19.0%
Total	111	189	300
	37.0%	**63.0%**	**100.0%**
	100.0%	100.0%	100.0%

Source: 2021 Survey Data

63% of the respondents from the Dehiwala Mt. Lavinia Municipal Council area responded that waste is collected four days per week while 37% responded that waste is collected two days per week.

3.22. Boralesgamuwa Urban Council area by the number of days waste is collected

Location	2 days a week	4 days a week	Total
Low income class	10	97	107
	9.3%	**90.7%**	**100.0%**
	32.3%	36.1%	35.7%
Middle income class	99	88	97
	9.3%	**90.7%**	**100.0%**
	29.0%	32.7%	32.3%
High income class	12	84	96
	12.5%	**87.5%**	**100.0%**
	38.7%	31.2%	32.0%
Total	31	269	300
	10.3%	**89.7%**	**100.0%**
	100.0%	100.0%	100.0%

Source: 2021 Survey Data

Nearly 90% (269) of the respondents from the Boralesgamuwa Urban Council area responded that waste is collected four days per week. Meanwhile, over 10% (31) responded that the waste is collected two days a week.

The findings of the first working paper confirms this finding as the local council officials explained that waste collection is carried out four days a week ; two days to collect organic waste and two days to collect inorganic waste. However, as some of the respondents have stated that waste is collected on two days a week it would be interesting to explore what caused them to state a number of days different from official information.

3.23. Dehiwala Mt. Lavinia Municipal Council area by payments made to the service provider

Income Class	Do not pay	Gift waste workers an small amount informally in festival times	Pay waste workers small amount monthly around 50 to 100 rupees	Pays income tax to the local council	Total
Low income class	93	14	7	0	114
	81.6%	**12.3%**	**6.1%**	**0.0%**	**100.0%**
	36.2%	53.8%	58.3%	0.0%	38.0%
Middle income class	113	7	5	4	129
	87.6%	**5.4%**	**3.9%**	**3.1%**	**100.0%**
	44.0%	26.9%	41.7%	80.0%	43.0%
High income class	51	5	0	1	57
	89.5%	**8.8%**	**0.0%**	**1.8%**	**100.0%**
	19.8%	19.2%	0.0%	20.0%	19.0%
Total	**257**	**26**	**12**	**5**	**300**
	85.7%	**8.7%**	**4.0%**	**1.7%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

Nearly 86% (257) of the respondents from the Dehiwala Mt. Lavinia Municipal Council area responded that they do not make a payment for the MSWM services provided by the local council. Nearly 9% (26) give a financial gift informally to the waste workers during festivities like the Sinhala and Tamil New Year and Christmas and the majority of these respondents are from the Low-Income class households (over 6%). 4% (12) of households pay a monthly amount ranging from LKR. 50 to LKR. 100 to the waste workers informally for their services while nearly 2% (5) stated that they pay income tax to the local council to maintain waste management activities.

3.24. Boralesgamuwa Urban Council area by payments made to the service provider

Location	Do not pay	Gift waste workers an small amount informally in festival times	Pay waste workers small amount monthly around 50 to 100 rupees	Pays income tax to the local council	Total
Low income class	95	8	3	1	107
	88.8%	**7.5%**	**2.8%**	**0.9%**	**100.0%**
	36.3%	30.8%	27.3%	100.0%	35.7%
Middle income class	81	12	4	0	97
	83.5%	**12.4%**	**4.1%**	**0.0%**	**100.0%**
	30.9%	46.2%	36.4%	0.0%	32.3%
High income class	86	6	4	0	96
	89.6%	**6.3%**	**4.2%**	**0.0%**	**100.0%**
	32.8%	23.1%	36.4%	0.0%	32.0%
Total	262	26	11	1	300
	87.3%	**8.7%**	**3.7%**	**0.3%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

Over 87% (262) of the respondents from the area responded that they do not pay for waste collection services provided by the local council. Nearly 9% (26) give a financial gift informally to the waste workers during festivities like the Sinhala and Tamil New Year and Christmas and the highest percentage of these households are from the middle class (over 12%). Nearly 4% (11) of households pay a monthly amount ranging from LKR. 50 to LKR. 100 to the waste workers informally for their services. Only one respondent stated that he/she pays income tax to the local council to maintain waste management activities.

The findings suggest that majority of the respondents do not pay for waste management services provided by the local councils. However, over 12% of the respondents pay waste workers informally for the services they provide on government holidays or on a monthly basis. Thus, it can be presumed that if the local council considers the possibility of charging residents for waste collection services, a significant percentage of respondents might be willing to make a payment.

3.3.6 Gender of the waste workers

3.25. Dehiwala –Mt. Lavinia Municipal council are by gender of the waste worker

Local council Area	Female	Male	Total
Low Income class	23	91	114
	20.2%	**79.8%**	**100.0%**
	65.7%	34.3%	38.0%
Middle income class	11	118	129
	8.5%	**91.5%**	**100.0%**
	31.4%	44.5%	43.0%
High Income class	1	56	57
	1.8%	**98.2%**	**100.0%**
	2.9%	21.1%	19.0%
Total	35	265	300
	11.7%	**88.3%**	**100.0%**
	100.0%	100.0%	100.0%

Source: 2021 Survey Data

Majority of the respondents from the Dehiwala Mt. Lavinia municipal council area stated that majority of the waste collectors are males (over 88%) .Only nearly 11% of respondents have stated that there are female waste workers.

3.26. Boralesgamuwa Urban Council area by gender of the waste workers

Local Council Area	Female	Male	Total
Low Income class	4	103	107
	3.7%	**96.3%**	**100.0%**
	66.7%	35.0%	35.7%
Middle Income class	1	96	97
	1.0%	**99.0%**	**100.0%**
	16.7%	32.7%	32.3%
High Income class	1	95	96
	1.0%	**99.0%**	**100.0%**
	16.7%	32.3%	32.0%
Total	6	294	300
	2.0%	**98.0%**	**100.0%**
	100.0%	100.0%	100.0%

Source: 2021 Survey Data

Majority of respondents from the Boralesgamuwa Urban Council area stated that majority of waste collection workers are males. Only 2% of the respondents stated that the waste collectors are females. The data confirms the findings of the second working paper of the MSWM series where an official of the Boralesgamuwa Urban council stated that they often do not employ female waste workers as often female workers do not like to travel in lorries.

“We are more than happy to employ female waste workers. But an issue arises when they are made permanent. They request transfers to different departments as they feel ashamed to work on roads. So we have to transfer them to another department and recruit a male worker to the waste collection team to replace them” (Key Informant Interviews, 2019- SEC/BUC/05/2019/04/15).

A study titled ‘Involvement of Women in Municipal Solid Waste Composting in Sri Lanka’ (2017) has explored the reasons for women to dropout from waste collection activities. According to the study, women who are involved as waste workers experience social discrimination, inadequate resources and welfare facilities, lack of training, health and family related problems (Sinnathamby, et al., 2017). In this context, it would be interesting to further explore this finding from female waste collectors.

3.3.7 Issues on the Waste management activities carried out by the councils

Table 3.27. DMMC area by issues on waste management activities carried out by the councils

Income Class	Waste collectors behave unruly and insultingly	Asking money to collect garbage	Waste collection vehicles breakdown often specially on rainy days	No issues	Total
Low income class	10	0	7	97	114
	8.8%	**0.0%**	**6.1%**	**85.1%**	**100.0%**
	32.3%	0.0%	38.9%	42.4%	38.0%
Middle income class	19	21	9	80	129
	14.7%	**16.3%**	**7.0%**	**62.0%**	**100.0%**
	61.3%	95.5%	50.0%	34.9%	43.0%
High income class	2	1	2	52	57
	3.5%	**1.8%**	**3.5%**	**91.2%**	**100.0%**
	6.5%	4.5%	11.1%	22.7%	19.0%
Total	**31**	**22**	**18**	**229**	**300**
	10.3%	**7.3%**	**6.0%**	**76.3%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

Over 76% (229) of the respondents from the Dehiwala Mt. Lavinia Municipal Council area had no issues with the waste management services provided by the council. Over 10% (31) responded that the waste collectors behave unruly and a higher percentage of these respondents are from the Middle income class (nearly 15%). Over 7% (22) responded that waste collectors asked for payments to collect waste and when compared to low and high income households the highest percentage are from the middle income class households (over 16%). Middle income class households (7%) stated that the vehicles of local councils breakdown often and that vehicles do not arrive on time during the rainy.

Table 3.28. BUC area by issues on waste management activities carried out by the councils

Income Class	Waste collectors behave unruly and insultingly	Asking money to collect garbage	Waste collection vehicles breakdown often specially on rainy days	No issues	Total
Low income class	3	5	8	91	107
	2.8%	**4.7%**	**7.5%**	**85.0%**	**100.0%**
	33.3%	41.7%	28.6%	36.3%	35.7%
Middle income class	4	4	8	81	97
	4.1%	**4.1%**	**8.2%**	**83.5%**	**100.0%**
	44.4%	33.3%	28.6%	32.3%	32.3%
High income class	2	3	12	79	96
	2.1%	**3.1%**	**12.5%**	**82.3%**	**100.0%**
	22.2%	25.0%	42.9%	31.5%	32.0%
Total	9	12	28	251	300
	3.0%	**4.0%**	**9.3%**	**83.7%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

Out of the respondents from the Boralesgamuwa Urban Council area, over 9% (28) responded that waste lorries do not come on the relevant dates and times or if it rains. 4% (12) complained that workers ask for money to collect waste. 3% (9) responded that the workers shout at them if waste is mixed even by accident or if they delay to handover the waste.

Majority of the residents in the selected local councils had no complaints regarding the services offered by the local councils. The findings of the survey confirms the previous finding of working paper 1 and 2 where the key informants, including officials of the local councils mentioned that there is a lack of funds and vehicles available to carry out waste management activities. The key informants also added that existing vehicles and machinery are over used and often breakdown due to limited resources. Another interesting finding is the fact that there are communication issues between waste workers

and the residents. It would be interesting to study whether the local councils have trained or advised waste collectors about their etiquettes or whether the local councils have a standard protocol in place to supervise the behavior of the waste workers.

4. Impact of the Meethotamulla Waste Dump Collapsing on MSWM

The Meethotamulla garbage mountain located at Pothwillkumbura, Meethotamulla, Kolonnawa collapsed on 14th of April 2017 (Disaster services, n.d.). The disaster destroyed over 146 houses killed 32 individuals and it affected a total of 1,765 people (Disaster services, n.d.). The disaster had a major impact on the waste management mechanism of Sri Lanka in general and it also prompted changes in the waste management activities of the local councils (Fernando et al, 2020). This chapter of the report explores the perspectives of residents on the impact of the collapse of the Meethotamulla waste mountain on municipal waste collection activities and household waste management activities.

4.1 Impact on waste collection activities

Table 4.1. Dehiwala-Mt. Lavinia Municipal Council area by impact of the Meethotamulla Disaster

Income Class	Yes	No	Do not know	Total
Low income class	87	22	5	114
	76.3%	**19.3%**	**4.4%**	**100.0%**
	36.6%	43.1%	45.5%	38.0%
Middle income class	108	16	5	129
	83.7%	**12.4%**	**3.9%**	**100.0%**
	45.4%	31.4%	45.5%	43.0%
High income class	43	13	1	57
	75.4%	**22.8%**	**1.8%**	**100.0%**
	18.1%	25.5%	9.1%	19.0%
Total	**238**	**51**	**11**	**300**
	79.3%	**17.0%**	**3.7%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

Over 79% (238) of the respondents from the Dehiwala-Mt. Lavinia Municipal Council area stated that waste management activities has changed after the Meethotamulla disaster.

Compared to other income classes the middle income class has experienced the impact the most (nearly 84%). 17% (51) stated that there has been no change in waste management after the Meethotamulla disaster.

Out of those who stated that waste management has changed after the Meethotamulla disaster, 52% identified the change to be the proper implementation of compulsory waste segregation. Further, 34% identified the change to be the introduction of new rules regarding garbage disposal such as penalizing individuals who discard waste at public places, prohibiting local councils to collect mixed waste etc. 14% stated that waste disposal got obstructed due to the disaster as the waste collection lorry did not come as scheduled for about three days after the disaster.

Table 4.2. Boralesgamuwa Urban Council area by the impact of the Meethotamulla Disaster

Location	Yes	NO	Do not Know	Total
Low Income Settlement	56	37	14	107
	52.3%	**34.6%**	**13.1%**	**100.0%**
	31.8%	43.5%	35.9%	35.7%
Middle Income Settlement	59	25	13	97
	60.8%	**25.8%**	**13.4%**	**100.0%**
	33.5%	29.4%	33.3%	32.3%
High Income Settlement	61	23	12	96
	63.5%	**24.0%**	**12.5%**	**100.0%**
	34.7%	27.1%	30.8%	32.0%
Total	176	85	39	300
	58.7%	**28.3%**	**13.0%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

Nearly 59% (176) of the respondents from the Boralesgamuwa Urban Council area stated that waste management has changed after the Meethotamulla disaster. Over 28% (85) believe that there has been no change in waste management after the Meethotamulla disaster.

Out of those who believe that waste management has changed after the Meethotamulla disaster, 57% stated that compulsory segregation of waste was imposed after the disaster.

Further, 29% attributed the change to the formulation of new rules such as penalizing discarding waste at public places. 14% believed that the disaster caused a positive change in the minds of the residents about waste segregation.

The findings suggest that the DMMC was the local council that experienced the most significant impact due to the Meethotamulla disaster as waste collection activities were temporarily disrupted for a number of days. DMMC was one of the councils that dumped waste to the Meethotamulla dumping site. After the disaster, the local council had to temporarily stop waste collection activities until an alternative dumping site was made available. Nevertheless, findings suggest that the Meethotamulla disaster played a key role in implementing the mandatory waste segregation regulation in both local councils. According to the findings of Fernando et al, 2020a, 2020b the local councils had introduced waste segregation to a limited number of wards as a pilot project. However, until the Meethotamulla disaster, the support from the general public was minimal, with a segregation rate of just over 10% in the local councils. However, after the Meethotamulla Waste Mountain collapsed, segregation rates had instantly increased, according to official data from the municipalities, to over 50% while the findings of the survey suggest that the segregation levels are higher than 90%. It would be interesting to study what are the short term solutions the residents or the local councils came up with in the period where waste management was disrupted.

4.2 Impact on Household Practices

Table 4.3. Dehiwala-Mt. Lavinia Municipal Council area by changes in waste practices in households after the Meethotamulla Disaster

Income Class	Yes	No	Do not know	Total
Low income class	92	18	4	114
	80.7%	**15.8%**	**3.5%**	**100.0%**
	37.7%	38.3%	44.4%	38.0%
Middle income class	112	16	1	129
	86.8%	**12.4%**	**0.8%**	**100.0%**
	45.9%	34.0%	11.1%	43.0%
High income class	40	13	4	57
	70.2%	**22.8%**	**7.0%**	**100.0%**
	16.4%	27.7%	44.4%	19.0%
Total	244	47	9	300
	81.3%	**15.7%**	**3.0%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

Over 81% of respondents from the Dehiwala-Mt. Lavinia Municipal Council area have changed waste practices in their respective household after the Meethotamulla disaster. Compared to other classes the Middle income class has changed the waste management activities (nearly 87%) after the disaster. Nearly 16% (47) of the total respondents from the Dehiwala-Mt. Lavinia Municipal Council area have not changed waste practices in their respective household after the Meethotamulla disaster, and 3% (9) cannot recall if any changes were made in household practices.

52% of those who have changed waste practices in their household after the Meethotamulla disaster have started segregating waste at home and the highest percentage of these respondents are from the Middle income class. Over 21% have reduced the usage of non-organic waste and, compared to other income group,s respondents from the High Income classes have adopted this change (over 71%). 15% have started making compost with organic waste and compared to low and high income classes a high percentage of respondents (over 54%) have adopted this measure.

Moreover 12% have started burning non-organic waste and majority of respondents are from the Middle income Settlement (over 68%).

Table 4.4. Boralesgamuwa Urban Council Area by changes in waste practices in households after the Meethotamulla Disaster

Location	Yes	No	Do not Know	Total
Low Income Settlement	71	29	7	107
	66.4%	**27.1%**	**6.5%**	**100.0%**
	36.4%	37.7%	25.0%	35.7%
Middle Income Settlement	64	20	13	97
	66.0%	**20.6%**	**13.4%**	**100.0%**
	32.8%	26.0%	46.4%	32.3%
High Income Settlement	60	28	8	96
	62.5%	**29.2%**	**8.3%**	**100.0%**
	30.8%	36.4%	28.6%	32.0%
Total	195	77	28	300
	65.0%	**25.7%**	**9.3%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

65% (195) of the total respondents from the Boralesgamuwa Urban Council area have changed waste practices in their respective households after the Meethotamulla disaster. Over 26% (77) of the total respondents from the Boralesgamuwa Urban Council area have not changed waste practices in their respective households after the Meethotamulla disaster, and over 9% (28) had no idea about the matter.

62% of those who have changed waste practices in their respective households after the Meethotamulla disaster have started segregating waste at home and the highest percentage (over 39%) of these respondents are from the low income class households. 26% have reduced the usage of non-organic waste and larger percentage of these respondents are from the high-income class (over 59%), Meanwhile, 12% have started making compost with organic waste.

The findings confirm that the Meethotamulla disaster had a clear impact on waste management activities of households particularly in DMMC. Majority had started to segregate waste and make compost with organic waste. In addition, a significant percentage of respondents have changed their consumer behaviour by reducing the consumption of material that generate non-organic waste. Nevertheless, as suggested

previously it is important to study whether these behaviors have remained the same over the years or whether the percentages have reduced over time. In addition, it was observed that the residents have resorted to burning non- organic waste after the Meethotamulla disaster. The nature of the answer suggests that at least some of them have started burning non-organic waste after the disaster.

5. Impact of SARS COV-19 on municipal solid waste management

5.1 Introduction

Table 5.1. DMMC area by impact of COVID-19 on waste collection

Income Class	Yes	No	Don't Know	Total
Low income class	13	100	1	114
	11.4%	**87.7%**	**0.9%**	**100.0%**
	31.7%	39.2%	25.0%	38.0%
Middle income class	19	109	1	129
	14.7%	**84.5%**	**0.8%**	**100.0%**
	46.3%	42.7%	25.0%	43.0%
High income class	9	46	2	57
	15.8%	**80.7%**	**3.5%**	**100.0%**
	22.0%	18.0%	50.0%	19.0%
Total	**41**	**255**	**4**	**300**
	13.7%	**85.0%**	**1.3%**	**100.0%**
	100.0%	100.0%	100.0%	100.0%

Source: 2021 Survey Data

85% (255) of the respondents from the Dehiwala-Mt. Lavinia Municipal Council Area stated that a change did not take place in the waste collection during the SARS COV 19 period. Nearly 14% (41) of the respondents stated that there was a change in waste collection activities. 68% stated that the vehicles did not come to collect waste on the designated dates. Another nearly 32% stated that the local authorities collected mixed waste during the lockdown period. When the research assistants probed into this claim, it was revealed that the Municipal Council collected both organic and inorganic waste together on these days.

Table 5.2. Boralesgamuwa Urban Council area by impact of COVID-19 on waste collection

Location	Yes	No	Total
Low Income class	9	99	108
	8.3%	**91.7%**	**100.0%**
	17.0%	*40.1%*	*36.0%*
Middle Income class	25	73	98
	25.5%	**74.5%**	**100.0%**
	47.2%	*29.6%*	*32.7%*
High Income class	19	75	94
	20.2%	**79.8%**	**100.0%**
	35.8%	*30.4%*	*31.3%*
Total	53	247	300
	17.7%	**82.3%**	**100.0%**
	100.0%	*100.0%*	*100.0%*

Source: 2021 Survey Data

Over 82% (247) of the respondents stated that a change did not occur during the SARS COV-19 period in the Boralesgamuwa Municipal Council area while nearly 18% (53) stated that a change did take place. Over 59% stated that waste collection vehicles did not arrive on time on the designated days and nearly 30% stated that the local council collected mixed waste during the SARS COVID-19 lock down period. Nearly 10% of the respondents stated that the number of waste collectors who came to collect waste reduced. When asked about the changes in waste management activities at household level, majority of the respondents (over 73%) stated that the amount of organic and inorganic waste produced in the households increased during the period, while another 16% stated that medical waste started to accumulate in their households.

The findings suggest that the spread of SARS COV -19 virus had an impact on waste collection activities carried out by local councils. Changes were noticed with regard to the changes in waste collection days and collection of mixed waste from households. In an interview with the Western province Waste Management Authority an official stated that the local councils in the western province including the DMMC and BUC struggled to employ the same number of waste workers due to the lack of safety suits and sanitation equipment such as masks and sanitizer. The official further added that the local councils found it difficult to locate extra funds to purchase these equipments and also because sanitary equipment had a high demand and a limited supply, the councils had faced

hardships in purchasing the sanitary items. Therefore, as a remedial measure, local councils had reduced the number days of waste collection and had opted to collect mixed waste. It is interesting to study how the local councils managed the mixed waste as the main waste dumping site in Colombo – the Karadiyana Waste Management Center does not permit dumping of mixed waste under normal circumstances.

5.2 Suggestions to improve the waste management systems

The researchers requested the respondents to identify the most important improvement that should be made to the municipal waste management system of their local council. The most frequently mentioned improvements are mentioned in the following sections.

Table 5.3 Dehiwala-Mt. Lavinia Municipal Council area by suggestion to improve the waste management

Income Class	Nothing needs to be changed	The waste segregation could be improved	Needs to improve the efficiency of the waste management system	Improve the waste recycling system	No idea	Should clean the canal	Total
Low income class	40	13	40	13	1	7	114
	35.1%	**11.4%**	**35.1%**	**11.4%**	**0.9%**	**6.1%**	**100.0 %**
	44.0%	22.4%	46.0%	27.7%	10.0%	100.0%	38.0%
Middle income class	38	31	31	22	7	0	129
	29.5%	**24.0%**	**24.0%**	**17.1%**	**5.4%**	**0.0%**	**100.0 %**
	41.8%	53.4%	35.6%	46.8%	70.0%	0.0%	43.0%
High income class	13	14	16	12	2	0	57
	22.8%	**24.6%**	**28.1%**	**21.1%**	**3.5%**	**0.0%**	**100.0 %**
	14.3%	24.1%	18.4%	25.5%	20.0%	0.0%	19.0%
Total	**91**	**58**	**87**	**47**	**10**	**7**	**300**
	30.3%	**19.3%**	**29.0%**	**15.7%**	**3.3%**	**2.3%**	**100.0 %**
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0 %

Source: 2021 Survey Data

Over 30% (91) of respondents stated that they did not think any changes are needed in the current waste management system. In terms of suggestions to improve the waste management system, 29% (87) stated that the waste management system needs to improve its efficiency. Over 19% (58) stated that waste segregation could be further improved. Moreover, over 16% (47) stated that recycling of waste should be improved. In addition, over 2% of respondents stated that the canal in Low Income Settlements Badowita should be cleaned as a part of MSWM activities carried out by the municipal council. All these respondents are from the Low Income Settlement.

5.4 Suggestions to improve waste management in Boralesgamuwa Urban Council

Location	Nothing needs to be changed	Increasing the frequency of garbage collection	Needs to improve the waste management system	Arrange a new system for making compost in own garden	Provide equipment for needed for waste management	Getting people used the idea of using waste as a way to earn money	Improve the waste recycling system	It is better to remove the Karadiyana dump	No idea	Total
Low Income class	5	41	5	11	10	12	12	2	9	107
	4.7%	**38.3%**	**4.7%**	**10.3%**	**9.3%**	**11.2%**	**11.2%**	**1.9%**	**8.4%**	**100.0 %**
	38.5%	36.3%	20.8%	36.7%	35.7%	50.0%	29.3%	28.6%	45.0%	35.7%
Middle Income class	6	32	11	13	12	5	10	2	6	97
	6.2%	**33.0%**	**11.3%**	**13.4%**	**12.4%**	**5.2%**	**10.3%**	**2.1%**	**6.2%**	**100.0 %**
	46.2%	28.3%	45.8%	43.3%	42.9%	20.8%	24.4%	28.6%	30.0%	32.3%
High Income class	2	40	8	6	6	7	19	3	5	96
	2.1%	**41.7%**	**8.3%**	**6.3%**	**6.3%**	**7.3%**	**19.8%**	**3.1%**	**5.2%**	**100.0 %**
	15.4%	35.4%	33.3%	20.0%	21.4%	29.2%	46.3%	42.9%	25.0%	32.0%
Total	13	113	24	30	28	24	41	7	20	300
	4.3%	**37.7%**	**8.0%**	**10.0%**	**9.3%**	**8.0%**	**13.7%**	**2.3%**	**6.7%**	**100.0 %**
	100.0 %	100.0 %	100.0 %	100.0 %	100.0%	100.0%	100.0%	100.0%	100.0%	100.0 %

Source: 2021 Survey Data

When asked for suggestions, nearly 38% (113) stated that the frequency of waste collection should be increased while nearly 14% (41) stated that the recycling of waste should be improved. 10% (30) of respondents stated that mechanisms should be introduced to implement a home based composting mechanism and over 9% (28) stated that residents should be provided with equipment needed for waste management activities such as waste bins. In addition, nearly 7% (20) of respondents stated that the Karadiyana dumping site should be removed from its current location.

The findings from the open-ended questions suggest that majority of respondents from BUC and DMMC believed that waste management activities in their local council area has to improve. Most of their suggestions focused on improving the existing system by increasing segregation, frequency of collection and the increase the amount of recycled waste. Respondents emphasized on the importance of improving the waste segregation activities. A respondent from the DMMC middle income class **stated "Still there are some families who do not segregate properly. I have seen instances where waste workers got injured because sharp items such as broken glass, porcelain pieces and metal pieces were mixed in with kitchen waste. When I segregate, I always think about the waste workers"**.

Another respondents stated **"I don't think that all individuals have an accurate picture about what is degradable waste and what is not. I have seen people mixing papers, newspapers, printed materials and clothes with degradable waste. I can only imagine the hardships waste workers have to go through when getting rid of these things. The local councils and the government should educate people more and increase their awareness".** The findings suggest that the awareness of respondents on segregation has to be further improved. The authors also believe that the segregation mechanism should be further improved by increasing the number of categories waste is segregated in to. Currently, the waste segregation is limited to the two categories of "degradable" and "non-degradable". As these categories are broad the authors there is a high possibility of partially degradable material such as laminated paper, partially degradable clothe items being mixed up with fully degradable material. This can create issues when it comes to processing and treating waste at waste management centers such as Karadiyana Waste management Center.

Interestingly, in addition to suggesting changes to the existing system, respondents also showed an enthusiasm to make changes to their waste management behaviour, such as adopting a home-based waste management system such as household level composting and awareness raising amongst respondents about the economic viability of waste. A respondent from the BUC stated **"people are used to simply hand waste over to the municipal council as it is the easy thing to do. But if you have a small garden even in a small space you can simply use the kitchen waste to make fertilizer at home. I always feel why one should throw away fertilizer".** The authors have made a similar recommendation to introduce domestic composting systems to households who have the space to conduct such an operation. In addition to introducing domestic level composting, it is important to also increase the awareness of the residents with regards to reducing the amount of waste generated at households. Often by changing the purchasing, storing and meal prepping practices of a household, the amount of kitchen waste generated can be significantly reduced (EPA, n.d.). The local council can introduce simplified and localized tool kits such **as "Food: Too Good to Waste Implementation Guide and Toolkit"** developed by the United States Environmental Protection Agency for this task. This would be an effective way to significantly reduce the annual coast spent on waste collection, transportation and disposal.

6. Conclusion

This particular study explored the waste-related practices of residents in two local councils of the Colombo district of Sri Lanka. One of the areas studied, the Dehiwala-Mt. Lavinia Municipal Council (DMMC), is the second largest local council in Sri Lanka in terms of population. The Boralesgamuwa Urban Council (BUC), the other local council that was studied, is a smaller local council. As discussed in chapter two, the two local councils are significantly different in terms of characteristics such as land mass, population, income and facilities available for the local councils to carry out waste management activities. Therefore, the findings cannot be used as a benchmark to compare and contrast the services offered by the local councils or the experiences of the residents.

Satisfaction with the local waste management mechanism

The findings revealed that the majority of respondents were satisfied with the overall cleanliness of their immediate neighborhood. An overall satisfaction was expressed in relation to waste management practices of residents and effective waste collection carried out by the local councils. An important finding of the study is that residents identified themselves as key actors in maintaining their immediate environment. It depicts a positive trend where the residents are eager to actively contribute to waste management. Findings revealed that external factors have influenced the overall cleanliness of the selected locations specifically with regard to the DMMC area. In the case of DMMC cleanliness was influenced by the preventive measures introduced by the government and the DMMC to curb the spread of the dengue pandemic. However, in the DMMC, none of the respondents from the Dehiwala Beachside (low income settlement) area were satisfied with waste collection activities, as the municipal council did not collect waste in their area. Currently, the residents have to carry waste from their households to roadsides to hand over the waste to municipal waste workers. It will be interesting to explore whether this is a unique situation where the local council is trying to exert power to control the residents of the area using MSWM.

In general, the respondents of the local councils were satisfied with the existing waste management mechanisms. According to them, waste management activities in their respective local areas have improved after the Meethotamulla disaster. The respondents have identified that the introduction of mandatory waste segregation and the increase in

the number of days waste is collected as major improvements. Findings suggest that the existing waste management system ignores the wishes and the concerns of low-income settlements. Therefore, in order to provide a more efficient service to the communities, the local councils should pay heed to the needs and requirements of all income classes.

Existing waste management practices

Findings suggest that women are the primary waste managers in majority of households. In addition to women, domestic workers (both male and female) act as the primary waste managers in high-income households. In this context any intervention introduced to improve MSWM should consider women and domestic workers as key stakeholders of MSWM. The data revealed that the amounts of waste generated in the majority of the households are less than 2.5 kg per day. Therefore, the local councils have a great opportunity to introduce domestic waste management activities, such as tumbler composting or Bokashi pre-composting, as a measure to reduce the pressure on the local municipal waste management system. Moreover, it was revealed that over 90% of the households selected for the study segregate waste. This figure is much higher than the figures suggested in the literature. The current study was conducted in year 2020 while the official statistics are from 2019. Therefore the discrepancy between the official statistics and the finding of the research could be a result of a drastic increase in the segregation in the period between 2019 and 2020. Another explanation could be the reluctance of residents to admit that they do not segregate waste. Nevertheless, it is important to further explore this situation to understand the factors that has cause the discrepancy.

In addition, it was revealed that respondents do not officially pay for the waste management services provided by the local councils. However, a significant percentage of respondents pay waste workers informally by gifting them a small amount on festival periods such as the New Year and by paying a monthly amount. This finding reveal that a significant percentage of respondents might be willing to make a payment if the local council decides to charge the residents for waste collection services.

The majority of residents in the selected local councils had no complaints regarding the services offered by the local councils. Nevertheless, a minority of respondents had complained about the behaviour of the waste workers stating that they request for

payments to collect money and that they are disrespectful. It is interesting to study further whether the local councils have provided a waste workers with a training on communicating with the residents and how different income classes treat waste workers. Further, the respondents stated that the breaking down of waste collection vehicles as another issue they have experienced. This finding is confirmed by our previous studies (ADD REF) where key informants, including the officials of local councils, mentioned that there is a dire lack of funds and vehicles available to the local councils to carry out waste management activities. In terms of waste workers, the findings suggest that majority of the workers are males and that only a small percentage of workers are females. The secondary data suggest that in the MSWM sector women have to experience unfavorable work conditions that discourage them from applying for employment opportunities in the MSWM sector.

The findings of the survey suggest that irrespective of the type of waste generated at households, respondents are dependent on the waste management services offered by the local councils. This situation may create positive outcomes for the MSWM mechanism, such as the ability easily educate, train and introduce interventions, such as further segregation of waste. Due to the monopoly the local councils have over the waste management, the residents do not have an alternative but to adhere to the interventions. It is the opinion of the authors that in any context including MSWM monopoly can bring about negative impacts. Due to the lack of competition, the local councils do not feel the need to constantly update and develop existing waste management practices and to introduce new interventions to manage the MSWM activities. This situation has created a stagnation in the waste management activities and the existing MSWM systems are still dependent on outdated measures, such as open dumping. This situation has ultimately led the country to suffer from waste-related crises, such as the collapsing of the Meethotamulla open dumping site. Further, high dependence on the local councils can exert a massive pressure on the municipal waste management system which can ultimately lead to the failure of the system.

Impact of the Meethotamulla disaster on Municipal Solid Waste Management

The findings suggest that the DMMC was the local council that experienced the most significant impact due to the Meethotamulla disaster as DMMC was one of the councils

that dumped waste to the Meethotamulla dumping site. The findings suggest that as the Meethotamulla disaster played a key role in implementing the mandatory waste segregation regulation in both local councils. These findings also coincide with the the suggestions of local officials that pre-existing waste segregation was turned mandatory after the Meethotamulla disaster ADD REF). In addition, the findings suggest that the disaster also motivated the residents to adopt measures such as reducing the use of non-organic products and to promote producing compost at domestic level.

Impact of SARS COVID-19 on MSWM and suggestions to improve the existing MSWM mechanism

The findings suggest that the spread of SARS COV -19 virus had an impact on waste collection activities carried out by local councils. Residents experienced alterations with regard to the changes in waste collection days and collection of mixed waste from households. These findings are confirmed by an official of the Western province Waste Management Authority where he stated that the DMMC and BUC found it difficult to employ the same number of waste workers due to the lack of safety suits and sanitation equipment. Therefore, the local councils had reduced the number days the waste is collected and had opted to collect mixed waste. The findings also suggested that the majority of respondents from BUC and DMMC believed that waste management activities in their local council area has to improve. Most of their suggestions focused on improving the existing system by increasing segregation, frequency of collection and the amount of recycled waste. In addition to suggesting changes to the existing system, respondents also showed an interest to make changes to their waste management behaviour such as adopting a home-based waste management system, including household-level composting and awareness raising amongst respondents about the economic viability of waste.

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