Based on a representative survey and in-depth interviews with residents and other stakeholders, this book by Fernando and De Silva provides detailed insights into one such underserved settlement, referred to by the pseudonym of Ovita, located in the Colombo metropolitan area. The detailed study provides glimpses of more general political and social processes in Ovita (and other informal settlements in Sri Lanka) that are marked by patron-client relationships. Using the case of Ovita, Fernando and De Silva also describe waste management beyond the municipal system showing a case of social and environmental inequality and injustice in an underserved settlement while, pointing to problematic issues related to waste labor and human dignity. Given the detailed analysis and the novel insights into an underserved as well as understudied neighborhood, we trust that the present book will be useful for government authorities, civil society and grassroots actors, and private parties to improve solid waste management in informal settlements in Sri Lanka and to improve the working conditions of both formal and informal waste workers.

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Waste Management in Ovita

An Underserved Relocated Settlement in Dehiwala - Mt.Lavinia Municipal Council

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Nishara Fernando
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Waste Management in Ovita

An underserved, relocation settlement in the Dehiwala - Mt. Lavinia Municipal Council of Sri Lanka

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Preface

While the generation of waste represents an increased social and environmental challenge in Sri Lanka, waste collection rates have significantly improved recently. Our previous studies have shown that residents in the Colombo metropolitan area are generally satisfied with the municipal solid waste services. Waste collection rates, waste segregation at the source, and satisfaction levels also do not vary much between different social groups based on income, education, religion, or ethnicity. However, there are important exceptions to this positive scenario in the case of specific informal and unrecognized neighbourhoods.

Based on a representative survey and in-depth interviews with residents and other stakeholders, this book by Fernando and De Silva provides detailed insights into one such underserved settlement, referred to by the pseudonym of Ovita, located in the Colombo metropolitan area. Rates of satisfaction with the municipal waste service are significantly lower in Ovita than in adjacent neighbourhoods; residents lament the low frequency of the collection of biodegradable waste, the waste pollution of the canal running through the neighbourhood, and the lack of bins to store waste. On the other hand, many do not pay municipal taxes that are used to cover expenses for waste collection but informally give small gifts to the municipal waste workers during important festivals. Local councilors rarely enforce taxation and hinder the implementation of higher user charges due to fears of becoming unpopular and losing votes. In this way, the detailed study on waste management provides glimpses of more general political and social processes in Ovita that are marked by patron-client relationships.

Using the case of Ovita, Fernando and De Silva also describe waste management beyond the municipal system. While the formal municipal system itself is permeated by informal relations (informal payments, patron-client relations), it is also interlinked with the informal waste sector. For example, informal recyclers buy valuable waste materials from formal waste workers. The authors have also revealed that drugs are regularly given as payment for waste work or recyclable materials. In this way, the book goes beyond showing a case of social and environmental inequality and injustice in an underserved settlement to point out problematic issues related to waste labour and human

dignity. The book also explains the failure of a previous community-based waste management project in Ovita, which holds lessons for projects that try to fill the gaps left by municipal services.

Given the detailed analysis and the novel insights into an underserved as well as understudied neighbourhood, we trust that the present book will be useful for government authorities, civil society and grassroots actors, and private parties to improve solid waste management in informal settlements in Sri Lanka and to improve the working conditions of both formal and informal waste workers. While waste collection is an important part of social and environmental justice, human dignity around waste work is also influenced by the overall waste management system. We hope that this book will encourage the reader to rethink the waste system in the Colombo metropolitan region as a whole to render it more sustainable and fair for all residents and workers.

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Abbreviations

CDCs	Community Development Committees
CEB	Ceylon Electricity Board
COVID -19	Corona Virus Disease
CSP	Cleaner Settlement Project
DMMC	Dehiwala-Mt. Lavinia Municipal Council
ISDA	Institution for Social Development and Action
JICA	Japan International Cooperation Agency
MSWM	Municipal Solid Waste Management
NGOs	Non-Governmental Organizations
NHDA	The National Housing Development Authority
NWSDB	National Water Supply and Drainage Board
PHI	Public Health Inspector
SPSS	Statistical Package for Social Sciences
USIP	Urban Settlement Improvement Programme

Chapter 1. Introduction

1.1 Introduction

Municipal Solid Waste Management (MSWM) in an urban setting is always a challenge due to increasing population and urbanization (Vidanaarachchi et al., 2006). These factors can contribute to the increase in the amount of waste and can also complicate the collection, treatment, and disposal of waste (Vij, 2012). Moreover, uncontrolled migration from rural to urban areas has given rise to illegal settlements, squatters, and informal housing in urban regions of countries throughout the world (Aguilar, 2008; Williams et al., 2019; Jones, 2017). These informal housing settlements are often located adjacent to urban centers, such as *"vacant or unused land designated for agriculture, open spaces, hazard areas, and future use* "(Limbumba & Ngware, 2016 p.93).

Informal housing can exert a negative effect on urban ecosystems and their services, such as waste water management, flood water management, MSWM, and others (Douglas, 2012). Considering such negative impacts, states take action to change the status of informal settlements by utilizing policy approaches such as upgrading the situation, demolition, resettlement, and relocation (Jones, P. 2017, Minnery et al. 2013, Weksea et al. 2011, Tadgellet et al. 2018).

The subject of the present study is the Ovita[1] relocation settlement, which is located in the Dehiwala- Mt. Lavinia Municipal Council (DMMC) area. The site came into existence in 1992 as a result of a canal improvement and relocation project initiated by the central government of Sri Lanka (Tortajada, 2006). The study intends to explore MSWM activities carried out by the residents of the settlement, the municipal council and informal waste managers. Such solid waste management activities are examined in relation to the collapse of the Meethotamulla waste dumping site and the spread of the COVID-19 virus.

[1] Ovita is a pseudonym used to protect the identity of the residents of the settlement.

The key objectives of the study are:

1. To identify solid waste management activities within the settlement in terms of generation, collection, and disposal of waste.

2. To comprehend the impact caused by the collapse of the Meethotamulla dumping site on waste management practices in the settlement and mitigation strategies employed by residents.

3. To explore the impact of the COVID-19 virus on waste management practices in the settlement.

1.2 Origins of Ovita

1.2.1 Urbanization and rise of informal settlements

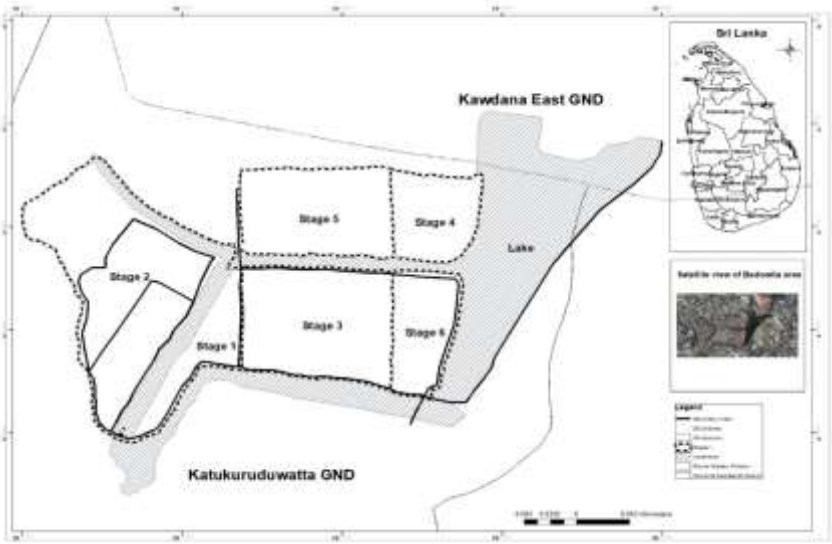
Sri Lanka has been experiencing an expansion of urban regions, especially in the Colombo Metropolitan Region, and major transport routes similar to those in other countries (World Bank, 2015). As a consequence, multiple informal settlements have sprung up in the pre-periphery of the Metro Colombo region (Wakely, 2018). A large majority of these informal settlements are located on unclaimed and unused land, including canal banks and low-lying land, which usually act as water retention areas (Fernando, 2018).Over time, large-scale reclamation of land that retained water, lack of proper maintenance, dumping of solid waste, and bank erosion made the city of Colombo vulnerable to urban floods (Tortajada, 2006).

Therefore, the government of Sri Lanka implemented a project titled "Greater Colombo Flood Control and Environmental Improvement Project" with the financial support of the Japan Bank for International Cooperation (Hosaka & Ogura, 2001). The aim of this 11,198-million-yen project was "river development for flood control, relocation, and housing improvements for shanty-dwellers along the riverbanks" (Tortajada, 2006, p. 2). Accordingly, a large number of informal settlers were relocated to 20 relocation sites located within the greater Colombo region, of which Ovita is the largest (Hosaka & Ogura, 2001).

1.3 Ovita

The settlement is located within the Katukurunduwatta West ward of the DMMC in the Ratmalana Divisional Secretariat (Fernando, 2018). The land used to build Ovita is reclaimed marshy land that sits next to a water body containing water from the "Dehiwala Canal" and "Weras Lake".

Figure 01: Map of Ovita relocated settlement



Source: Survey data, 2022

1.4 Relocation to Ovita

The marshy land was divided into four stages, and plots of land and 50 m^2 were given to each relocated family (Fernando, 2018). The National Housing Development Authority (NHDA) granted loan facilities up to LKR 20,000.00 to settlers for the construction of houses, in addition to a grant of LKR 8,000.00 to procure trucks to transport their belongings and to lay the foundation of houses (Tortajada, 2006). The government of Sri Lanka invested in developing infrastructural facilities such as "water supply, public toilets, drainage facilities, garbage collection boxes, community center, street lighting, roads,

etc." (Tortajada, 2006, p. 3). Moreover, the Institution for Social Development and Action (ISDA) provided small loans for self-employed members of the community.

Tortajada (2006) describes the situation in the initial stages of relocation as a "lively refugee camp". According to her, the government had initially agreed to invest in basic infrastructure such as communal taps, communal toilets, common waste bins for every 30 to 40 houses, roads, street lighting, and a community center prior to relocating families. Nevertheless, according to Tortajada, none of these facilities were provided to the relocated communities, even after a year of relocation. Community members had recounted their experiences and stated that life in the settlement was hard. She describes the settlement as a *"muddy area that was yet to be properly reclaimed and that lacked essential infrastructure and facilities for normal living conditions... The water in these wells was grey and undrinkable. Night soil from the communal lavatories was seldom collected on time. These overflows contributed to high health and environmental risks and made living in the area unpleasant"* (Tortajada, 2006, p. 3). This deplorable state of the settlement lasted until 1998, and nearly 3% of the originally relocated families had moved out of the community due to the hardships they experienced.

Image 1.1. Main road of the Ovita settlement

Source: Malith De Silva, 2022

Image 1.2. A road in stage 2 of Ovita settlement

Source: Malith De Silva, 2022

Image 1.3. The road that runs between stages 4 and 5

Source: Malith De Silva, 2022

In 1997, Ovita was selected to be developed as a pilot community project under the Urban Settlement Improvement Programme (USIP) and as a Cleaner Settlement Project (CSP). The National Water Supply and Drainage Board (NWSDB) and the Ceylon Electricity Board (CEB) provided water and electricity services to the community as part of the programmes. Further, the

DMMC installed and began to maintain street lighting, solid waste disposal, and mosquito control (Tortajada, 2006). USIP and the Japan International Cooperation Agency (JICA) established Community Development Committees (CDCs) in the community. The CDCs were utilized to incorporate the community in development activities carried out by the government and Non-Governmental Organizations (NGOs).Community members were provided with various training opportunities, including bookkeeping and international training on waste management. These trained members of CDCs were later contracted to carry out development activities within the community, including community-based waste management.

1.4.1 Current status

The Ovita settlement has further expanded with stages five and six in recent years. The total population of the community has risen to over 1500 families, and the living standards of the community have improved significantly as a result of community interventions by JICA and USIP with the participation of CDCs.

Table 1.1 Population of the settlement by stage

Stage	Number of families
1. Stage 1	157
2. Stage 2	431
3. Stage 3	337
4. Stage 4	114
5. Stage 5	261
6. Stage 6	238
Total	**1538**

Source: Divisional Secretariat, 2022

Ovita is often identified in literature as an underserved community that is "better off" than others in Colombo (Fernando, 2018) due to the improvement of infrastructure and financial support of self-employed individuals.

Nevertheless, the community is still facing many challenges. The community has become infamous for housing major drug kingpins and drug traffickers in Colombo. Raids by the Narcotic Bureau and the Police have become common, and the settlement has gained a negative reputation among the general public

as a hot spot for crimes. Fernando (2018) describes how this negative reputation has created hardships for community members. He cites an individual living in the settlement who states that "There are males who consume heroin. When they cannot legally earn an adequate income to buy their daily dose of heroin, they steal from fellow household members or neighbours which very often leads to domestic violence, police arrests, and harassment. Due to these situations, we have been socially and economically marginalized from the outside world. This is why some of our innocent youth find it difficult to get decent jobs, and children are not admitted to good schools because they are from "Ovita" (Fernando, 2018: P. 14).

Further, the community suffers from contamination of land and water sources. Tortajada (2006) expresses that the neighboring canal has been contaminated with chemical waste, which is discarded by factories and households. According to her, the canal has become a "depository of hazardous waste". She suggests that the factories upstream be prohibited from discarding waste into the canal and that a filtration mechanism be installed to detoxify the water to avoid contamination of waterways downstream.

Moreover, she highlights that the lack of a plan to improve the quality of life of community members is a major challenge. According to Tortajada (2006), the support and cooperation extended by NGOs have been ad hoc and issue-specific. These organizations have not envisioned a long-term plan for the future of the community. This has hindered the development of community members and resulted in the gradual degradation of living conditions achieved through interventions from JICA and USIP.

1.5 Research methodology

1.5.1 Type of data

Both primary and secondary data were collected to obtain a comprehensive understanding of the situation in the settlement. 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 gather data on the composition of waste, current waste management practices (including segregation and disposal) at the household level, and challenges experienced by residents. In accordance with the objectives, the study collected qualitative and quantitative data from respondents. The study gathered quantitative data related to waste generation, waste segregation, disposal, and management practices, apart from demographic information. Qualitative data provides details on problems, opinions on efficiency, the impact of the collapse of the Meethotamulla dumping site, and the impact of the COVID-19 pandemic on waste management.

1.5.2 Research method

A survey and in-depth interviews were deemed as the most suitable methods that should be used for this particular study. These methods permitted the research team to collect primary data from a large number of respondents (600) efficiently. It also enabled simultaneous collection of qualitative and quantitative data from respondents.

1.6 Data collection

1.6.1 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 were gathered from the review.

1.6.2 Primary data collection technique

Questionnaire with community members

A questionnaire was administered to the selected sample of residents living in all stages of the Ovita settlement. The questionnaire included closed and open-ended questions that covered dimensions such as cleanliness, waste management, disposal, waste collection, issues, community-based waste management programmes, informal waste workers, the impact caused by the collapse of the Meethotamulla dumping site, and the impact of the COVID-19 pandemic on MSWM. The questionnaire was originally developed in English and later translated into Sinhala and Tamil.

In-depth interviews with selected community members

An in-depth interview schedule was utilized to collect qualitative data from residents. The schedule included open-ended questions that covered dimensions such as cleanliness, waste management, disposal, waste collection, issues, community based waste management programmes, informal waste workers, impacts caused by the collapse of the Meethotamulla dumping site and the impact of the COVID-19 pandemic on MSWM. The schedule was originally developed in English and later translated into Sinhala and Tamil.

1.7 Sample selection criteria

The random sampling method was utilized to select respondents for the survey from all stages of the settlement in order to ensure that each respondent was granted an equal opportunity to be represented in the sample. The sample for in-depth interviews was selected using the purposive sampling method by identifying individuals and community leaders who had lived in the settlement.

1.8 Sample size

The sample size for the survey was predetermined by the research team. Six hundred and seven respondents were selected from the six stages employing a stratified random sampling design proportionate to the number of families living in each stage. The number of respondents selected from each stage is given below.

Table 1.2 Population of the settlement and the selected sample size

Stage	Population	Sample size
1. Stage 1	157 (10.2%)	62
2. Stage 2	431 (28%)	170
3. Stage 3	337 (22%)	133
4. Stage 4	114 (7.3%)	45
5. Stage 5	261 (17%)	103
6. Stage 6	238 (15.5%)	94
Total	**1538 (100%)**	**607**

Source: Own data

1.9 Primary data collection

Primary data collection was carried out by trained research assistants who had completed an honors degree in Sociology. These research assistants were trained at an online workshop prior to the initiation of data collection to familiarize them with the data collection tools. Data collection was carried out from 10th February 2019 to 18th April 2022.

The data collection process was supervised by the co-authors. The authors conducted interviews with primary waste managers of households to obtain the most accurate data on MSWM. The duration of each interview was approximately 40 to 45 minutes. The collection of data using the in-depth interview schedule was carried out simultaneously.

1.10 Data analysis

Qualitative and quantitative methods of analysis were applied to obtain a comprehensive understanding of the situation at the field location. Data collected from the questionnaire was entered into the Statistical Package for Social Sciences (SPSS) after editing, cleaning, and coding.

Both univariate and bivariate statistical analysis tests were applied as necessary and appropriate. These findings are presented using tables. Qualitative data collected through in-depth interviews was coded by hand and later analyzed using thematic analysis technique (Helene, 2012).

1.11 Challenges

The research team had to endure multiple challenges during the survey.

Key challenges included

1. Obtaining approval from local council

The research team had to obtain approval from the DMMC to carry out data collection activities. After officially requesting permission, the research team had to wait almost a month to begin data collection until permission was granted. This delay impacted the research in multiple ways. For example, the research team originally recruited 10 research assistants to carry out data collection, but the delay in obtaining approvals made it difficult to retain them

as they had other engagements. Eventually, 10 new research assistants had to be recruited and trained to collect data.

2. Spread of the COVID-19 virus in the stages

A fourth wave of the COVID-19 virus spread across the Ovita underserved settlement during the data collection period. With the spread of the virus, the administration of the University of Colombo issued instructions to refrain from engaging in data collection activities. Therefore, the research team had to further postpone data collection until due approval was granted.

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

Some respondents were reluctant to participate in the study due to the spread of the COVID-19 virus. As a countermeasure, the research team had to avoid these respondents and select new ones.

1.12 Summary of chapters

Chapter two of the working paper elaborates on the socio-economic and demographic characteristics of the Ovita underserved settlement with reference to its ethnic and religious composition, source of income, monthly income, and key decision-makers in the households.

Chapter three discusses the key findings of the research in relation to the generation of waste, waste composition, waste management services, key service providers, the nature of services and payments made to service providers, the satisfaction of consumers, and more.

Chapter four elucidates waste management in relation to the collapse of the Meethotamulla waste mountain and the spread of the COVID-19 virus. Specifically, the impact on waste generation at the household level and waste management activities. Chapter five discusses the findings of the research in brief while highlighting the key issues identified through the survey.

Chapter 2. Socio-economic & demographic data of the settlement

2. 1 Introduction

This chapter elaborates on the socio-economic and demographic information of the Ovita settlement with reference to population, religion, ethnicity, education, source of income, monthly income, and key decision-makers in the households.

Table 2.1 Sample selected from the settlement by stage

Stage	Frequency	Percent
Stage 1	62	10.2
Stage 2	170	28.0
Stage 3	133	21.9
Stage 4	45	7.4
Stage 5	103	17.0
Stage 6	94	15.5
Total	**607**	**100.0**

Source: Survey data, 2022

The highest number of questionnaires were administered in stage 2 (170), and the second highest in stage 3 (133). Moreover, 103 and 94 questionnaires were conducted in stages 5 and 6, respectively. The least number of questionnaires were administered in stages 1 (62) and 4 (45).

Table 2.2 Ethnicity of the respondents by stage

Stage	Sinhala	Tamil	Muslim	Burgher	Total
Stage 1	36	15	9	2	62
	5.9%	2.5%	1.5%	0.3%	10.2%
Stage 2	93	59	17	1	170
	15.3%	9.7%	2.8%	0.2%	28.0%
Stage 3	95	24	14	0	133
	15.7%	4.0%	2.3%	0.0%	21.9%
Stage 4	34	7	4	0	45
	5.6%	1.2%	0.7%	0.0%	7.4%
Stage 5	67	19	15	2	103
	11.0%	3.1%	2.5%	0.3%	17.0%
Stage 6	42	41	5	6	94

	6.9%	6.8%	0.8%	1.0%	15.5%
Total	**367**	**165**	**64**	**11**	**607**
	60.5%	**27.2%**	**10.5%**	**1.8%**	**100.0%**

Source: Survey data, 2022

Nearly 61% of the respondents are Sinhalese and over 27% are Tamils. Further, nearly 11% are Muslims and nearly 2% are Burghers.

Table 2.3 Religion of the respondents by stage

Stage	Buddhist	Hindu	Christian	Roman Catholic	Islam	Total
Stage 1	31	8	12	2	9	62
	5.1%	1.3%	2.0%	0.3%	1.5%	10.2%
Stage 2	86	35	25	8	16	170
	14.2%	5.8%	4.1%	1.3%	2.6%	28.0%
Stage 3	91	16	14	0	12	133
	15.0%	2.6%	2.3%	0.0%	2.0%	21.9%
Stage 4	29	5	4	2	5	45
	4.8%	0.8%	0.7%	0.3%	0.8%	7.4%
Stage 5	60	13	11	5	14	103
	9.9%	2.1%	1.8%	0.8%	2.3%	17.0%
Stage 6	40	27	18	3	6	94
	6.6%	4.4%	3.0%	0.5%	1.0%	15.5%
Total	**337**	**104**	**84**	**20**	**62**	**607**
	55.5%	**17.1%**	**13.8%**	**3.3%**	**10.2%**	**100.0%**

Source: Survey data, 2022

Nearly 56% of the respondents are Buddhists and over 17% are Hindus. Moreover, nearly 14% are Christians while over 10% are Islam devotees.

Table 2.4 Education of respondents by stage

Stage	No formal education	Primary education	Second. education	Degree	Post Graduate	Total
Stage 1	13	25	24	0	0	62
	2.1%	4.1%	4.0%	0.0%	0.0%	10.2%
Stage 2	42	86	42	0	0	170
	6.9%	14.2%	6.9%	0.0%	0.0%	28.0%
Stage 3	29	56	47	0	1	133
	4.8%	9.2%	7.7%	0.0%	0.2%	21.9%
Stage 4	5	19	21	0	0	45
	0.8%	3.1%	3.5%	0.0%	0.0%	7.4%
Stage 5	18	59	25	0	1	103
	3.0%	9.7%	4.1%	0.0%	0.2%	17.0%
Stage 6	18	53	22	1	0	94

	3.0%	8.7%	3.6%	0.2%	0.0%	15.5%
Total	**125**	**298**	**181**	**1**	**2**	**607**
	20.6%	**49.1%**	**29.8%**	**0.2%**	**0.3%**	**100.0%**

Source: Survey data, 2022

Nearly 21% of respondents have not received formal education. Over 49% of respondents have received primary education, while nearly 30% have received secondary education.

Table 2.5 Key decision maker of households by stage

Stage	Husband	Wife	Jointly	Son	Daughter	All	Grand father	Grand mother	Total
Stage 1	23	24	7	1	1	2	3	1	62
	3.8%	4.0%	1.2%	0.2%	0.2%	0.3%	0.5%	0.2%	10.2%
Stage 2	76	59	13	7	6	6	2	1	170
	12.5%	9.7%	2.1%	1.2%	1.0%	1.0%	0.3%	0.2%	28.0%
Stage 3	69	37	9	5	3	6	3	1	133
	11.4%	6.1%	1.5%	0.8%	0.5%	1.0%	0.5%	0.2%	21.9%
Stage 4	18	12	7	1	2	3	0	2	45
	3.0%	2.0%	1.2%	0.2%	0.3%	0.5%	0.0%	0.3%	7.4%
Stage 5	56	28	7	1	4	1	6	0	103
	9.2%	4.6%	1.2%	0.2%	0.7%	0.2%	1.0%	0.0%	17.0%
Stage 6	50	19	13	5	0	1	6	0	94
	8.2%	3.1%	2.1%	0.8%	0.0%	0.2%	1.0%	0.0%	15.5%
Total	**292**	**179**	**56**	**20**	**16**	**19**	**20**	**5**	**607**
	48.1%	**29.5 %**	**9.2%**	**3.3%**	**2.6%**	**3.1%**	**3.3%**	**0.8%**	**100.0%**

Source: Survey data, 2022

As to the question of who is the main decision-maker in the household, over 48% of respondents stated that the husband is the key decision-maker in the household, while in nearly 30% of households, the wife is the key decision-maker. Further, in over 9% of families, the husband and wife make key decisions collectively.

Table 2.6 Source of income by stage

Stage	Salaried employment	Daily Wage employment	Self-employment	children income	Contract basis	Total
Stage 1	16	39	6	0	1	62
	2.6%	6.4%	1.0%	0.0%	0.2%	10.2%
Stage 2	42	108	19	1	0	170
	6.9%	17.8%	3.1%	0.2%	0.0%	28.0%
Stage 3	31	74	26	1	1	133
	5.1%	12.2%	4.3%	0.2%	0.2%	21.9%
Stage 4	10	28	5	2	0	45
	1.6%	4.6%	0.8%	0.3%	0.0%	7.4%
Stage 5	29	55	18	1	0	103
	4.8%	9.1%	3.0%	0.2%	0.0%	17.0%
Stage 6	25	57	12	0	0	94
	4.1%	9.4%	2.0%	0.0%	0.0%	15.5%
Total	**153**	**361**	**86**	**5**	**2**	**607**
	25.2%	**59.5%**	**14.2%**	**0.8%**	**0.3%**	**100.0%**

Source: Survey data, 2022

In terms of the source of income, nearly 60% of respondents are engaged in daily paid employment while over 25% are engaged in salaried employment. Further, over 14% of respondents are self-employed.

Table 2.7 Monthly income of respondents by stage

Stage	LKR. 500 to 5000	LKR. 5001 to 10000	LKR. 10001 to 20000	LKR. 20001 to 30000	LKR. 30001 to 40000	LKR. 40001 to 50000	LKR. 50001 to 70000	LKR. 70001 to 90000	Total
Stage 1	0	2	15	18	7	11	0	9	62
	0.0%	0.3%	2.5%	3.0%	1.2%	1.8%	0.0%	1.5%	10.2%
Stage 2	6	2	44	58	33	18	7	2	170
	1.0%	0.3%	7.2%	9.6%	5.4%	3.0%	1.2%	0.3%	28.0%
Stage 3	7	5	52	38	20	7	1	3	133
	1.2%	0.8%	8.6%	6.3%	3.3%	1.2%	0.2%	0.5%	21.9%
Stage 4	4	3	14	11	5	5	0	3	45
	0.7%	0.5%	2.3%	1.8%	0.8%	0.8%	0.0%	0.5%	7.4%
Stage 5	3	2	33	30	13	17	2	3	103
	0.5%	0.3%	5.4%	4.9%	2.1%	2.8%	0.3%	0.5%	17.0%
Stage 6	8	7	30	28	6	10	2	3	94
	1.3%	1.2%	4.9%	4.6%	1.0%	1.6%	0.3%	0.5%	15.5%
Total	**28**	**21**	**188**	**183**	**84**	**68**	**12**	**23**	**607**
	4.6%	**3.5%**	**31.0%**	**30.1%**	**13.8%**	**11.2%**	**2.0%**	**3.8%**	**100.0%**

Source: Survey data, 2022

Over 8% of respondents earn a monthly income between LKR.500.00 and LKR.10, 000.00.31% of the respondents earn a monthly income between LKR. 10,000.00 and LKR. 20,000.00 while over 30% earn an income ranging from LKR.20,001 to LKR.30,000.00. Further over 25% of respondents earn a monthly income between LKR. 30,001 and LKR. 50,000. Nearly, 6% of respondents earn an income between LKR.50, 000.00 and LKR.90,000.

2.2 Discussion

The findings of this chapter reveal key characteristics of the community, including its social dynamics and economic situation. The Ovita settlement displays typical characteristics of an underserved settlement. The majority of respondents are vulnerable to income insecurity since a significant proportion of them are engaged in daily paid employment. Further, it was also revealed that nearly 30% of households are headed by females.

This particular characteristic further reveals the vulnerability of the community, as these households have a greater tendency to be susceptible to instabilities due to social, political, and economic changes.

These findings paint a bleak picture regarding the socio-economic status of the underserved settlement. These economic and social vulnerabilities also lead to difficulties in affording services such as solid waste management. Moreover, their socio-economic situation compels them to rely on public services (such as basic infrastructure and municipal solid waste management) provided by the central and local governments.

Chapter 3. Municipal Solid Waste Management in the settlement

3.1 Introduction

Chapter 3 discusses the solid waste management mechanism that functions within the settlement with reference to the history of waste management activities, current waste management mechanisms and key stakeholders involved, main service providers, segregation of waste, waste composition, informal waste managers and their services, satisfaction of respondents regarding waste management practices, etc.

When analyzing the data in the proceeding chapters, the authors utilized the stages of the settlement as the independent variable. The data were also tabulated using religion, ethnicity, and the highest education level as independent variables. However, the tabulations revealed that the dependent variables related to waste management activities are not significantly influenced by religion, ethnicity, or education level.

3.2 Origins of the waste management services in Ovita

Municipal solid waste management in the Ovita underserved settlement began in early 1992, in the first stages of relocation. According to Tortajada (2006), a steering committee was appointed in 1992, consisting of 14 government officers and members of local councils, to ensure that relocation activities were carried out smoothly. The committee had considered waste management a significant component of the relocation process, as building communal waste bins for every 30 to 40 houses in the community was one of the prerequisite facilities identified by the committee. Unfortunately, it took nearly six months for authorities to construct the communal bins. The qualitative data gathered by the study using in-depth interviews reveals how households managed waste during this period. According to the data, residents had employed two methods to dispose of waste, one of which was dumping the waste into the adjoining canal.

Kumara[2] is a 63 year old daily paid labourer living in stage 2. He expounded on this further by stating that *"when I moved here in 1993 with my wife and*

[2] Kumara is a pseudonym used to protect the identity of the respondent.

two children, Ovita did not have a waste management system... We used to dump all the waste generated in our house into the canal. Initially, this worked as the canal washed away the waste, but after a while, the canal got blocked. The canal became a hot bed for mosquitoes and flies" (In-depth interview, 2022).

The second method was to burn waste on the roadside. Mahen[3], a 56-year-old resident living in stage 1 stated that "*People who lived close to the road dumped waste on the road sides and used to burn these on the road. This made the settlement quite unclean. But I don't blame the residents. The local council did not collect waste from our community. We spoke to many politicians and complained to the Dehiwala-Mt. Lavinia Municipal Council. But we were told that the council cannot collect waste from the settlement as we do not pay municipal tax to the council"* (In-depth interview, 2022).

The findings also suggest that the lack of waste management contributed to the settlement being identified as a cleaner settlement project by the USIP. Maduka[4], a 43-year-old female living in stage 3 recounted her experiences as follows: "*In the early stages of the program the NGO organized a meeting with community members. Some government officials, local politicians, and some foreigners joined the meeting. In it, they said that they want to introduce a waste management system to the community because the situation there is unhealthy. They explained that we have to join with them to change the situation of the settlement*" (In-depth interview, 2022).

The findings suggest that the interventions of the USIP and JICA paved the way for the implementation of the current waste management system, in addition to the community-based waste management mechanism that was later implemented by SEVANATHA, a local NGO. According to Tortajada (2006), under the interventions of the USIP and JICA, "*The activities of the pilot project were entrusted to different agencies. The National Water Supply and Drainage Board and the Ceylon Electricity Board provided water and electricity services, respectively, and the Dehiwala-Mt. Lavinia Municipal*

[3] Mahen is a pseudonym used to protect the identity of the respondent.
[4] Maduka is a pseudonym used to protect the identity of the respondent.

Council provided street lighting, solid waste disposal, and mosquito control" (Tortajada, 2006 p.5).

3.3 Current waste management mechanism

The existing waste management in the Ovita settlement is primarily carried out by the municipal solid waste management mechanism of the Dehiwala-Mt. Lavinia Municipal Council. The findings of the survey suggest that an overwhelming majority of respondents considered the municipal council to be the main service provider for waste management.

Table 3.1 Main service provider for bio-degradable waste by stage

Stage	Municipal Council	Informal waste collectors	Not giving to anyone	Total
Stage 1	62	0	0	62
	10.2%	0.0%	0.0%	10.2%
Stage 2	169	0	1	170
	27.8%	0.0%	0.2%	28.0%
Stage 3	133	0	0	133
	21.9%	0.0%	0.0%	21.9%
Stage 4	45	0	0	45
	7.4%	0.0%	0.0%	7.4%
Stage 5	103	0	0	103
	17.0%	0.0%	0.0%	17.0%
Stage 6	91	1	2	94
	15.0%	0.2%	0.3%	15.5%
Total	**603**	**1**	**3**	**607**
	99.3%	**0.2%**	**0.5%**	**100.0%**

Source: Survey data, 2022

Over 99% of respondents indicated that the municipal council is the main service provider that manages bio-degradable waste.

Table 3.2 Main service provider for non-bio-degradable waste by stage

Stage	Municipal Council	informal waste collectors	Total
Stage 1	60	2	62
	9.9%	0.3%	10.2%
Stage 2	166	4	170
	27.3%	0.7%	28.0%
Stage 3	131	2	133
	21.6%	0.3%	21.9%
Stage 4	43	2	45
	7.1%	0.3%	7.4%
Stage 5	97	6	103
	16.0%	1.0%	17.0%
Stage 6	92	2	94
	15.2%	0.3%	15.5%
Total	**589**	**18**	**607**
	97.0%	**3.0%**	**100.0%**

Source: Survey data, 2022

Moreover, 97% of respondents mentioned that the waste management mechanism of the local council is the main service provider for non-bio-degradable waste. Only 3% of respondents considered informal waste workers as the main service provider.

3.3.1 Waste generation

In terms of waste production, the findings reveal that residents produce bio-degradable as well as non-biodegradable waste, and a significant proportion of the waste produced consists of organic material.

Table 3.3 Generation of bio-degradable waste by stage

Stage	0-0.3 Kg	0.5 kg	1 kg	2 kg	3 kg	4 kg	5 kg	6 kg	8 kg	10 kg	20 kg	N/A	Total
Stage 1	1	6	10	7	9	5	14	3	1	4	1	1	62
	0.2%	1.0%	1.6%	1.2%	1.5%	0.8%	2.3%	0.5%	0.2%	0.7%	0.2%	0.2%	10.2%
Stage 2	2	8	14	42	22	16	39	12	5	9	1	0	170
	0.3%	1.3%	2.3%	6.9%	3.6%	2.6%	6.4%	2.0%	0.8%	1.5%	0.2%	0.0%	28.0%
Stage 3	1	11	14	28	24	22	17	10	1	3	2	0	133
	0.2%	1.8%	2.3%	4.6%	4.0%	3.6%	2.8%	1.6%	0.2%	0.5%	0.3%	0.0%	21.9%
Stage 4	0	1	3	5	8	12	11	3	0	1	0	1	45
	0.0%	0.2%	0.5%	0.8%	1.3%	2.0%	1.8%	0.5%	0.0%	0.2%	0.0%	0.2%	7.4%
	3	7	4	19	23	17	14	8	3	4	0	1	103

Stage 5	0.5%	1.2%	0.7%	3.1%	3.8%	2.8%	2.3%	1.3%	0.5%	0.7%	0.0%	0.2%	17.0%
Stage 6	0	8	3	17	19	12	24	2	2	6	0	1	94
	0.0%	1.3%	0.5%	2.8%	3.1%	2.0%	4.0%	0.3%	0.3%	1.0%	0.0%	0.2%	15.5%
Total	**7**	**41**	**48**	**118**	**105**	**84**	**119**	**38**	**12**	**27**	**4**	**4**	**607**
	1.2%	**6.8%**	**7.9%**	**19.4%**	**17.3%**	**13.8%**	**19.6%**	**6.3%**	**2.0%**	**4.4%**	**0.7%**	**0.7%**	**100.0%**

Source: Survey data, 2022

Data collected from the questionnaire suggests that over 70% of households produce between 2 kg and 5 kg of bio-degradable waste. Moreover, over 14% of respondents produce between 6 kg and 20 kg. The qualitative data reveals that the majority of households that produce 10 kg or more are engaged in making lunch packets for a living. These lunch packets are prepared at households and distributed to street vendors who sell them with a healthy sales margin. Preparation, cooking, and disposal of leftover food waste account for the large amount of waste generated on a weekly basis in these households.

Nevertheless, some households that produce a large amount of waste consist of many families (three or four families) living in the same unit. These houses had been constructed in the small space available by building up to three stories to accommodate all the families. Even though this type of communal living is evident among the Muslim community of Sri Lanka, the authors met three such households owned by Sinhalese respondents. Pradeep[5] a 62-year-old male living in stage 3 explained this scenario, saying, "*This is the house I moved into in 1995. Of course, at the time, this was a single-story building with a room, a living area, and a small kitchen. I have two daughters, and they grew up here and went to school here. As we are located quite close to good schools, they went to Mt.Lavinia High School and Buddhist Ladies School. Now they are married, and both have houses in Homagama. But, as they want to get their children into good schools, they stay here with me. Also, their husbands quit their jobs and joined my business of repairing and modifying three-wheelers. So it is easier for them to live with me. So with the money I had saved up, I built two more stories of the house for my children to live in, which is an easy arrangement for all of us*" (In-depth interview, 2022).

[5] Pradeep is a pseudonym used to protect the identity of the respondent.

Table 3.4 Generation of non-bio degradable waste by stage

Stage	0.1 Kg	0.2 Kg	0.3 Kg	0.4 Kg	0.5 kg	0.6 kg	0.8 kg	1 kg	4 kg	5 kg	6 kg	N/A	Total
Stage 1	8	3	1	0	20	1	0	19	0	2	0	8	62
	1.3%	0.5%	0.2%	0.0%	3.3%	0.2%	0.0%	3.1%	0.0%	0.3%	0.0%	1.3%	10.2%
Stage 2	9	5	0	0	84	0	2	46	3	5	4	12	170
	1.5%	0.8%	0.0%	0.0%	13.8 %	0.0%	0.3%	7.6%	0.5%	0.8%	0.7%	2.0%	28.0 %
Stage 3	7	5	1	0	49	0	0	48	3	5	1	14	133
	1.2%	0.8%	0.2%	0.0%	8.1%	0.0%	0.0%	7.9%	0.5%	0.8%	0.2%	2.3%	21.9 %
Stage 4	0	1	0	0	24	0	0	16	0	1	0	3	45
	0.0%	0.2%	0.0%	0.0%	4.0%	0.0%	0.0%	2.6%	0.0%	0.2%	0.0%	0.5%	7.4%
Stage 5	2	0	2	0	49	0	0	39	2	4	1	4	103
	0.3%	0.0%	0.3%	0.0%	8.1%	0.0%	0.0%	6.4%	0.3%	0.7%	0.2%	0.7%	17.0 %
Stage 6	3	4	0	1	44	0	0	31	0	1	2	8	94
	0.5%	0.7%	0.0%	0.2%	7.2%	0.0%	0.0%	5.1%	0.0%	0.2%	0.3%	1.3%	15.5 %
Total	**29**	**18**	**4**	**1**	**270**	**1**	**2**	**199**	**8**	**18**	**8**	**49**	**607**
	4.8%	**3.0%**	**0.7%**	**0.2%**	**44.5%**	**0.2%**	**0.3%**	**32.8%**	**1.3%**	**3.0%**	**1.3%**	**8.1%**	**100.0 %**

Source: Survey data, 2022

A significant proportion (nearly 45%) of respondents produce 0.5 kg of non-biodegradable waste every week, while nearly 33% produce 1 kg of non-biodegradable waste every week. The qualitative data reveals the types of non-biodegradable waste thus produced. According to an interviewee, a major proportion of non-biodegradable waste consists of polythene bags. He further stated that, "*In our household, it's mostly polythene bags. We go to the nearby supermarket to purchase our food items, and you get so many polythene bags at the supermarket. Specially, when you buy rice, vegetables, or fruits, you get a polythene bag for each item. It is a waste, but it keeps items separated and prevents them from mixing together. My wife is a tailor; she takes on subcontracts to sew collars and shirt pockets. This also generates a considerable amount of non-biodegradable waste at our house. When possible, my wife and daughter make lamp wicks with left over clothes. But if the left-over clothes are not cotton based we collect them in the non-biodegradable waste bag to be handed over to the local council's truck*" (In-depth interview, 2022).

The findings reveal that the majority of the waste produced is biodegradable. However, even though the local council can look at cheaper options to manage biodegradable waste, it must be noted that composting waste is not pragmatic

in the settlement. This is due to the lack of space for communal composting and the limited space available for residents inside and outside their homes.

The council can introduce more appropriate waste management options, such as using collected kitchen waste for animal feed, specially hog farming. Using biodegradable waste as animal feed is extremely sustainable as it does not produce harmful by-products and has extremely low operational costs, which are often limited to the transportation of feed due to the constant demand for animal feed throughout the year.

3.3.2 Segregation of waste

In the aftermath of the Meethotamulla disaster, the DMMC took a policy decision to make segregation at home compulsory. Accordingly, residents are expected to segregate waste into two categories: (a) biodegradable and (b) non-biodegradable waste. Findings suggest that the majority of respondents living in Ovita abide by this decision.

Table 3.5 Segregation of waste by stage

Stage	Segregate waste	Do not segregate waste	Total
Stage 1	62	0	62
	10.2%	0.0%	10.2%
Stage 2	169	1	170
	27.8%	0.2%	28.0%
Stage 3	133	0	133
	21.9%	0.0%	21.9%
Stage 4	45	0	45
	7.4%	0.0%	7.4%
Stage 5	102	1	103
	16.8%	0.2%	17.0%
Stage 6	93	1	94
	15.3%	0.2%	15.5%
Total	**604**	**3**	**607**
	99.5%	**0.5%**	**100.0%**

Source: Survey data, 2022

Quantitative data reveals that over 99% of respondents segregate waste. The finding suggests that the decision taken by the local council to segregate waste was successful. Nevertheless, the majority (73%) of respondents had

segregated waste as "Food waste and plastic waste" instead of following the segregation specifications issued by the local council. Findings from qualitative data also confirm that the majority of respondents segregate waste into food waste and plastics.

This was apparent in the account of Maheshika[6], a 29-year-old housewife living in stage 5. She stated that "The council expects us to segregate waste at home. In our home, we collect all the kitchen waste, clothes, and boxes in one bucket, and the rest of the waste in a large polythene bag. If they don't segregate, they don't collect waste. They will leave the bucket on the roadside" (In-depth interview, 2022).

Table 3.6 Types of segregated waste by stage

Stage	As food waste & plastic waste	As degradable waste & non-bio-degradable waste	As economically viable and non-viable waste	Total
Stage 1	40	21	1	62
	6.6%	3.5%	0.2%	10.2%
Stage 2	113	57	0	170
	18.6%	9.4%	0.0%	28.0%
Stage 3	95	38	0	133
	15.7%	6.3%	0.0%	21.9%
Stage 4	40	5	0	45
	6.6%	0.8%	0.0%	7.4%
Stage 5	78	25	0	103
	12.9%	4.1%	0.0%	17.0%
Stage 6	77	17	0	94
	12.7%	2.8%	0.0%	15.5%
Total	**443**	**163**	**1**	**607**
	73.0%	**26.9%**	**0.2%**	**100.0%**

Source: Survey data, 2022

Over 73% of respondents segregated waste as "food waste and plastic waste," while nearly 27% segregated waste as "bio-degradable and non-bio-degradable waste". This difference in segregation is quite interesting, as it reveals a shortcoming in the waste management strategy implemented by the municipal council. In the aftermath of the Meethotamulla disaster, the local council

[6] Maheshika is a pseudonym used to protect the identity of the respondent.

informed residents that waste should be segregated through waste workers and Public Health inspectors (PHIs). According to the accounts of the residents, the council had not made an effort to raise awareness and educate residents regarding the types of waste that are bio-degradable and those that are not. Therefore, it is evident that residents relied on their own understanding and comprehension when deciding degradability.

The authors posed a question to respondents to assess their knowledge further. Accordingly, the findings revealed a clear confusion among respondents regarding degradable and non-degradable waste. For instance, some respondents identified branches, glass, newspapers, books, and garden waste as non-biodegradable, while others identified facemasks, hand sanitizer bottles, milk powder packets, clothes, metal cans, etc.

Table 3.7 Biodegradability of types of waste

Type of waste	Bio-degradable waste	Non-bio degradable waste
1. Kitchen Waste	603 99.3%	4 0.7%
2. Leftover food	590 97.2%	17 2.8%
3. Fruits of vegetables	557 91.8%	50 8.2%
4. Plastics	9 1.5%	598 98.5%
5. Glass	**56** **9.2%**	551 90.8%
6. Broken furniture	**117** **19.3**	490 80.7
7. Branches	220 36.2	**387** **63.8**
8. Grass	392 64.6%	**215** **35.4%**
9. Newspaper	**223** **36.7%**	384 63.3%
10. Books	**208** **34.3%**	399 65.7%
11. Electronic parts	**59** **9.3**	548 90.7
12. Metal containers	**104** **17.1%**	503 82.9%

13. Sanitary pads	29 4.8%	578 95.2
14. Clothes	67 11%	540 89%
15. Face masks	41 6.8%	566 93.2%
16. Hand sanitizer bottles	31 5.1%	576 94.9

Source: Survey data, 2022

Confusion regarding the degradability of waste can have a negative impact on the intermediate treatment and disposal of waste. As a significant percentage of respondents identified non-biodegradable waste as bio-degradable, it is evident that a significant amount of non-biodegradable waste ends up as biodegradable waste.

Image 3.1 Non-bio-degradable waste mixed with bio-degradable waste

Source: Malith De Silva, 2022

The local council disposes of bio-degradable waste at the Karadiyana Waste Management Center. Segregated biodegradable waste is converted to carbonic fertilizer in the center.Therefore, having non-biodegradable waste mixed with bio-degradable material can contribute to the increase in toxin levels in

carbonic fertilizer. Countries such as the United States of America have experienced threats to their food production due to the use of carbonic fertilizer produced by toxic waste (Adegoke, 2016).

Therefore, the local council should take measures to reduce the mixing of organic and inorganic waste. The measures are twofold. Firstly, awareness can be raised among residents through a long-term awareness-raising campaign. The campaign could introduce different types of bio-degradable and non-bio-degradable waste to residents. This can be carried out by utilizing traditional mediums of communication such as advertisements, presentations, flyers, posters, letters, and digital communication mediums such as documentaries, short films, videos, social media posts, etc. The second option is to introduce communal waste disposal bins in the settlement. Residents should be encouraged to dispose of non-biodegradable waste in communal bins.

3.3.2 Waste collection

Qualitative data reveals that the municipal council designates specific dates to collect bio-degradable and non-biodegradable waste. According to the interviews carried out with officials of the DMMC, waste workers collect biodegradable waste every Tuesday and Thursday and non-biodegradable waste every Wednesday and Saturday. Nevertheless, qualitative and quantitative data suggest that waste collection is carried out only two or three days a week.

Table 3.8 Number of collection dates by stage

Stage	Once a week	Twice a week	Three time a week	Four Times a week	Once every two week	No specific date	Total
Stage 1	12	36	11	3	0	0	62
	2.0%	5.9%	1.8%	0.5%	0.0%	0.0%	10.2%
Stage 2	31	109	21	3	4	2	170
	5.1%	18.0%	3.5%	0.5%	0.7%	0.3%	28.0%
Stage 3	12	92	26	1	1	1	133
	2.0%	15.2%	4.3%	0.2%	0.2%	0.2%	21.9%
Stage 4	13	27	3	1	1	0	45
	2.1%	4.4%	0.5%	0.2%	0.2%	0.0%	7.4%
Stage 5	25	64	10	0	2	2	103
	4.1%	10.5%	1.6%	0.0%	0.3%	0.3%	17.0%
Stage 6	6	70	17	0	0	1	94

	1.0%	11.5%	2.8%	0.0%	0.0%	0.2%	15.5%
Total	**99**	**398**	**88**	**8**	**8**	**6**	**607**
	16.3%	**65.6%**	**14.5%**	**1.3%**	**1.3%**	**1.0%**	**100.0%**

Source: Survey data, 2022

The majority of respondents (nearly 66%) stated that waste is collected on two days, while nearly 15% stated that waste is collected on three days. Further, over 16% of respondents stated that waste is collected in one day. These findings, derived from quantitative data, are confirmed by qualitative data.

Asanka[7], a 38-year-old male working as a traveling ice cream vendor is living in stage 5 of the settlement. According to him, "*The waste collection vehicles usually arrive two days a week. On one day, usually on Monday or Tuesday, the biodegradable waste is collected, and on Tuesday or Saturday, the non-biodegradable waste is collected. We usually keep the segregated waste in buckets on the roadside and have them taken over to the waste collection trucks. They dump the waste into the compactors and give the bucket back to us*" (In-depth interview, 2022).

Kumudu[8] a-25-year-old mother living in stage 6 stated that "*The waste collection vehicle doesn't really operate on a time table. I usually get to know that the waste vehicle has come to the settlement either through a neighbour living close to the main road or when the waste workers shout asking for waste. I keep our waste in polythene rice bags. I hang them on a nail on our parapet wall so that dogs cannot get on to the bags*" (In-depth interview, 2022).

[7] Asanka is a pseudonym used to protect the identity of the respondent.
[8] Kumudu is a pseudonym used to protect the identity of the respondent.

Image 3.2 Waste collection tractor in Ovita

Source: Malith De Silva, 2022

Image 3.3 Bio-degradable waste hanged on a wall

Source: Malith De Silva, 2022

It is evident that there are divided opinions among respondents regarding the number of days the waste collection is carried out. Nevertheless, everyone agrees that waste management vehicles do not function according to a fixed timetable, and residents are not aware of the days of waste collection. This

issue can be resolved by informing residents through officers of the local council, Grama Sewaka[9] and community leaders.

Similar to the awareness-raising campaign, the sharing of information should be carried out for a longer period until residents become familiar with the days. Another reason for differing opinions could be a result of infrastructural inequity. Infrastructure inequity refers to the inequity of infrastructural facilities such as roads, waterways, electricity, etc., which can greatly reduce the opportunity that a community has to access and enjoy services provided by public or private entities. In the case of stages 5 and 6 of Ovita, the residents lack access to waste management services offered by the DMMC. The two stages are later additions to the settlement and are located at the eastern border of the settlement, near the large water body containing water from the "Weras Ganga".

In-depth interviews further revealed that waste collection vehicles only reach up to half way through the community as the 10 foot road that leads to certain stages is blocked by vehicles of residents that are parked on either side of the road. Therefore, residents are expected to walk halfway up the road to hand over waste to municipal council workers. According to Naleeka[10], a 47-year-old housewife who lives in stage 5 stated, "*The waste truck never comes here as the road is blocked by vehicles of the residents. We have to carry waste all the way to the 4th stage if we want to hand it over to the municipal truck. On most days, we miss the waste collection truck, as they now have a habit of not coming at all to stage 5, expecting us to be at stage 4 when they arrive. If we miss the collection vehicle, we need to wait another week to hand over the waste, and as you know, one simply cannot keep food waste for a long time. So if we miss the collection vehicle, we have to haul the collected waste to the Galle Road or pay a drug addict to dispose of it for us*" (In-depth interview, 2022).

[9] Grama Sewaka Niladhari is a Sri Lankan public official appointed by the central government to carry out administrative duties in a grama niladhari division, which is a sub-unit of a divisional secretariat.

[10] Naleeka is a pseudonym used to protect the identity of the respondent.

Madavi[11] a 38-year-old housewife living in stage 5 stated, "*I don't blame the residents. We simply cannot park our vehicles anywhere else, as they might get broken into or stolen. The local council should do something about it. In addition to not coming to stage 6, they also don't come on a designated day. My wife has to keep her eyes always open to see whether the garbage truck is coming, which is quite difficult when you have to take care of a five-year-old and a seven-month-old toddler*" (In-depth interview, 2022).

In order to provide an equitable waste management service to the residents living in stages 5 and 6, the municipal council can adopt multiple approaches. One option is to consider the possibility of maintaining communal waste bins in the stages, allowing the residents to dispose of waste. As the findings revealed that residents struggle to store bio-degradable waste, these communal bins can be utilized to collect only non-bio-degradable waste. Nevertheless, it should be emphasized that this should be a short-term option.

The local council should look for a pragmatic and cost-effective way to collect waste along the congested roads of stages 5 and 6. As the local council or any other entity has yet to design and initiate a plan to create a parking space for the vehicles of residents, the most pragmatic solution is to introduce a smaller vehicle, such as a three-wheeler or a motor cycle, for waste collection. Small vehicles will be able to fit on narrow roads and will also be cost-effective in terms of operational costs.

The local council does not charge residents of the Ovita underserved settlement for waste management services. However, the council charges residents an annual municipal tax. The amount is decided by calculating 6% of the annual valuation of properties. For the households in Ovita this amount is less than LKR.3,000. (approx. CHF. 8.00) a year. Respondents had mixed responses regarding payments to the local council for waste management services.

[11] Madavi is a pseudonym used to protect the identity of the respondent.

3.9 Payment to service provider by stage

Stage	Yes	No	Total
Stage 1	30	32	62
	4.9%	5.3%	10.2%
Stage 2	80	90	170
	13.2%	14.8%	28.0%
Stage 3	46	87	133
	7.6%	14.3%	21.9%
Stage 4	19	26	45
	3.1%	4.3%	7.4%
Stage 5	26	77	103
	4.3%	12.7%	17.0%
Stage 6	33	61	94
	5.4%	10.0%	15.5%
Total	**234**	**373**	**607**
	38.6%	**61.4%**	**100.0%**

Source: Survey data, 2022

Over 61% of respondents stated that they do not make a payment to the local council while nearly 39% stated that they do. Respondents who had made a payment further clarified their response by elucidating the nature of payments as follows:

3.10 Type of payment to the local council by stage

Stages	Annual Municipal Tax	Giving small amounts during festive months	Giving a small amount of money occasionally	Giving LKR. 100 to workers every month	Total
Stage 1	10	18	1	1	30
	4.3%	7.7%	0.4%	0.4%	12.8%
Stage 2	28	50	2	0	80
	12.0%	21.4%	0.9%	0.0%	34.2%
Stage 3	16	28	2	0	46
	6.8%	12.0%	0.9%	0.0%	19.7%
Stage 4	9	10	0	0	19

	3.8%	4.3%	0.0%	0.0%	8.1%
Stage 5	15	11	0	0	26
	6.4%	4.7%	0.0%	0.0%	11.1%
Stage 6	14	18	1	0	33
	6.0%	7.7%	0.4%	0.0%	14.1%
Total	**92**	**135**	**6**	**1**	**234**
	39.3%	**57.7%**	**2.6%**	**0.4%**	**100.0%**

Source: Survey data, 2022

Nearly 58% of respondents had voluntarily given a small amount of money to waste collectors during the festive months. The findings of the qualitative data suggest that the above-mentioned payment is made voluntarily. Swaminathan[12], a 50-year-old businessman living in stage 3 elaborated on this type of payment with this explanation: "*Their job is not a pleasant one. They work with garbage and filth every day. Also, they do a good job at collecting waste, so I do feel obliged to pay them a small amount during festive months such as the new year, April new year, Christmas, Vesak festival, etc. It's not a fixed amount; I give them what I can afford to give them. They also don't make a fuss about the amount I give to them*" (In-depth interview, 2022).

Over 39% of respondents stated that they pay an annual municipal tax to the local council. The respondents clarified why they consider the annual municipal tax a payment for MSWM provided by the council. According to Mahinda[13], municipal taxes are paid to the council for all the services provided. "*The local council is an administrative body that is there to provide services to residents. This is why we elect members to the council. Managing the municipal waste produced in its administrative area, including Ovita, is one of the key responsibilities of the local council. Annually, the local council* charges a municipal tax from the residents to cover the expenses the council has to bear" (In-depth interview, 2022).

[12] Swaminathan is a pseudonym used to protect the identity of the respondent.

[13] Mahinda is a pseudonym used to protect the identity of the respondent.

Aksha[14] a 26-year-old female living in stage 3 with her parents stated that "*The local council and the elected members are responsible for waste management in the council area. We already pay them with our day-to-day taxes for their salaries, buildings, vehicles, etc. Still, they again charge an annual tax from the residents. I don't think we should pay taxes, and I pay taxes only because it is compulsory. If not, I would not have paid any taxes or payments to the local council*" (In-depth interview, 2022).

Qualitative data reveals that respondents consider the services provided by the council obligatory. The rationale used to justify this sentiment is the fact that residents elect members to the council of their own free will. These findings expose the patron-client relationship that exists between residents and elected members of the local council. The relationship between these two actors has all the telltale features of patron-client relationships: personal communication, direct exchange of resources, a certain degree of loyalty, and inequality between patron and client (Eisenstadt and Roniger, 1980).

As local members are elected by residents, the two parties maintain a close yet distant relationship. Often, this relationship is informal in nature, as residents seek personal favours from elected members. When residents are faced with difficulties in relation to the services provided by the local council (including solid waste management), they directly contact elected members to seek solutions. In an interview carried out with an elected member of a local council considered under the MSWM project, the official emphasized this reciprocal relationship. He stated that "*MSWM is one of the key services our council provides to voters. They expect us to keep their area clean and sanitized. The solid waste management provided by the council has a great significance in terms of obtaining the votes of the residents*" (In-depth interview, 2019).

This relationship provokes elected members to propose and support decisions that are popular among voters. This was revealed in an interview with a top official from a local council when the respondent recounted how elected members rejected the proposal to impose a tax on waste collection. He further stated that "*the aim of the regulation proposed by the officers was to charge a waste collection tax of LKR 100.00 from the citizens. However, the elected*

[14] Aksha is a pseudonym used to protect the identity of the respondent.

members rejected the proposal immediately, even without taking it up for debate. An elected member of the local council asked me, "Are you trying to reduce our voter base?" Do you want us to lose?" (In-depth interview, 2019).

This patron-client relationship is highly beneficial to residents as it allows them to directly establish links with authoritative figures without being victims of red tape. The relationship gives way for quick solutions to the issues of residents. Nevertheless, this patron-client relationship can exert negative impacts on waste management infrastructure in the long run. Further, as apparent from the account of the officer, elected members tend to support decisions that are popular among voters with the aim of re-election. However, these popular decisions often exert immense pressure on the waste management architecture, forcing the system to stretch its resources. These decisions have contributed to reducing the quality of services provided by local councils in the long run, as these ad hoc decisions reduce the efficiency of services offered and become a burden to local councils.

3.3.3 Satisfaction regarding municipal solid waste management

Data gathered using the survey suggests that the majority (over 55%) of respondents are satisfied with municipal solid waste management services provided by the local council. The majority affirmed this finding during in-depth interviews. Sumanga[15], a 32-year-old male living in stage 2 stated that "*the waste workers do a good job. For me, the fact that they collect the waste is good enough to be satisfied. Before the local council provided the services, the settlement was covered with filth. Dogs and crows used to take garbage everywhere. Flies were everywhere. The situation became better when the local council and the JAICA came together and implemented many programmes*" (In-depth interview, 2022).

[15] Sumanga is a pseudonym used to protect the identity of the respondent.

3.11 Satisfaction with waste collection by stage

Stage	Satisfied	Dissatisfied	Total
Stage 1	36	26	62
	5.9%	4.3%	10.2%
Stage 2	104	66	170
	17.1%	10.9%	28.0%
Stage 3	85	48	133
	14.0%	7.9%	21.9%
Stage 4	18	27	45
	3.0%	4.4%	7.4%
Stage 5	47	56	103
	7.7%	9.2%	17.0%
Stage 6	45	49	94
	7.4%	8.1%	15.5%
Total	**335**	**272**	**607**
	55.2%	**44.8%**	**100.0%**

Source: Survey data, 2022

Nearly 45% of respondents stated that they were dissatisfied with waste collection activities. The respondents further clarified the reasons for the degree of satisfaction, which are elucidated by tables 3.12 and 3.13.

3.12 Reasons for satisfaction by stage

Stage	Because they don't charge	Because waste is collected each week	Because waste collectors are punctual	Because waste collection is systematic	Because waste collection is carried out without interruptions	Because the waste workers are friendly	Total
Stage 1	5	19	5	2	5	0	36
	1.5%	5.7%	1.5%	0.6%	1.5%	0.0%	10.7%
Stage 2	6	63	7	4	25	0	105
	1.8%	18.8%	2.1%	1.2%	7.5%	0.0%	31.3%
Stage 3	4	54	7	2	16	1	84
	1.2%	16.1%	2.1%	0.6%	4.8%	0.3%	25.1%
Stage 4	0	8	8	0	2	0	18
	0.0%	2.4%	2.4%	0.0%	0.6%	0.0%	5.4%
	7	26	7	1	6	0	47

Stage 5	2.1%	7.8%	2.1%	0.3%	1.8%	0.0%	14.0%
Stage 6	0	28	4	10	2	1	45
	0.0%	8.4%	1.2%	3.0%	0.6%	0.3%	13.4%
Total	**22**	**198**	**38**	**19**	**56**	**2**	**335**
	6.6%	**59.1%**	**11.3%**	**5.7%**	**16.7%**	**0.6%**	**100.0%**

Source: Survey data, 2022

Over 59% of respondents stated that they are satisfied with waste collection activities, as the municipal council collects waste every week. Further, nearly 17% were satisfied because waste is collected without interruptions, and over 11% were content because waste workers are punctual. Nearly 7% of respondents stated that they are satisfied with waste management as the local council does not charge a fee to collect waste.

The responses signify key expectations by residents in terms of solid waste management, such as free service, uninterrupted waste collection, and regular (weekly) collection. These characteristics also signify the "out of sight, out of mind" mindset of respondents. It is evident that all key requirements aim at simply removing waste from households and the settlement. This approach can have a negative impact on waste management mechanisms in the long run as it distances waste producers from waste. Waste becomes the responsibility of someone else (waste workers) as a result, detaching from the responsibility that waste producers have towards waste generation and management. Thus, waste production and waste management become invisible to producers.

Secondly, invisibility complicates waste management procedures. The simple task of responsibly producing and managing waste at the household level becomes a complicated mechanism that demands large amounts of resources, technical knowledge, and the intervention of multiple stakeholders. Further, as municipal waste management is a socio-ecological system, invisibility complicates the lives of many secondary stakeholders who are part of sub-systems, such as informal waste workers, local council officials, elected members, farmers, etc.

3.13 Reasons for dissatisfaction by stage

Stage	The collection days for biodegradable waste are not adequate	Lack of bins to store waste	Not attending to the waste dumped in to the canal	Lack of uniformity in waste collection	Because the truck do not come to certain roads	Total
Stage 1	8	10	5	0	3	26
	2.9%	3.7%	1.8%	0.0%	1.1%	9.6%
Stage 2	23	16	19	5	3	66
	8.5%	5.9%	7.0%	1.8%	1.1%	24.3%
Stage 3	6	7	25	3	8	49
	2.2%	2.6%	9.2%	1.1%	2.9%	18.0%
Stage 4	6	5	10	0	6	27
	2.2%	1.8%	3.7%	0.0%	2.2%	9.9%
Stage 5	24	11	14	1	5	55
	8.8%	4.0%	5.1%	0.4%	1.8%	20.2%
Stage 6	11	14	9	5	10	49
	4.0%	5.1%	3.3%	1.8%	3.7%	18.0%
Total	**78**	**63**	**82**	**14**	**35**	**272**
	28.7%	**23.2%**	**30.1%**	**5.1%**	**12.9%**	**100.0%**

Source: Survey data, 2022

The respondents indicated reasons for their dissatisfaction regarding MSWM services provided by the local council. Among them, a significant percentage (over 30%) mentioned that failure to attend to the waste dumped into the canal is a cause of dissatisfaction; 29% mentioned that the number of days that bio-degradable waste is insufficient; and over 23% stated that the lack of communal bins to collect bio-degradable waste is dissatisfying. Nearly 13% of respondents expressed their dissatisfaction with the fact that waste collection is not carried out in certain sections of the settlement.

The qualitative data gathered using in-depth interviews revealed that the stagnant canal is a major concern. The respondents stated ways in which the canal affects their lives. Jeevan[16] a 45 year old self-employed resident living in stage 2 stated that "*the council does not attend to the canal. There used to be a net that catches waste dumped to the canal up stream. Most of the waste you see here aren't waste thrown by the residents rather they are thrown in to the canal upstream in Dehiwala. However, as the canal becomes curved near*

[16] Jeevan is a pseudonym used to protect the identity of the respondent.

the settlement the flowing speed of the canal reduces near the settlement. Thus, the waste get lodged in the canal and completely blocks it. As you can see the canal is extremely filthy, full of flies and mosquitos. The council should attend to the canal and clean it. If they cannot install a net to catch waste they should at least stop the factories upstream from discarding chemical waste to the water" (In-depth interview, 2022).

Image 3.4 The canal blocked with non-biodegradable waste

Source: Malith De Silva, 2022

Image 3.5 Part of the canal flowing between stages 3 and 2

Source: Malith De Silva, 2022

Image 3.6 Residents crossing the blocked canal to reach stage 5

Source: Malith De Silva, 2022

The authors observed that the canal had become a major threat to the wellbeing of the residents. It is blocked at three locations: at the beginning of stage 3, near the bridge between stages 3 and 2, in the middle of the canal route between stages 4 and 5, and near the secondary bridge that connects stage 4 to a by-road that leads to Galle Road. The canal had become a hotbed for the breeding of mosquitoes and flies. It is of paramount importance that the council attend to this issue (even though management of the canal is not directly linked to municipal solid waste management by the local council), as the situation of the canal directly impacts cleanliness in the settlement and the health of the community.

3.14 Suggestions of respondents to improve MSWM by stage

Stage	Collecting waste on designated days without interruption	Attending to the canal and cleaning it by monthly	Increasing the number of days waste is collected	Waste should be collected in roads in the center of the community	Establishing a waste managemen t committee	Total
Stage 1	7	8	8	4	2	29
	2.6%	2.9%	2.9%	1.5%	0.7%	10.7%
Stage 2	23	15	15	15	4	72
	8.5%	5.5%	5.5%	5.5%	1.5%	26.5%
Stage 3	19	10	18	10	1	58
	7.0%	3.7%	6.6%	3.7%	0.4%	21.3%
Stage 4	6	6	3	3	0	18
	2.2%	2.2%	1.1%	1.1%	0.0%	6.6%

Stage 5	23	9	10	6	1	49
	8.5%	3.3%	3.7%	2.2%	0.4%	18.0%
Stage 6	12	6	18	9	1	46
	4.4%	2.2%	6.6%	3.3%	0.4%	16.9%
Total	**90**	**54**	**72**	**47**	**9**	**272**
	33.1%	**19.9%**	**26.5%**	**17.3%**	**3.3%**	**100.0%**

Source: Survey data, 2022

Over 33% of respondents stated that waste should be collected without any interruptions in order to improve the waste management mechanism. Further, over 26% stated that the number of days that waste is collected should be increased. Qualitative data suggests that respondents expect local councils to increase the number of days that bio-degradable waste is collected since it is difficult to store such waste.

Further, nearly 20% of respondents stated that the canal should be cleaned on a monthly basis. As noted previously, the canal that runs through the settlement is an integral part of the underserved settlement. Therefore, the canal and the surrounding environment have a major impact on the cleanliness and hygiene of the settlement. In this light, the proposition of the respondents to clean the canal on a monthly basis is justifiable.

Over 17% of respondents had requested that the local council should collect waste from the roads located in the center of the community. This particular finding was reiterated during qualitative interviews. Sameera[17] a 50-year-old male living in stage 4 of the settlement stated that waste is not collected from households located within the settlement. "*I live in stage 3, in a small four-way junction in the stage. The waste collection vehicle of the council does not come to our area; rather, they expect us to come to the main road of the settlement and hand over the waste. You should come here when the waste collection vehicle is here. It's like a circus. My husband and my neighbours have to run after the vehicle, and if they miss it from one side, they have to run to the other side of the settlement to get hold of the tractor. This is unfair; others don't have to do it. Then expecting us to do it every week is unfair*" (In-depth interview, 2022).

[17] Sameera is a pseudonym used to protect the identity of the respondent.

3.3.4 Informal waste management in the settlement

The study also explored waste management activities carried out by informal waste workers. The aim was to generate a brief yet accurate account of the labour force, collection methods, types of waste collected, collection dates, customer base, etc.

In the early years, Ovita was a hub for informal waste collectors. This was a result of the central location of the settlement in the DMMC and the relatively inexpensive space it offers for businesses to prosper. The location assured access to the majority of the middle- and high-income earning communities, thus assuring the availability of economically viable waste items such as metal, glass, paper, electronic items, etc. Further, the location of Ovita reduced transport costs significantly as many waste collectors either settled in the community, purchased neighbouring land, or encroached on available free space, such as road sides. Waste collectors utilized their stores to further segregate collected waste items and sold items to entrepreneurs who converted them into raw materials to be exported. Again, the central location of Ovita within the local council and the commercial capital of Colombo made the services provided by informal waste workers more attractive due to competitive prices and low transportation costs.

Nevertheless, the findings of the study suggest that the number of informal waste collectors that operate in the community has reduced over time. The majority (nearly 65%) of respondents stated that only two waste workers are active in the community, while nearly 20% of respondents stated that there is only one informal waste collector.

3.15 Number of waste workers active within the settlement by stage

Stage	1 collector	2 collectors	3 collectors	4 collectors	Total
Stage 1	9	40	6	7	62
	1.5%	6.6%	1.0%	1.2%	10.2%
Stage 2	44	104	15	7	170
	7.2%	17.1%	2.5%	1.2%	28.0%
Stage 3	21	89	16	7	133
	3.5%	14.7%	2.6%	1.2%	21.9%
Stage 4	8	33	3	1	45
	1.3%	5.4%	0.5%	0.2%	7.4%
Stage 5	14	72	11	6	103
	2.3%	11.9%	1.8%	1.0%	17.0%
Stage 6	25	54	13	2	94
	4.1%	8.9%	2.1%	0.3%	15.5%

Total	**121**	**392**	**64**	**30**	**607**
	19.9%	**64.6%**	**10.5%**	**4.9%**	**100.0%**

Source: Survey data, 2022

Qualitative data reveals that there are at least three to four waste workers who collect economically viable waste. However, only two of these waste workers are established in the settlement.

Findings from qualitative data revealed key factors that have contributed to the decrease in the number of informal waste collectors. Respondents stated that the majority of residents living in the settlement hand over economically viable waste to the waste collection vehicle of the municipal council. Asitha[18] a respondent living in stage 3 explained the reason for handing over the waste in the following manner: "*Most of the residents, including our family, hand over waste items such as books, newspapers, glass, metal, tin cans, etc. to the waste collection vehicle of the council. Even though we do not get any money out of it, it is easier for us to hand it over than keeping the items with us*" (In-depth interview,2022). Thus, it is clear that collection by local councils has contributed to the decrease in the number of informal waste collectors.

According to the respondents, another factor that might have contributed to the decrease in waste collectors within the settlement could be the change in the method of payment, as informal waste collectors have altered their payment method. Instead of paying the residents a monitory compensation, economically viable waste items are exchanged for basins and jugs made out of low-grade recycled plastics. This shift in the informal sector from monitory compensation to a barter system seems to have discouraged respondents from storing economically viable waste to be handed over to informal waste collectors.

Tissa[19] a male respondent living in stage 4 stated, "*The informal waste collectors do not pay money for the items they collect from us. Don't get me wrong; they never gave the residents a fair amount for the items they collected. They always lied and undervalued the items they purchased. At least then they paid in cash. But now they have come up with a new scam. They give you a*

[18] Asitha is a pseudonym used to protect the identity of the respondent.
[19] Tissa is a pseudonym used to protect the identity of the respondent.

substandard basin or jug for anything you give them. If you give them a stack of papers, they give you a small jug, and if you give them an old laptop, they give you a basin. You can give them a washing machine; they will still give you a basin. How many basins a man need? Even the plastic items they provide are substandard. You cannot use the jugs to make tea or any other hot beverage. If you try to do so, the shape changes completely. So now tell me, "What's the point of giving waste to informal waste workers?" (In-depth interview, 2022).

Wimal[20], a 56-year-old male daily paid labourer living in stage 1 expounded on a factor that had contributed to the reduction of informal waste collectors. *"Informal waste collectors now don't have to spend money on daily paid labour to collect waste. Instead, they purchase the economically viable waste items from the waste workers of the municipal council. While collecting waste, the waste workers of the municipal council segregate economically viable waste. At the end of their shifts, they sell the economically viable waste to informal waste collectors and divide the amount amongst them"* (In-depth interview, 2022).

Image 3.7 Informal waste collectors collecting waste

Source: Malith De Silva, 2022

[20] Wimal is a pseudonym used to protect the identity of the respondent.

Types of waste collected by informal waste workers

Findings from the qualitative data reveal the types of waste collected by informal waste collectors, such as metal, papers, plastic items, electronic waste, and mechanical waste. The respondents further elaborated on the different subcategories of waste collected, including aluminium cans, iron, copper, phone batteries, laptop batteries, vehicle batteries, blenders, steel chairs, wrought iron, washing machines, fan mortars, fan blades, transformers, white glass, PET bottles, tonic caps, iron cases, tough plastics, rubber tyres, etc.

3.16 Informal waste collection dates by stage

Stage	Once a week	Twice a week	Once a month	No specific date	Total
Stage 1	11	13	27	11	62
	1.8%	2.1%	4.4%	1.8%	10.2%
Stage 2	37	26	56	51	170
	6.1%	4.3%	9.2%	8.4%	28.0%
Stage 3	23	41	41	28	133
	3.8%	6.8%	6.8%	4.6%	21.9%
Stage 4	5	17	10	13	45
	0.8%	2.8%	1.6%	2.1%	7.4%
Stage 5	15	19	37	32	103
	2.5%	3.1%	6.1%	5.3%	17.0%
Stage 6	13	21	36	24	94
	2.1%	3.5%	5.9%	4.0%	15.5%
Total	**104**	**137**	**207**	**159**	**607**
	17.1%	**22.6%**	**34.1%**	**26.2%**	**100.0%**

Source: Survey data, 2022

Over 34% of respondents stated that informal waste workers collect waste once a month while over 26% stated that it is difficult to identify a specific day.

Informal waste workers and the labour force

The authors observed that the majority of informal waste workers are employed on a daily wage basis. Waste workers do not have a contract that

specifies their remuneration or period of appointment. According to the accounts of respondents, the majority of workers consume drugs for recreational purposes. Jayasekara[21], 41 a self-employed resident of stage 1 stated, *"These workers are addicts of heroin and ice (Methamphetamine). The waste collectors pay them a daily wage according to the amount of waste they collect on a given day. Whatever they earn on a daily basis is spent on consuming drugs. The next day they again need to work for the waste collector to finance their habit"* (In-depth interview, 2022).

The authors also observed that most waste workers are employed on a daily wage basis and that they obtain the support of their family members to run the business. For example, one informal waste collector has his wife and eldest son involved in the waste collection business. His wife is responsible for calculating and paying salaries, while his son is responsible for bookkeeping. Therefore, in addition to daily paid labourers the labour force of the informal waste sector consists of labourers who offer their services voluntarily based on kinship.

Paying with drugs

The authors witnessed a previously unidentified method of payment that is used by the most prominent waste collector in the Ovita settlement, which is "paying with drugs". This was witnessed during multiple visits to the collection center and observing waste workers. The son of the waste collector measures the weight of the waste collected by each waste worker and writes it down. Then the worker walks upstairs to a room on the second floor. The workers come out of the room after 10 to 15 minutes of intoxicated. A neighbour of the informal waste collector later informed the authors that the room on the second floor is a drug den where waste workers are given a dose of recreational drugs. The dose worker gets is relative to the amount of waste they collected on that day.

The authors managed to verify this information during a visit to the informal waste workers home. Upon arrival, there was an argument between the wife of the informal waste collector and a waste worker. The waste worker complained

[21] Jayasekara is a pseudonym used to protect the identity of the respondent.

that he was cheated because only half a shot was given to him. The wife retorted by stating that the worker had consumed a shot on credit the previous week and that he had failed to collect enough waste this week to compensate for a full shot. These findings open up a new window for exploration, at least in the Sri Lankan context. Though mafia groups have been involved in waste management internationally, the situation in Sri Lanka should be confirmed with concrete evidence.

3.3.5 Community based waste management mechanism (1997-2001)

This section attempts to draft a brief profile regarding the community-based waste management programme that existed in the Ovita settlement. It explores the types of waste managed by the programme, the success of the programme and the factors that contributed to its failure.

Introduction

In the period between 1997 and 2001, a local NGO based in Colombo, Sri Lanka, called "SEVANATHA" implemented a community-based waste management programme using funds granted by the "Urban Settlement Programme" of the United Nations Human Settlement Programme. The programme was implemented at the request of a community leader and the Community Development Council (CDC) of the settlement (Roberts & Kahaley, 2006). The community-based waste management programme focused on recovering non-biodegradable waste from the waste generated within the council.

The programme offered both local and overseas training regarding bookkeeping, communal waste management, and segregation to selected members of the CDC. After training and improving the awareness of residents, three individuals were appointed to collect economically viable waste, including polythene bags, plastic bottles, PET bottles, etc. CDC collected economically viable waste from households, and each household was given a monthly payment for the amount of waste they handed over to the community-based programme. The programme was functional until 2001 with the supervision and financial support of SEVANATHA and is hailed as a successful community-based waste management programme. A recycling center was constructed in the Ovita underserved settlement, and economically viable waste collected from the settlement was processed and sold to

companies as raw material. The income thus generated was utilized to pay the residents.

In 2001, SEVANATHA officially exited the programme and the community waste management mechanism collapsed the following year. The resource recovery center built as part of the project was incorporated into the formal municipal solid waste management programme of the DMMC.

The findings of the survey suggest that over 22% of respondents have participated in the programme which was implemented in the stages 1, 2 and 3.

3.17 Participation in the programme by stage

Stage	Yes	No	Total
Stage 1	16	46	62
	2.6%	7.6%	10.2%
Stage 2	45	125	170
	7.4%	20.6%	28.0%
Stage 3	26	107	133
	4.3%	17.6%	21.9%
Stage 4	6	39	45
	1.0%	6.4%	7.4%
Stage 5	21	82	103
	3.5%	13.5%	17.0%
Stage 6	21	73	94
	3.5%	12.0%	15.5%
Total	**135**	**472**	**607**
	22.2%	**77.8%**	**100.0%**

Source: Survey data, 2022

Findings from the qualitative data revealed that the programme managed recyclable waste such as paper, plastics, metal, pet bottles, etc., which were collected using a small cart.

3.18 Effectiveness of the programme by stage

Stage	Yes	No	Total
Stage 1	1	6	7
	0.7%	4.4%	5.2%
Stage 2	5	35	40
	3.7%	25.9%	29.6%

Stage 3	4	33	37
	3.0%	24.4%	27.4%
Stage 4	1	8	9
	0.7%	5.9%	6.7%
Stage 5	2	20	22
	1.5%	14.8%	16.3%
Stage 6	1	19	20
	0.7%	14.1%	14.8%
Total	**14**	**121**	**135**
	10.4%	**89.6%**	**100.0%**

Source: Survey data, 2022

Out of the respondents who had participated in the programme, over 10% stated that the programme was a success, while nearly 90% stated that programme was a failure. The qualitative data gathered for the study revealed a few of the key factors that contributed to the failure of the programme. Sagara[22] is a 60-year-old retired resident living in stage 4 who stated, "*The programme failed simply because the NGO exited from the programme. The officials of the NGO and the local council supervised the waste management activities and corrected the activities of the programme when needed. But when they left the programme the members of the CDC failed to maintain the standards introduced by the programme. For example, when the officers were part of the programme the residents were paid in cash for the amount of waste they handed over to the CDC. But few months after the NGO exited the programme, the CDC began to pay the residents in kind, such as soap*" (In-depth interview, 2022).

3.19 Causes for the failure of the programme by stage

Stage	Failure to pay on time	Lack of supervision by the NGO	Mishandling of funds by community members	Lack of involvement of community members	Lack of involvement of municipal council	Total
Stage 1	2	2	4	1	1	10
	1.7%	1.7%	3.3%	0.8%	0.8%	8.3%
Stage 2	9	14	8	0	3	34

[22] Sagara is a pseudonym used to protect the identity of the respondent.

	7.4%	11.6%	6.6%	0.0%	2.5%	28.1%
Stage 3	6	9	10	3	1	29
	5.0%	7.4%	8.3%	2.5%	0.8%	24.0%
Stage 4	1	0	4	2	0	7
	0.8%	0.0%	3.3%	1.7%	0.0%	5.8%
Stage 5	4	7	7	1	0	19
	3.3%	5.8%	5.8%	0.8%	0.0%	15.7%
Stage 6	6	6	8	1	1	22
	5.0%	5.0%	6.6%	0.8%	0.8%	18.2%
Total	**28**	**38**	**41**	**8**	**6**	**121**
	23.1%	**31.4%**	**33.9%**	**6.6%**	**5.0%**	**100.0%**

Source: Survey data, 2022

Nearly 34% of respondents stated that the programme failed because the CDC officers (three elected members) mishandled the funds of the programme. Sumangala[23] a female resident of stage 3 was part of the programme and she stated that "*The members of the CDC used the funds generated from the projects for their personal use. When they failed to generate new funds for the programme they began to hand over soap to the residents for the waste they provided for the programme. Later they failed to even give a soap bar. The residents did not stop giving economically viable waste to the CDC offical s.It is them who stopped collecting waste*" (In-depth interview, 2022).

The findings suggest that the programme was successful as long as the implementing organization was involved in the programme. The exit of the NGO had a severe impact on the administration of the programme. This outcome can be a result of the "out of sight-out of mind" approach of the residents. It is also important to gradually exit the programme at a phase that is appropriate for the residents.

[23] Sumangala is a pseudonym used to protect the identity of the respondent.

Chapter 4. Waste management in crisis

4.1 Introduction

Chapter 4 of the report attempts to understand the impact of two crises events on the municipal solid waste management of the Ovita settlement. The first section of the chapter explores the impact caused by the collapses of the Meethotamulla dumping site on waste management and waste practices of households while the second section explores the impact of the COVID-19 virus on MSWM activities and household waste management activities.

4.2 Collapse of the Meethotamulla waste dumping site

On 14th April 2016, Meethotamulla garbage dump, largest open dumping site in Sri Lanka collapsed, killing over 13 individuals and displacing over 300 families. The event had a drastic impact on municipal solid waste management in the country, forcing the government and local authorities to adopt new policies and regulations. Moreover, the event also paved the way for the introduction of compulsory segregation in all local councils of Sri Lanka.

Quantitative data gathered from the survey suggests that a significant portion of respondents had experienced some change related to waste management mechanism in the aftermath of the disaster.

Table 4.1 Meethotamulla disaster and impact on waste management by stage

Stage	Yes	No	Don't Know	Total
Stage 1	23	27	12	62
	3.8%	4.4%	2.0%	10.2%
Stage 2	56	75	39	170
	9.2%	12.4%	6.4%	28.0%
Stage 3	60	48	25	133
	9.9%	7.9%	4.1%	21.9%
Stage 4	15	19	11	45
	2.5%	3.1%	1.8%	7.4%
Stage 5	40	44	19	103
	6.6%	7.2%	3.1%	17.0%
Stage 6	42	28	24	94
	6.9%	4.6%	4.0%	15.5%
Total	**236**	**241**	**130**	**607**
	38.9%	**39.7%**	**21.4%**	**100.0%**

Source: Survey data, 2022

A slightly high percentage of respondents (nearly 40%) stated that municipal solid waste management remained the same and nearly 39% stated that there was a change during this period. Over 21% of respondents stated that they were unaware about a change. This mixed response regarding the impact of the Meethotamulla crisis might have derived from the difficulty of recalling the changes that occurred in waste management activities in 2016. This outcome showcases one of the limitations of the retrospective approach used in research.

Some respondents stated that the collapse of the Meethotamulla dumping site had little to no impact on waste management activities in the settlement. Sakuna[24] a 40 year old male daily paid labourer living in stage 1 commented saying "*Yes! It was a sad incident. Something that could have been avoided. But I can't recall that it had any influence over the waste collection in the settlement. This could be because the waste collected from our settlement is taken to a different dumping site. I think the waste from this area is dumped at a dumping ground in Dematagoda*" (In-depth interview, 2022). Nevertheless, it was confirmed that the waste collected was disposed to the Meethotamulla and Karadiyana waste disposal sites during an interview collected with a senior administrative office of the DMMC.

Further, another Kavindu[25] a 39 year old daily paid labourer living in stage 4 stated that "*Waste collection during this period was the same. They collected waste every week or so ….maybe they were late for a few additional days but it was really nothing because they were late on some occasions even before. Our neighbor is a waste collector at the local council. He always informed us if the vehicle was not coming due to breakdowns or maintenance issues so we would find other ways to get rid of waste like handing it over to drug users, giving them something or keeping the waste near the bus stand or on the road side*" (In-depth interview, 2022).

This statement reveals an interesting dynamic of life in an underserved settlement. As the name suggests, residents of an underserved settlement have limited access to services offered by the central government and local councils and this limited access stems from their disadvantaged socio-economic and

[24] Sakuna is a pseudonym used to protect the identity of the respondent.
[25] Kavindu is a pseudonym used to protect the identity of the respondent.

political standing in society which makes them invisible. Therefore, residents have little or no say regarding the services offered by the central government or local councils. This invisibility becomes a key dynamic of their existence which becomes normalized with time, both for themselves and to other individuals, groups and organizations that interact with them. For an instance, the above respondent stated that waste collection was not affected by the collapse of the Meethotamulla disaster but says waste collection was delayed before the incident and that the delay is normal.

This exposes the inefficient and disrupted municipal solid waste management service provided to the settlement. Further, it elucidates how this inefficiency and lack of attention by the local council (specifically the waste management arm) has become normalized among residents to such an extent that a delay of few days or a week is considered normal. In this light, it is fair to assume that their existence in other sub-systems also maybe over shadowed by this invisibility. Moreover, it can also be argued that this contributes to their entrapment in the vicious cycle of poverty. As invisibility restricts residents from accessing support and advocacy services, it can limit access to life opportunities, thus limiting opportunities for social mobility.

Table 4.2 Impacts caused by Meethotamulla disaster by stage

Stage	Garbage collection temporarily stopped	Waste workers came on random days to collect waste unannounced	Community members threw waste in to the canal	Segregation of waste was made compulsory	Waste accumulated in houses and roadsides	Total
Stage 1	11	1	5	6	0	23
	4.7%	0.4%	2.1%	2.5%	0.0%	9.7%
Stage 2	24	2	0	24	6	56
	10.2%	0.8%	0.0%	10.2%	2.5%	23.7%
Stage 3	25	2	0	27	6	60
	10.6%	0.8%	0.0%	11.4%	2.5%	25.4%
Stage 4	9	1	1	4	0	15
	3.8%	0.4%	0.4%	1.7%	0.0%	6.4%
Stage 5	19	2	0	17	2	40
	8.1%	0.8%	0.0%	7.2%	0.8%	16.9%
Stage 6	23	0	0	19	0	42
	9.7%	0.0%	0.0%	8.1%	0.0%	17.8%
Total	**111**	**8**	**6**	**97**	**14**	**236**
	47.0%	**3.4%**	**2.5%**	**41.1%**	**5.9%**	**100.0%**

Source: Survey data, 2022

47% of respondents who stated that the Meethotamulla disaster had an impact on the waste management mechanism revealed that waste management activities stopped temporarily immediately after the disaster and qualitative data revealed that a significant number of respondents had suffered due to the suspension of waste collection. Nalayani[26] a 45-year-old housewife living in stage 2 revealed that *"the waste collection activities of the settlement stopped for almost a week and a half. As biodegradable waste cannot be stored for long residents began to find alternative disposal methods such as dumping waste in to the canal and dumping waste illegally on roadsides"* (In-depth interview, 2022).

Further, over 41% stated that the municipal council made it compulsory to segregate waste after the disruption in waste management activities. This step may have been an ad hoc decision taken by elected members and officials to address the pressure that came from society. In addition, this decision was based on policy and regulatory changes adopted by the Western Province Waste Management Authority. However, as discussed in chapter three the local council had failed to clearly inform the residents about the categories of segregation.

Table 4.3 Changing household MSWM mechanisms by stage

Stage	Yes	No	Can't remember	Total
Stage 1	13	42	7	62
	2.1%	6.9%	1.2%	10.2%
Stage 2	34	120	16	170
	5.6%	19.8%	2.6%	28.0%
Stage 3	49	68	16	133
	8.1%	11.2%	2.6%	21.9%
Stage 4	9	26	10	45
	1.5%	4.3%	1.6%	7.4%
Stage 5	37	49	17	103

[26] Nalayani is a pseudonym used to protect the identity of the respondent.

	6.1%	8.1%	2.8%	17.0%
Stage 6	32	45	17	94
	5.3%	7.4%	2.8%	15.5%
Total	**174**	**350**	**83**	**607**
	28.7%	**57.7%**	**13.7%**	**100.0%**

Source: Survey data, 2022

Nearly 29% of respondents had made changes to waste management activities while nearly 58% of respondents had not felt the need to change household activities. Nearly 14% could not recall whether they changed their waste management activities as a result of the disaster. The quantitative and qualitative data gathered by the study revealed that segregating at the source was the most significant change (over 75%) that took place at household level. In addition, nearly 15% of respondents had handed over waste to informal collectors to be discarded and another nearly 7% had disposed kitchen waste to the canal.

4.4 Changes in the household waste management activities by stage

Stage	Disposing kitchen waste to the canal	Discarding waste to roadsides	Starting to segregate waste	Garbage was given to informal waste workers to dispose	Total
Stage 1	1	0	7	5	13
	0.6%	0.0%	4.0%	2.9%	7.5%
Stage 2	4	1	26	3	34
	2.3%	0.6%	14.9%	1.7%	19.5%
Stage 3	2	1	37	9	49
	1.1%	0.6%	21.3%	5.2%	28.2%
Stage 4	0	0	8	1	9
	0.0%	0.0%	4.6%	0.6%	5.2%
Stage 5	3	1	26	7	37
	1.7%	0.6%	14.9%	4.0%	21.3%
Stage 6	2	2	27	1	32

	1.1%	1.1%	15.5%	0.6%	18.4%
Total	**12**	**5**	**131**	**26**	**174**
	6.9%	**2.9%**	**75.3%**	**14.9%**	**100.0%**

Source: Survey data, 2022

Banuka[27] a 54 old small scale businessman living in stage 3 revealed how his family members began to segregate waste; *" about a month after the Meethotamulla disaster the waste workers who came to collect waste from our household informed my wife that segregating waste as food and plastics was a must. We did not really care for it, as in previous instances the local council had tried to collect waste to a "SAMPATH PIYASA". Some people handed over their waste to it but over time it failed and the waste collection hut became a drug den. If you go to the PHI office some parts of it are still there" (In-depth interview, 2022).*

This account reveals that some respondents were initially not eager to segregate waste. If not, they were unsure about the new regulation, which was implemented by the council, as it had tried to introduce waste segregation in the past but failed because community members did not cooperate. The "SAMPATH PIYASA" mentioned by the respondent is an activity of the "PILISARU" national environmental protection programme which was introduced in mid-2015 by the Central Environmental Authority (CEA). The programme was the brainchild of the president at the time and thus had significant support from the government.

As part of the project, communal waste segregation points were introduced to collect non-biodegradable waste such as glass, metals, paper, plastics, and polythene. The government invested in constructing temporary huts to collect the above-mentioned types of waste. However, since it was not mandatory to segregate waste at the source, the project quickly failed. In a previous interview with a national advisor to the Government of Sri Lanka (GoSL), it was revealed that collection points located in communal settings had failed miserably, other than those implemented by schools in Colombo. These collection points

[27] Banuka is a pseudonym used to protect the identity of the respondent.

eventually provided refuge to the homeless and drug users. Further, as the hut was made out of iron sheets, it became a target for drug users and scrap metal collectors, and many collection points were demolished by these individuals.

Thamara[28], a 60-year-old housewife from stage 5, further explained how they resorted to segregating waste. "*After a few weeks, the waste collectors came, and this time they did not collect waste bags or buckets that were not segregated. They left it and asked us to segregate it and hand it over to them the next day. I then realized that the council is serious about the segregation this time and instructed my wife to collect kitchen and plastic waste separately*" (In-depth interview, 2022).

These findings suggest that the policy decision made by the local council to refrain from collecting unsegregated waste was the key motivating factor for the segregation of waste. The collapse of the Meethotamulla waste dumping site has had a considerable impact on waste management in the Ovita underserved settlement. Key impacts of the disaster were disruption of waste collection activities, introduction of compulsory segregation, adopting strategies such as dumping kitchen waste to the canal or handing over waste to informal waste workers. Only a small portion of residents could recall the impact of the disaster on waste management activities.

4.3 Waste management amidst COVID-19 pandemic

This section elucidates the findings of the survey in relation to the impact of the COVID-19 virus on MSWM activities in the underserved settlement. The quantitative data suggests that a significant proportion of residents felt an impact. As depicted by table (4.5) below, 58% of respondents stated that they experienced a change in waste management activities.

4.5 Changing of waste management in COVID-19 period by stage

Stage	Yes	No	Total
Stage 1	36	26	62
	5.9%	4.3%	10.2%
Stage 2	85	85	170
	14.0%	14.0%	28.0%

[28] Thamara is a pseudonym used to protect the identity of the respondent.

Stage 3	78	55	133
	12.9%	9.1%	21.9%
Stage 4	29	16	45
	4.8%	2.6%	7.4%
Stage 5	64	39	103
	10.5%	6.4%	17.0%
Stage 6	60	34	94
	9.9%	5.6%	15.5%
Total	**352**	**255**	**607**
	58.0%	**42.0%**	**100.0%**

Source: Survey data, 2022

Both qualitative and quantitative data depict changes that took place mainly because waste collectors were infected. The ill health of waste collectors had contributed to reducing the frequency of waste collection, disrupting waste collection activities, and initiating the collection of mixed waste.

4.6 Changes in the waste collection activities by stage

Stage	Waste collection activities stopped for few weeks	The number of waste collectors reduced significantly	Segregated waste was collected together	The frequency of waste collection was reduced	Total
Stage 1	8	10	11	7	36
	2.3%	2.8%	3.1%	2.0%	10.2%
Stage 2	22	15	20	29	86
	6.3%	4.3%	5.7%	8.2%	24.4%
Stage 3	23	14	17	22	76
	6.5%	4.0%	4.8%	6.3%	21.6%
Stage 4	3	8	10	9	30
	0.9%	2.3%	2.8%	2.6%	8.5%
Stage 5	19	13	14	18	64
	5.4%	3.7%	4.0%	5.1%	18.2%
Stage 6	16	14	14	16	60
	4.5%	4.0%	4.0%	4.5%	17.0%
Total	**91**	**74**	**86**	**101**	**352**
	25.9%	**21.0%**	**24.4%**	**28.7%**	**100.0%**

Source: Survey data, 2022

Nearly 26% of respondents stated that waste collection activities were halted completely for a significant period, and qualitative data suggests that the most difficult days were during the lockdown period. Ciril[29] a 65-year-old resident living in stage 2, stated that "*the initial weeks in the lockdown period were the most difficult. As all the members of the family were at home, the kitchen waste increased a lot. Then the waste collection vehicles did not turn up at all in the first few weeks. We knew that a large number of waste collectors got sick with COVID-19, as some of them were our neighbours. Gradually, waste collection began after about three weeks. The lorries would come unannounced and collect all the types of waste together*" (In-depth interview, 2022). Nearly 29% of respondents stated that the frequency of waste collection decreased significantly during this time period.

This was further confirmed by the account of Dimantha[30] a 36-year-old shop owner living in stage 1. He stated that "*in the second lockdown period that lasted from November 2020 to January 2021, the waste collection vehicles always arrived unannounced, and the frequency of waste collection was limited to once a week or once every two weeks. Due to the small space we have in the settlement, we had no option but to keep the kitchen waste on the roadside, as the kitchen waste starts to go bad in no time*" (In-depth interview, 2022).

Further, over 24% of respondents stated that mixed waste was collected. According Ishara[31], a 50-year-old respondent living in stage 4, "*the council collected all types of waste together even after expecting us to segregate waste in the lockdown period. They always came unannounced and informed the residents that they were collecting all types of waste together. So we handed over all the waste we had collected at our home. I think as most of the waste workers who are working as waste collectors got sick, they had no other option but to collect everything together*" (In-depth interview, 2022).

It can also be assumed that the collection of waste, irrespective of the type, could have been a result of the pressure exerted on waste collectors by the

[29] Ciril is a pseudonym used to protect the identity of the respondent.
[30] Dimantha is a pseudonym used to protect the identity of the respondent.
[31] Ishara is a pseudonym used to protect the identity of the respondent.

elected members of the council. As mentioned previously, the patron-client relationship that exists between residents and the elected members of the council dictates the majority of the relations the respondents have with the council and its services. This is also true in terms of MSWM activities. In previous interviews carried out with elected members of the DMMC, it was revealed that residents of the council informed them if waste collection activities were not carried out properly in an area of the council or if waste was not collected. Further, during interviews with officials from the local councils, it was revealed that some elected members had directly intervened in waste collection activities by pressuring workers and supervisory officers to collect unsegregated waste from businesses and households. Therefore, as mentioned earlier, it is fair to assume that elected members might have contributed to the collection of unsegregated waste.

Finally, 21% of respondents stated that there was a significant reduction in the number of waste collectors that came to collect waste from households during the lockdown period. The qualitative data revealed that a compactor usually carried around four waste collectors prior to the pandemic, which were reduced to two during the pandemic. Kamala[32] a 35-year-old housewife living in stage 1, recalled her experience: "*The number of waste collectors reduced a lot. Earlier, there were three to four waste collectors, and once the lorry was stopped on a road, two waste workers would collect waste from one house while the other two collected waste from another. But with the number of collectors going down, I noticed how the council workers struggled to complete the waste collection quickly. Also, they were wearing masks and gloves. They were not also helping that much, as some workers told us that it was difficult to breathe with the masks and the boots got slippery when they climbed on top of waste*" (In-depth interview, 2022).

The above response confirms the reduction of waste workers during the pandemic and the difficulties experienced by waste workers when collecting waste while adhering to the safety guidelines issued by the Ministry of Health. This is an aspect of the lives of waste workers that often health officials, administrators, and even researchers fail to evaluate. An effort should be made to record the experiences of waste workers when collecting waste while using

[32] Kamala is a pseudonym used to protect the identity of the respondent.

recommended equipment and utensils, the compatibility of the recommended safety items, and their aptness. The findings derived from such data would be instrumental in improving the quality of the work life of waste collectors in a similar pandemic situation.

As depicted in Table 4.7, a significant proportion (over 34%) of respondents living in the underserved settlement stated that household waste management activities had to be changed due to the impact of the COVID-19 virus. Nevertheless, a large majority (nearly 66%) stated that they did not experience any major change at the household level. The respondents revealed that available waste management alternatives were utilized to overcome the challenges posed by the virus to waste management activities. Lakmali[33] a 48-year-old housewife living in stage 1 explained how she managed waste at household level: *"I collected the waste as usual in kitchen and plastic waste and kept them for the waste collectors to come and collect. But when they got late to collect it, I dumped some of the kitchen waste into the flowing water of the canal and burned the plastic items that we had. It was not that difficult for us to dispose waste in this period"* (In-depth interview, 2022).

Moreover, it should also be pointed out that the DMMC had done its level best to provide waste management services to the residents immediately. In a previous interview with officials of the local council, it was revealed that the council took measures to operate with a minimum number of waste workers and utilized the services of workers who were assigned to other sections of the council to collect waste. Further, the council had taken measures to provide dry rations and other items to infected workers and their families. This would have contributed to the quick recovery of waste workers, permitting them to return to work as early as possible.

4.7 Changing household MSWM activities by stage

Stage	Yes	No	Total
Stage 1	25	37	62
	4.1%	6.1%	10.2%
Stage 2	49	121	170

[33] Lakmali is a pseudonym used to protect the identity of the respondent.

	8.1%	19.9%	28.0%
Stage 3	41	92	133
	6.8%	15.2%	21.9%
Stage 4	19	26	45
	3.1%	4.3%	7.4%
Stage 5	35	68	103
	5.8%	11.2%	17.0%
Stage 6	39	55	94
	6.4%	9.1%	15.5%
Total	**208**	**399**	**607**
	34.3%	**65.7%**	**100.0%**

Source: Survey data, 2022

The study further explored the types of changes prompted by the pandemic at the household level. Quantitative and qualitative data suggest that all changes occurred in relation to disposal and not storage of waste. Household members had employed adoptive measures such as disposing waste to the roadside (over 30%), burning garbage near the canal (over 25%), handing waste to neighbours who work as waste collectors (nearly 24%), and disposing waste to the canal (nearly 21%) to face the challenges posed by disrupted waste management activities.

4.8 Changes in the household waste management by stage

Stage	Disposing waste to the canal	Burning garbage near the canal	Disposing waste to neighbours who work as waste workers	Disposing waste to roadsides	Total
Stage 1	3	3	13	6	25
	1.4%	1.4%	6.3%	2.9%	12.0%
Stage 2	13	8	9	19	49
	6.3%	3.8%	4.3%	9.1%	23.6%
Stage 3	6	12	10	13	41
	2.9%	5.8%	4.8%	6.3%	19.7%
Stage 4	6	5	2	6	19
	2.9%	2.4%	1.0%	2.9%	9.1%
Stage 5	11	10	8	6	35

	5.3%	4.8%	3.8%	2.9%	16.8%
Stage 6	4	15	7	13	39
	1.9%	7.2%	3.4%	6.3%	18.8%
Total	**43**	**53**	**49**	**63**	**208**
	20.7%	**25.5%**	**23.6%**	**30.3%**	**100.0%**

Source: Survey data, 2022

As revealed in some accounts of respondents, a major strategy adopted by residents was the collection or disposal of waste on road sides. Residents had disposed of waste on the road that runs through the settlement or on the bank of the canal. As Oshan[34] a 33-year-old resident of stage 3, explained, "*As you can see, our house is very small. With four family members, we barely fit in. With all the family members staying at home, the amount of kitchen waste collected in the house also somewhat increased. So I had no option but to keep the waste collection basket outside the house on the road. It did create some trouble with dogs and crows dragging the waste buckets. But we couldn't do anything else. It was also easy for us to keep the waste outside as the officers from the council and even the police officers who came for routine checks were concerned only about COVID but not about waste*" (in-depth interview, 2022). In addition to explaining the ploy she utilized to manage waste, her account also explains why it was easier for her to manage the waste on the roadside. According to her, the officials who came to check on residents were mostly concerned about preventing the spread of COVID-19 and were less concerned with waste management.

This account also reveals the importance of having a separate unit dedicated to carrying out waste management activities. Even though there is a waste management committee in the DMMC, the responsibilities of its members range from safeguarding public health to enforcing the regulations of the local council and responding to emergency situations such as the pandemic. For instance, the Public Health Inspector (PHI) is responsible for environmental management, investigation and control of communicable diseases, maintenance of occupational and school health, including immunization, food safety, control of non-communicable diseases, supporting the management of health activities during disasters, health education and promotion, and

[34] Oshan is a pseudonym used to protect the identity of the respondent.

enforcement of public health law (Ministry of Health, 1986). It is clear that a PHI has to manage a large array of activities that limit his or her capacity to be committed to waste management activities alone since they have to prioritize the activities they can invest in based on contextual and situational needs. Thus, this finding points to the importance of introducing a carder that is specifically appointed to manage waste management activities to deliver an effective service to the residents and also to assure that waste management practices employed by the respondents are legal.

Moreover, some respondents had resorted to burning waste near or on the bank of the canal. Prasadi[35] a 40-year-old housewife living in stage 3, stated, "s*ince waste collection workers delayed coming for collection, I opted to burn some of the waste items for safety reasons and also due to a lack of space. In the aftermath of the lockdowns, I resorted to burning face masks and throwing sanitary liquid bottles near the bank of the canal, as keeping them in the house was unhealthy. Keeping used masks was a risk as our houses are small. The dangers of using or touching used facemasks were reiterated on television, so burning the masks was the best option. I also burned waste such as paper, polythene bags, and plastic items. It was not just me; almost everyone did this, and some are still doing it*" (In-depth interview, 2022). It is also interesting to see how waste management strategies used by respondents, for instance, the burning of medical waste (though harmful to the environment and the health of individuals), are based on strong logic and reason.

In the case explained above, the respondent resorted to burning waste as it is "unhealthy" and "unsafe". This revelation hints at how the actions of individuals are always based on their own version of reasoning and logic, which is often constructed by values, norms, and especially the realities surrounding them. These realities might differ from the technical and formal realities constructed by experts and technocrats, yet they are effective and coherent. The academic community has a responsibility to bridge these realities in an attempt to create a merging point where they can interact and learn from each other. In other words, research activities carried out by researchers should aid in the creation of a dialogue between the technocrat's

[35] Prasadi is a pseudonym used to protect the identity of the respondent.

version of reality affiliated with waste management and laypeople's version of reality that facilitates co-learning and knowledge sharing.

The respondents had also resorted to utilizing available social capital to counter the changes in municipal solid waste management. Some respondents had handed over the waste in their household to their neighbours who work as either waste collectors or drivers of waste collection trucks. Namali[36] a 49-year-old housewife living in stage 4, stated that "*when the waste collection vehicle gets delayed, we hand it over to a neighbour who works as a driver of a lorry. He comes to his house in his vehicle to have lunch every day. So even though he is not assigned to collect waste from our area, we put our waste into his vehicle. He is not really fond of this, but as we are neighbours he begrudgingly accepts waste*" (In-depth interview, 2022). This account exposes the importance of social capital in terms of solid waste management. Often, social capital is discussed in relation to vulnerability, poverty alleviation, and social mobility, yet accounts such as these reveal the potential of social capital in resolving matters and concerns relevant to solid waste management. The method utilized by the residents might not be in line with formal waste management procedures, but it has been successful enough to cater to the needs of the communities.

4.4 Discussion

The section revealed challenges experienced by respondents in the aftermath of the Meethotamulla disaster and during the COVID-19 pandemic. The normalization of invisibility as well as the employment of effective strategies have reduced the impact of crisis events on the lives of the residents. Nevertheless, it is evident that access to waste management should be based on equity. The disadvantaged social position of residents will continue to hinder access to better services. Thus, residents should be empowered socially, politically, and economically. The approach of treating residents of an underserved settlement as an underprivileged group that requires support and guidance by the government, NGOs, and experts will continue to retain them within the vicious cycle of invisibility.

[36] Namali is a pseudonym used to protect the identity of the respondent.

Chapter 5. Conclusion

The findings of the study revealed that residents living in the Ovita underserved settlements have special social, economic, and political characteristics that are unique in nature. The residents seem to lack agency over the services offered by the DMMC due to their disadvantaged position in society. The findings revealed that the settlement had been neglected in terms of providing solid waste management services since the early 1990s. This negligence caused the settlement to be a testing ground for community-based waste management activities implemented by international and local non-governmental organizations. The residents had become guinea pigs, or subjects of waste management experiments. Further, these experiments have done very little to improve the waste management of the community and have contributed to creating conflicts and mistrust among residents. Moreover, the community-based waste management activities implemented by NGOs had been somewhat successful until the implementing agency became active in the field. This reveals that the community-based waste management programmes have failed to actually integrate the community into the community programmes. Further, it was revealed that only a few active members had benefited from the programme.

In terms of waste management, the residents' approach to waste management is aligned with "out of sight, out of mind" mindset. The positive elements of MSWM, including segregation of waste, were a result of regulations implemented by the DMMC. Community members are yet to change their mindset that waste management is solely the responsibility of the council and the government. The patron-client relationship that exists between the elected members of the council and the residents of the Ovita settlement and the service-oriented (considering waste management as a "SEWA" to the community) approach of the local council are the root causes for the existence of this mindset. A change in this mindset is mandatory to achieve sustainable waste management, as sustainable systems demand greater contributions from the community. Yet, as emphasized previously, it should be reiterated that in order to begin the process of changing this mindset, the socio-economic and political standing of the community has to be improved. The findings of the data and the observations of the authors revealed that the majority of the

residents living in the Ovita community are engaged in a daily struggle for economic survival. Further, their existence is troubled by drug abuse, crimes, domestic violence, and many other ailments created by generational poverty. Therefore, in such a context, the residents have to prioritize survival over sustainable consumption and waste management. Therefore, attempts to implement sustainable waste management programmes or activities within Ovita or another settlement that has similar characteristics are futile.

Here, it must be kept in mind, as mentioned above, that improving their agency socially, economically, and politically is just the beginning of the process of changing their mindset. This is evident from previous research activities carried out within the middle and high-income areas of the DMMC area. Despite having much better social, political, and economic standing compared to residents of Ovita, the residents that hail from middle- and high-income areas too had the "out of sight, out of mind" mindset. Therefore, it is evident that in order to achieve a circular waste management mechanism, it is necessary to change the waste management approaches of DMMC and the organizations that provide financial and technical support to local councils and national-level agencies.

For instance, it was revealed that programmes implemented by local government agencies, the central government, and NGOs focus only on the post-generational management of waste. Little effort had been expended to introduce responsible consumption and reduce the production of waste, which is the most effective way of achieving sustainable waste management. Thus, this management-oriented approach of the DMMC council and the national agencies supports the existence of the "out of mind, out of sight" mindset.

The crisis situations of the collapse of the Meethotamulla dumping site and the spread of the COVID-19 virus have had an impact on the waste management activities of the settlement. These impacts included changes in waste management and waste collection activities by the local councils. It is evident that the local councils as well as provincial and national-level organizations do not have plans and standard operational procedures to face crisis situations. Thus, all the efforts they have implemented in crisis situations have been ad hoc remedies. It is evident that ad hoc remedies such as collecting mixed waste and reducing the number of collection days have had negative impacts on

waste management and have made the residents question the very point of making an effort to segregate waste. Nevertheless, it is evident that the respondents have somewhat successfully countered the challenges experienced in relation to disposing waste during the crisis by utilizing the social capital available to them.

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Annexures

Case study 1 - Saman

Saman[37] a 56-year-old male, lives in stage one of the Ovita settlement with his wife, two daughters, and his mother-in-law. Saman is a traveling vendor that sells ice cream and cotton candy. Saman had moved to the settlement in 1993 from Dehiwala as a part of the relocation programme implemented by the government of Sri Lanka. He recalled how the initial situation of the settlement was worse than the current situation. His wife was pregnant at the time with their first child when they first moved and settled in stage 1. Saman had built a small one-room house using timber to live in until the house was constructed with the aid of the government. *"All the families lived here like that. "The ground was muddy, and we only had three common toilets in the beginning; a water pipeline came to the settlement much later. The settlement was full of waste; every roadside had piles of waste".*

The settlement did not have any waste management mechanisms in place at the early stage of the settlement. Most of the residents had resorted to disposing of their waste into the canal, which was much bigger at the time, and, as it was flowing freely, the waste they disposed of floated away. "The canal was much cleaner back then." It was flowing freely and did not stink at the time. So whatever waste we put into the canal is washed away because it connects with the Dehiwala canal, and the waste ends up at sea." Also, his wife sometimes burned the waste that was generated in their household. Saman recalls how, after a few years, the canal running through the community became almost completely blocked due to the large amount of waste dumped there. The canal became a hotbed for flies and mosquitoes, and dengue fever spread across the community. This got so bad when his wife, Wimala, got pregnant with their second child. They decided that it would be better to stay at Wimala's mother's house in Kimbulaela. This was done to be safe from dengue and other ailments such as skin irritations and infections. Wimala spent over five months in her mother's family with their first daughter, and Saman continued to live in Ovita as he could not abandon the house. He visited his wife every day in the evening

[37] Saman is a pseudonym used to protect the identity of the respondent.

and would return to his house in Badovita to spend the night. "It was not at all safe for a pregnant mother to live on stage. Of course, some stayed in the settlement when they were pregnant, mostly because they did not have anyone to go to. Fortunately, my wife's home town is Modara, and her mother invited us to live with them until the baby is born. My wife stayed with her mother and my eldest daughter until three months after the delivery of the baby. That period was quite hard because I had to go to work and then straight away go to my mother-in-law's house in the evening with vegetables and rice to have dinner there and come back in the evening by bicycle to sleep at our house".

Saman recalled how a NGO established a waste management system in the community in the year 2000 or so. According to him, some residents living in the settlements were trained in waste collection and were paid a salary for it. *"A neighbour of ours was selected for the programme, and if I recall correctly, she went to Korea for training also. There were a few others like her, and they traveled around the community with a push cart, collecting polythene and plastic. At the end of the month, they would pay the households that handed over waste a small amount. The collectors would sell the waste they collected for a much better price and earn a profit"*. Saman and his family continued to dispose of waste generated in their homes at the canal, while the local council began to collect waste from the settlement, which they handed over to the council's waste workers. The collection of 'SILI BAGS" (polythene bags) stopped after some time, and Saman does not know why it stopped. Saman stated that since then, his family has continued to hand over waste to the municipal council. According to him, the workers of the municipal council visit the settlement every week, and his wife and daughters hand over the waste to the municipal council. He also said sometimes the waste collection vehicle does not come on designated days. During such weeks, his wife requests that he dispose of waste in Mt. Lavinia City. So he carries the waste bags with him and keeps the waste bags near the Mt. Lavinia bus stand.

In the period where the COVID-19 virus spread in the community, the waste workers had not visited the community to collect waste. In that period, Saman and his family had disposed of food waste into the canal and proceeded to burn masks and gloves they used in front of their house. "*the waste collectors did not come for nearly three weeks. So we did the best we could. My wife and I got together and burned all the plastic with masks and sanitizer bottles. We*

had to put kitchen waste in the canal as the country was on lockdown. We couldn't do anything else".

Case study 2 - Mallika

Mallika[38] is a 50-year-old respondent who lives in stage 1 of the Ovita settlement with her two sons, her younger daughter, and her husband. They moved to the settlement around 1995, when they were given land to settle in the settlement. Previously, Mallika had lived with her elder brother in their house, and when they were asked to relocate to OVita, they were given a separate plot of land to build a new house. Mallika recalled how they managed waste in the beginning by collecting it in bags and carrying it to the adjoining road for the waste collection vehicles of the local council to collect it. *"Those days, the local council did not collect waste from the settlement as we did not pay municipal tax to the council. So we had to drop the waste off at roadside places so that the vehicles of the council could collect it. My husband was working as a welder at the time in Narahenpita, and in the morning he would carry the waste on his push bicycle*".

Mallika is one of the individuals who played an active role in collecting waste in the community-based waste management programme implemented by SEVANATHA, a local NGO. She recalls how the GS officer of the settlement at the time informed her to attend a meeting on waste management. "*The meeting took place at the community center, and a few sirs and lady officers attended the meeting. They told us that they are trying to implement a waste management programme in the settlement to manage waste, that we can be part of it, and that they will provide us with training and equipment, in addition to making a small payment to us. We were given training on bookkeeping, and three of our members got the opportunity to go to Japan and learn about waste segregation. After the training, a waste management facility was installed in the settlement. This collection center was still there at the beginning of the settlement, and now it belongs to the DMMC as it was handed over to them as the programme failed. Under the programme, we collected waste from stages one to four and also had a male helper go around the settlement and collect polythene waste. We instructed the residents to collect plastic and polythene*

[38] Mallika is a pseudonym used to protect the identity of the respondent.

bags as in a lager bag and also to collect and hand over paper and cement bags to us. We would measure the weight of the waste the residents gave us, and we noted that in our book. The collected waste was then bailed according to the nature of the waste, and most of the waste we collected was sold to a cement production facility. They burned polythene and plastic as fuel at their facility. The money we gathered by selling the waste was then paid back to the residents according to the amount of waste they gave us".

Mallika recounted how, after a year or so, the programme began to collapse. *"But overtime, people did not want to hand over waste to us. This was also the result of the municipal council beginning to collect waste in the settlement. Afterwards, the interest people had in segregating waste became less and less, and after about two years, the programme stopped almost completely. There were some problems among the workers on the programme. One of our workers began to make decisions without consulting us about waste collection and the selling prices. We had a few fights regarding this, and my husband then asked me not to work with them anymore. So I quit the programme. I think after that, the programme went on for another eight to nine months and then completely stopped".*

Case study 3 - Aksha

Aksha[39] is a 26-year-old female living in stage 3 with her parents. She and her family segregate waste according to the instructions of DDMC and hand over waste to them on due days. Aksha recounted how waste management was much worse than the current situation. She recalled how every nook and cranny of the settlement was full of disposed waste. *"When I was schooling, the waste collection was literally non-existent." The municipal council did not collect waste from our area, and I remember my father would carry a bag full of waste once in a while when taking us to the school. He would hold it in his handle bar and on our way to the council, he would drop it off at the roadside of the city or the bus stand".*

She recounted how the local council initiated waste collection activities within the council. *"After a while, the local council began to collect waste from the*

[39] Aksha is a pseudonym used to protect the identity of the respondent.

settlement and also took measures to build the roads and renovate the bridges in the settlement. The situation in the settlement became much better after their intervention. Aksha recounted how she appreciated the decision taken by the local council to clean and develop the canal that runs through the settlement. "*I was always bothered by the status of the canal. My father said when we initially moved to the settlement that the canal was much cleaner. He said that they used water from the canal to build our house. But for me, I never saw a clean canal. It always stank, was blocked. Dead animals would float in it and flies and mosquitos infested the canal. The settlers also had a role to play in the settlement of the canal. They would dump all kitchen waste to the canal. Imagine over a thousand families disposing waste into the canal on a daily basis. They would throw the gray water and even some households dumped the water and waste that came from their households into the canal. Under this new programme they made the banks of the canal bigger and also cleaned it from upstream. I only later got to know that in addition to the households from our settlement, some factories located upstream also dispose of their chemical waste into the canal. The water of the canal was always dark and stinky, but I never imagined that factories also disposed of waste into the canal. Under the programme the municipal council cleaned the canal and enforced the banks with concrete. Further, the council implemented new laws prohibiting the dumping of waste into the canal, and the PHI officers always came around and checked and fined the individuals who dumped waste into the canal. So the situation improved a lot".*

Aksha was quite happy with the new developments in the waste management sector. She recounted how gradually these new developments and the progress of the settlement faded away with time. "The *programme was implemented by a NGO with the municipal council and, initially, everything was better. But overtime, the situation of the canal worsened again gradually. By 2007, the canal had reverted to its previous state, and during heavy rain, the canal flooded stages 1, 2, and 3. This happened because the council stopped upholding laws and as the factories upstream again began to release toxic water into the canals. This resulted in the spread of dengue fever across the settlement. This actually became a yearly occurrence. The blocked canal also became a hotbed for flies, and even eating became quite a difficult thing".*

She then went on to recount how measures were taken to improve the situation of the canal in late 2010. "*Around 2010, the canal was cleaned again by the local council, and I think the low land reclamation and development authority also had a role to play in it. They installed a catchment net above the settlement, and the net worked. Again, the canal became clean, but this time it was for a short period only. The catchment net broke after a while, and the canal got blocked again. This year, fortunately, the rain was not that heavy, so the canal did not flood. I am pretty sure that when the monsoon season comes, the canal will flood a significant portion of the houses. I don't think the situation will improve anytime soon. I'll be married in August, and then I will move to Homagama to a house my husband and I built. I will initially move, and then I will take my family with me. That's the best thing to do*".

Case study 4- Kalpa

Kalpa[40] is a 60-year-old male living with his family in stage 2. Kalpa is an informal waste collector by profession and employs over 10 workers to collect waste. Kalpa had moved to the settlement in 2005. "*We did not move here initially. It was my wife's uncle who got a house from the settlement. He did not want to live here, as his son had bought him a house in Dematagoda. So he gave us the house, and we moved into the settlement. In the beginning, I collected waste by going around in my three-wheeler. In those days, I only collected metals such as steel, copper, and aluminium. I also ran a three-wheeler to make an additional income. Those were the good days. I didn't even have to take the waste to be sold. Big businessmen from Jampata Street came in trucks to collect metal items. The prices for metals were very good. A kilogram of copper cost 750 rupees at the time, and a kilogram of aluminum cost around 1500 rupees. Over time, I managed to buy a small Town Ace van truck to collect waste, and I also employed around 10 new workers to collect waste*".

Kalpa recounted why the location was ideal for informal waste collection. "*Ovita is located in the center of Colombo, right next to the Galle road. So transporting waste is also quite easy. Even when I collect waste from 15 to 20 kilometers away, I can reach my house within an hour. The same is true with*

[40] Kalpa is a pseudonym used to protect the identity of the respondent.

my workers; after collecting waste, they can reach Ovita within an hour or so, always before 5 o'clock. Also, labour is very cheap in the settlement. Most of my employees are drug users. So they don't want much other than to eat something, have a place to sleep, and have some money to continue their habit. Also, let me tell you something. Drug users are hard workers, especially when they are sick. When they want to buy drugs, they will do anything, and they become unimaginably strong. They don't steal from me because I have been taking care of them for the last 10 years. I don't recruit anyone new, as I have enough people to collect waste. I give them a place to stay, their meals, and also a daily payment according to the amount of waste they collect".

Kalpa went on to discuss how waste collection activities have changed over time. "*All I always did was collect waste and hand it over to a businessman who processed it. But now the situation has changed. There are many waste collectors now, and they go everywhere. So, if our waste collector enters a road where waste has already been collected, we receive very little, if anything at all. Also, now the local council also collects waste, and the people hand over valuable waste items to them as it is easier for them. Some informal collectors buy this waste from the council workers; I also did it once or twice, but often the waste they offer us is not that useful. Only once in a while does something good turn up. So I don't work with them anymore. The prices of the items have gone down due to the lack of demand. I don't collect glass bottles anymore, as the prices given by the glass factory in Horana do not pay a good amount. It is not a lucrative business any more. I just break even every month. That is also because my wife and son help me with weighing and sorting activities*".