R4D PROJECT:

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

PROJECT WORKING PAPER #7

WASTE MANAGEMENT IN OVITA

AN UNDERSERVED RELOCATED SETTLEMENT IN DEHIWALA-MT.LAVINIA MUNICIPAL COUNCIL

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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
NGOs	Non-Governmental Organizations
NHDA	The National Housing Development Authority
NWSDB	National Water Supply and Drainage Board
PHI	Public Health Inspector
USIP	Urban Settlement Improvement Programme

1. Introduction

Municipal solid waste management in an urban setting is always a challenge due to increasing population and urban density (Vidanaarachchi et al, 2006). These factors can contribute to the increase in the amount of waste and can also complicate 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 its services such as wastewater management, flood water management, municipal solid waste management 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 neighbourhood blocks, demolition, resettlement and relocation (Jones, P. 2017, Minnery, et al. 2013, Weksea et al. 2011, Tadgellet al, 2018).

The subject of the present study is the Ovita[1] relocation settlement which is located in the Dehiwala-Mt. Lavinia Municipal Council 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 municipal solid waste management activities carried out by the residents of the settlement, the municipal council and Waste entrepreneurs. 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.

Key objectives 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.

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

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 the rise of informal settlements

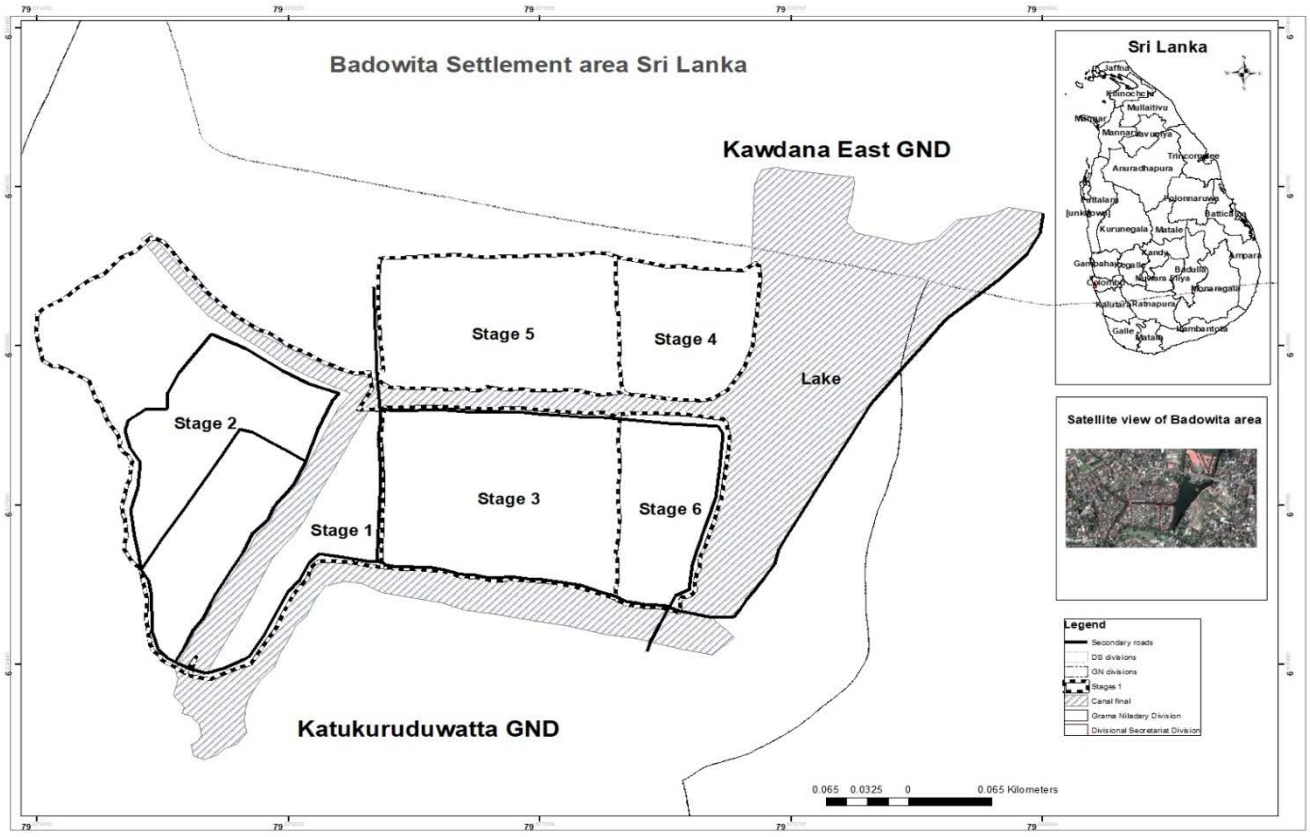
Sri Lanka has been experiencing an expansion of urban regions especially in the Colombo Metropolitan region and major transport routes similar to other countries (World Bank, 2015). As a consequence, multiple informal settlements have sprung up in the periphery of the Metro Colombo region (Wakely, 2018). A large majority of these informal settlements are located in unclaimed and unused land, including canal banks and low lying land which usually act as water retention areas (Fernando, 2018). Overtime, large-scale reclamation of land which 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 (over 77 million US Dollars according to exchange rate on 2022.10.06) 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 which were 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 Dehiwala-Mt. Lavinia Municipal Council in the Ratmalana Divisional Secretariat (Fernando, 2018; World Bank, 2019). The land on which Ovita is built is a reclaimed marshy land which sits next to a water body containing water from the “Dehiwala Canal” and “Weras Lake”.

Map 01: Map of Ovita relocated settlement



Source: Survey data, 2022

1.4 Relocation to Ovita

The marshy land was divided into four stages and each relocated family was given a.50m^2 land to build a house (Fernando, 2018). The National Housing Development Authority (NHDA) granted loan facilities up to LKR. 20,000.00 (nearly 55 US Dollars according to exchange rate on 2022.10.06) 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 the life in the settlement was a hard one. She describes the settlement as a *"muddy area which was yet to be properly reclaimed, and which lacked essential infrastructures and facilities for normal living conditions…… the water in these wells were [to be] grey and undrinkable…Night soils from the communal lavatories were 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 had lasted till 1998 and nearly 3% of the originally relocated families had moved out of the community due to the hardships they experienced.

Image 1.1. A road in stage 2 of Ovita

Source: Malith De Silva, 2022

Image 1.2. The road that runs between stages 4 and 5

Source: Malith De Silva, 2022

Image 1.3. The main road of the Ovita settlement

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 Dehiwala-Mt. Lavinia Municipal Council 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 NGOs (Non-Governmental Organizations). Community members were provided with various training opportunities including book-keeping and international training in Japan on waste management. These trained members of CDCs were later contracted to carryout development activities within the community including community-based waste management.

1.4.1 Current status

The Ovita settlement has further expanded with stage five and six in recent years (2010). The total population of the community has risen to over 1500 families and the living standards of the community has improved significantly as a result of community interventions organized by JICA and USIP with the participation of CDCs.

Table 1.1. Population of the community

Stage	Year of establishment	Number of families
1. Stage 1	1992	157
2. Stage 2	1992	431
3. Stage 3	1992	337
4. Stage 4	1992	114
5. Stage 5	1997	261
6. Stage 6	2004	238
Total		**1538**

Ovita is often identified in literature as an underserved community which 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 place 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 or neighbours that very often lead to domestic violence, police arrests and harassment. Owing 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 should be prohibited from discarding waste into the canal and that a filtration mechanism should be installed to detoxify the water to avoid contamination of waterways down the canal.

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 has 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 was collected to obtain a comprehensive understanding of the situation in the settlement. As the study sought to comprehend 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 information from respondents. The study gathered quantitative data related to waste generation, waste segregation, and disposal and management practices apart from demographic information. Qualitative data provides details on problems, opinions on efficiency, impact of the collapse of the Meethotamulla dumping site and the impact of the SARS-COV19 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 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 document analysis. Specific data on existing waste management systems, practices, waste generation and 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 was similar to the questionnaires used in the previous r4d studies. it included closed and open-ended questions that covered dimensions such as cleanliness of the settlement, waste management, disposal, waste collection, issues, community-based waste management programmes, informal waste workers, 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 was later translated to Sinhala and Tamil languages.

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. 25 in-depth interviews were conducted with purposively selected residents of the settlement. The schedule was originally developed in English language and was later translated to Sinhala and Tamil languages.

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 were selected using the purposive sampling method by identifying individuals and community leaders that lived in the settlement since its inception and those who had engaged in community development activities.

1.8 Sample Size

The sample size for the survey was pre-determined by the research team. Six hundred and seven respondents were selected from the six stages employing stratified random sampling design proportionately 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**

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 2022 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 40-45 minutes. 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 in the field location. Data collected from the questionnaire was entered into the Statistical Package for Social Sciences (SPSS) after editing, cleaning and coding data. Both Univariate and Bi-Variate statistical analysis tests were applied as necessary and appropriate. These findings are presented using tables. Qualitative data collected by in-depth interviews were coded by hand and were later analyzed using thematic analysis techniques (Helene, 2012).

1.11 Challenges

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

Obtaining approval from local councils

The research team had to obtain approval from the Dehiwala-Mt. Lavinia Municipal Council to carryout data collection activities. After requesting for permission officially, the research team had to wait for almost a month to begin data collection until permission was granted.

This delay impacted the research in multiple ways. For an example, the research team originally recruited 10 research assistants to carryout 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.

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 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.

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 counter measure, the research team had to avoid these respondents and select new respondents.

1.12 Structure of the working paper

The chapter two of the working paper elaborates 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 maker of the households. The chapter three discusses the key findings of the research in relation to generation of waste, waste composition, waste management services, key service providers, nature of service and payments made to service providers, satisfaction of the consumers and more. The chapter four elucidates the waste management in relation to the collapse of the Meethotamulla waste mountain and the spread of Covid – 19 Virus. Specifically, the impact the events had on the waste generation at household level and waste management activities. The chapter five discusses the findings of the research in brief while highlighting the key issues identified through the survey.

2. Socio-economic & demographic information of the settlement

2. 1 Introduction

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

Table 2.1 Population of the settlement by stage

Stage	Frequency	Percentag
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 stage 5 and stage 6 respectively. The least number of questionnaires were administered in stage 1 (62) and stage 4 (45).

Table 2.2 Ethnicity of the respondents by stage

Stage	Sinhala	Tamil	Muslim	Burgher	Total
Stage 1	36	15	9	2	62
Stage 2	93	59	17	1	170
Stage 3	95	24	14	0	133
Stage 4	34	7	4	0	45
Stage 5	67	19	15	2	103
Stage 6	42	41	5	6	94
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
Stage 2	86	35	25	8	16	170
Stage 3	91	16	14	0	12	133
Stage 4	29	5	4	2	5	45
Stage 5	60	13	11	5	14	103
Stage 6	40	27	18	3	6	94
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	Secondary education	Degree	Post Graduate	Total
Stage 1	13	25	24	0	0	62
Stage 2	42	86	42	0	0	170
Stage 3	29	56	47	0	1	133
Stage 4	5	19	21	0	0	45
Stage 5	18	59	25	0	1	103
Stage 6	18	53	22	1	0	94
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% of respondents have received secondary education.

Table 2.5 Key decision maker of households by stages

Stage	Husband	Wife	Jointly	Son	daughter	All together making decision	grand father	Grand mother	Total
Stage 1	23	24	7	1	1	2	3	1	62
Stage 2	76	59	13	7	6	6	2	1	170
Stage 3	69	37	9	5	3	6	3	1	133
Stage 4	18	12	7	1	2	3	0	2	45
Stage 5	56	28	7	1	4	1	6	0	103
Stage 6	50	19	13	5	0	1	6	0	94
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 who the main decision maker of the household is, over 48% of respondents stated that the husband is the key decision maker of the households while in nearly 30% of the 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

Stage	Salaried employment	Daily Wage employment	Self-employment	Depend on children income	Contract basis	Total
Stage 1	16	39	6	0	1	62
Stage 2	42	108	19	1	0	170
Stage 3	31	74	26	1	1	133
Stage 4	10	28	5	2	0	45
Stage 5	29	55	18	1	0	103
Stage 6	25	57	12	0	0	94
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, similar to other underserved settlements in urban Colombo, 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 the respondents

Stage	LKR 500 to 5000 (*USD 1.37 to 13.73)	LKR 5001 to 10000 (USD 13.74 To 27.47)	LKR 10001 to 20000 (USD 27.48 to 54.94)	LKR 20001 To 30000 (USD 54.94 to 82.41)	LKR 30001 to 40000 (USD 82.41 to 109.89)	LKR 40001 to 50000 (USD 109.90 to 137.36)	LKR 50001 to 70000 (USD 137.36 to 192.30)	LKR 70001 to 90000 (USD 192.30 to 247.25)	Total
Stage 1	0	2	15	18	7	11	0	9	62
Stage 2	6	2	44	58	33	18	7	2	170
Stage 3	7	5	52	38	20	7	1	3	133
Stage 4	4	3	14	11	5	5	0	3	45
Stage 5	3	2	33	30	13	17	2	3	103
Stage 6	8	7	30	28	6	10	2	3	94
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

* The exchange rate on 04.10.2022 on USD to LKR. was utilized for the conversion

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. 50,000.00. Nearly, 6% of respondents earn an income between LKR.50, 000.00 and LKR. 90,000.00.

2.2 Discussion

The findings of this chapter reveal key characteristics of the community including their social dynamics and economic situation. The Ovita settlement displays typical characteristics of an underserved settlement. Majority of respondents are vulnerable to income insecurity since a significant proportion of respondents 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 vulnerability of the community as these households have a greater tendency of been susceptible to instabilities due to social, political and economic changes. Moreover, nearly 70% of respondents earn a daily income

which is lower than the national poverty line of LKR. 1,4232.This reveals economic vulnerability of the community to fulfill basic needs of family members.

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 paid services such as solid waste management. Moreover, their social-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.

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 and etc.

When analyzing 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 the independent variable. 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 as a significant component of the relocation process as building communal waste bins for every 30 to 40 houses of 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 reveal how households managed waste during this period.

[2] Poverty line is defined based on the minimum expenditure for a person to meet the daily calorie intake of 2,030 kcal based on the Cost of Basic Needs approach and was set at LKR. 1,423 in 2002.

According to the data, residents had employed two methods to dispose waste of which one was dumping the waste into the adjoining canal.

Kumara3 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 two children Ovita did not have a waste management system……We use to dump all the waste generated in our house to 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 mosquitos and flies" (In-depth interview, 2022).

The second method was to burn waste on the roadside. Mahen4, a 56 year old resident living in stage 1 stated that "People who lived closed to the road dumped waste to the road sides and use 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 a waste management contributed to the settlement been identified as a cleaner settlement project by the USIP. Maduka5, 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 as the situation in the community was 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 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 by SEVANATHA in 1997 , 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 (CEB) provided water and

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

electricity services respectively…the Dehiwela- Mt. Lavinia Municipal 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 that the municipal council is the main service provider of waste management.

Table 3.1 Main service provider for biodegradable waste by stage

Stage	Municipal Council	informal waste collectors	not giving to anyone	Total
Stage 1	62	0	0	62
Stage 2	169	0	1	170
Stage 3	133	0	0	133
Stage 4	45	0	0	45
Stage 5	103	0	0	103
Stage 6	91	1	2	94
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 biodegradable 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
Stage 2	166	4	170
Stage 3	131	2	133
Stage 4	43	2	45
Stage 5	97	6	103
Stage 6	92	2	94
Total	**589**	**18**	**607**
	97.0%	**3.0%**	**100.0%**

Source: Survey data, 2022

Moreover, 97% of respondents mentioned that waste management mechanism of the local council is the main service provider. Only 3% of respondents had considered informal

waste workers as the main service provider. These individuals stated that instead of handing over non-biodegradable waste on a weekly basis, they collect the valuable waste according to categories such as newspapers, bottles, beer cans and hand them over to informal waste workers. According to these respondents when a bulk of categorized waste is provided to informal waste workers, they pay with cash instead of plastic items.

3.3.1 Waste generation

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

Table 3.3 Generation of biodegradable waste by stage

Stage	0-0.3 kg	0.5 kg	1kg	2kg	3kg	4kg	5kg	6kg	8kg	10 kg	20 kg	Do not produce bio degradable waste	Total
Stage 1	1	6	10	7	9	5	14	3	1	4	1	1	62
Stage 2	2	8	14	42	22	16	39	12	5	9	1	0	170
Stage 3	1	11	14	28	24	22	17	10	1	3	2	0	133
Stage 4	0	1	3	5	8	12	11	3	0	1	0	1	45
Stage 5	3	7	4	19	23	17	14	8	3	4	0	1	103
Stage 6	0	8	3	17	19	12	24	2	2	6	0	1	94
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 2Kgs to 5Kgs of bio-degradable waste. Moreover, over 14% of respondents produce between 6Kgs to 20Kgs. The qualitative data reveals that majority of households that produces 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 by keeping a healthy sales margin. Preparation, cooking and disposal of leftover food waste accounts for the large amount of waste generated on a weekly basis.

Nevertheless, some households that produce a large amount of waste consists 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. Pradeep6 a 62 year old male living in stage 3 explained this scenario saying "This is the house I moved in to 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 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 in to good schools they stay here with me. Also their husbands quit their job 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 invites an easy arrangement for all of us" (In-depth interview, 2022).

Table 3.4 Generation of non-biodegradable waste KG per households 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	4kg	5kg	6kg	Do not produce non-bio degradable waste	Total
Stage 1	8	3	1	0	20	1	0	19	0	2	0	8	62
Stage 2	9	5	0	0	84	0	2	46	3	5	4	12	170
Stage 3	7	5	1	0	49	0	0	48	3	5	1	14	133
Stage 4	0	1	0	0	24	0	0	16	0	1	0	3	45
Stage 5	2	0	2	0	49	0	0	39	2	4	1	4	103
Stage 6	3	4	0	1	44	0	0	31	0	1	2	8	94
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 1Kg of non-bio degradable waste every week. The qualitative data reveals the types of non-biodegradable waste thus produced.

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

According to an interviewee, a major proportion of non-biodegradable waste consists of polythene bags. He further stated: “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, fruits, you get a polythene bag for each item. It is a waste but it keeps items separated and from mixing together. My wife is a tailor she takes sub contracts to sew collars and shirt pockets. This also generates a considerable amount of non-biodegradable waste at our house. When possible my wife and my daughter make lamp wicks. But if the leftover clothes are not cotton based we collect in the non-biodegradable waste bag to be handed over to the local council’s truck” (In-depth interview, 2022)

The findings reveal that majority of the waste produced are bio-degradable. However, even though the local council can look at cheaper options to manage bio degradable waste, it must be noted that composting of waste is not practical in the settlement. This is due to the lack of space for communal composting and the limited space available for residents in and outside their homes.

3.3.2 Segregation of Waste

In the aftermath of the Meethotamulla disaster, the Dehiwala-Mt. Lavinia Municipal Council took a policy decision to make segregation at home compulsory. Accordingly, residents are expected to segregate waste into two categories namely; (a) biodegradable and (b) non-biodegradable waste. Findings suggests that majority of respondents living in Ovita abide by this regulation.

Table 3.5 Segregation of Waste by stage

Stage	Segregate waste	Do not segregate waste	Total
Stage 1	62	0	62
Stage 2	169	1	170
Stage 3	133	0	133
Stage 4	45	0	45
Stage 5	102	1	103
Stage 6	93	1	94
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, 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 majority of respondents segregate waste as food waste and plastics. This was apparent in the account of Maheshika[7], 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, pieces of clothes, cardboard boxes into one bucket and rest of the waste into a large polythene bag. If I 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

Type of waste	Bio-degradable waste	Non-bio degradable waste
Kitchen Waste	603	4
Leftover food	590	17
Leftover food	557	50
Plastics	9	598
Glass	56	551
Broken furniture	117	490
Branches	220	387
Grass	p392l	215
Newspaper	223	384
Books	208	399
Electronic parts	59	548
Metal containers	104	503
Sanitary pads	29	578
Clothes	67	540
Face masks	41	566
Hand sanitizer bottles	31	576

Source: Survey data, 2022

Over 73% of respondents segregated waste as "Food Waste and Plastic Waste" while nearly 27% had segregated waste as "Biodegradable and Non-biodegradable 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, through waste workers and Public Health

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

inspectors, informed residents that waste should be segregated. 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 biodegradable and not. Therefore, it is evident that residents had 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-biodegradable waste. For an instance, some respondents had identified branches, glass, newspapers, books, garden waste as non-bio degradable while some had identified facemasks, hand sanitizer bottles, milk powder packets, clothes, metal cans etc.

Table 3.7 biodegradability of types of waste

Stage	As Food Waste & Plastic waste	As biodegradable waste & non-biodegradable waste	As economically Viable and non-viable waste	Total
Stage 1	40	21	1	62
Stage 2	113	57	0	170
Stage 3	95	38	0	133
Stage 4	40	5	0	45
Stage 5	78	25	0	103
Stage 6	77	17	0	94
Total	443	163	1	607
	73.0%	26.9%	0.2%	100.0%

Source: Survey data, 2022

Confusion regarding the degradability of waste can have a negative impact on intermediate treatment and disposal of waste. As a significant percentage of respondents had identified non-biodegradable waste as biodegradable, it is evident that a significant amount of non-biodegradable waste ends up as biodegradable waste. The authors observed that biodegradable waste buckets had a mixture of materials during field visits.

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

Source: Malith De Silva, 2022

The local council disposes bio-degradable waste to the Karadiyana Waste Management Centre. Segregated biodegradable waste is converted to carbonic fertilizer in the center. Therefore, having non-biodegradable waste mixed with biodegradable material can contribute to the increase in toxin levels (traces of heavy metals) of carbonic fertilizer. Countries such as the United States of America has experienced threats to their food production due to the use of carbonic fertilizer (organic Fertilizer) produced by toxic waste (Adegoke, 2016).

3.3.2 Waste collection

Qualitative data reveals that the municipal council designates specific dates to collect biodegradable and non-biodegradable waste. According to the interviews carried out with officials of the Dehiwala–Mt.Lavinia Municipal Council, waste workers collect biodegradable waste every Tuesday and Thursday and non-biodegradable waste every Wednesday and Saturday. Nevertheless, qualitative, and quantitative data suggests that waste collection is carried out only on 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
Stage 2	31	109	21	3	4	2	170
Stage 3	12	92	26	1	1	1	133
Stage 4	13	27	3	1	1	0	45

Stage 5	25	64	10	0	2	2	103
Stage 6	6	70	17	0	0	1	94
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

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 on one day. These findings derived from quantitative data is confirmed by qualitative data.

Asanka[8], a 38-year-old male working as a travelling 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 usually on Tuesday or Saturday, the non-biodegradable waste is collected. We usually keep the segregated waste in buckets on the roadside and have them over to the waste collection trucks. They dump the waste into the compactors and gives the bucket back to us" (In-depth interview, 2022).*

Kumudu[9] a 25-year-old mother living in stage 6 stated that *"The waste collection vehicle doesn't really operate on a timetable. 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 shouts 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).*

Image 3.2 Waste collection tractor in Ovita

Source: Malith De Silva, 2022

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

Image 3.3 Biodegradable waste hung 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 about the days of waste collection. This issue can be resolved by informing residents through officers of the local council, Grama Sewaka[10] and community leaders. Similar to the awareness raising campaign, 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 in terms of roads, water ways, electricity, etc. that can greatly influence the opportunity that a household or a community has to access services provided by public or private entities. In the case of stage 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 is located at the eastern border of the settlement, near the large water body containing water from the “Weras Ganga”.

In-depth interviews further reveal that waste collection vehicles only reach up to halfway of the community as the 10 feet road that leads to certain stages are blocked by vehicles of residents which are parked on either side of the road. Therefore, residents are expected

[10] 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.

to walk halfway up to the road to hand over waste to municipal council workers. According to Naleeka[11], 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 over waste to the municipal truck. On most of the days we miss the waste collection truck as they now have made a habit of not coming at all to the stage 5 expecting us to be at the stage 4 when they arrive. If we miss the collection vehicle, we need to wait another week to hand waste over 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 of a drug addict to dispose of it for us" (In-depth interview, 2022).*

Madavi[12] a 38-year-old housewife living in stag 5 stated *"I don't blame the residents. We simply cannot park our vehicles anywhere else as they might get broken into or can be stolen. It is the local council that should do something about it. In addition to not come to stage 6, they don't also 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).*

The local council does not charge residents of the Ovita underserved settlement for waste management services. However, the council charges an annual Municipal Tax from residents. 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, 000.00 (approx. USD 12.00) a year. Respondents had mixed responses regarding payments to the local council for waste management services.

3.9 Actual Payments made to service provider by stage

Stage	Yes	No	Total
Stage 1	30	32	62
Stage 2	80	90	170
Stage 3	46	87	133
Stage 4	19	26	45
Stage 5	26	77	103
Stage 6	33	61	94
Total	234	373	607
	38.6%	61.4%	100.0%

Source: Survey data, 2022

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

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 payments to the local council by stage

Stages	Annual Municipal Tax	Giving small amounts during festive months	Voluntarily Giving a small amount of money occasionally to workers	Giving LKR. 100 to workers every month	Total
Stage 1	10	18	1	1	30
Stage 2	28	50	2	0	80
Stage 3	16	28	2	0	46
Stage 4	9	10	0	0	19
Stage 5	15	11	0	0	26
Stage 6	14	18	1	0	33
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 festive months. Findings of the qualitative data suggests that the above-mentioned payment is made voluntarily. Swaminathan[13], a 50-year-old businessman living in stage 3 elaborated on this type of payment by 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 on 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 annual Municipal Tax as a payment for municipal solid waste management provided by the council. According to Mahinda[14], 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 it administrative area including Ovita is one of the key responsibilities of the local council. Annually the local*

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

council charges a Municipal Tax from the residents to cover the expenses the council has to bare" (In-depth interview, 2022).

Aksha[15] 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 of 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 payment to the local council" (In-depth interview, 2022).*

Qualitative data reveals that respondents of the local council consider the services provided by the local council as obligatory. The rationale used to justify this sentiment is the fact that residents elect members to the council with their 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 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) residents 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 "municipal solid waste management 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 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 by an interview with a top official from a local council when the respondent recounted how elected members rejected the proposal to impose a tax for waste collection. He further stated that "the aim of the regulation proposed by the officers was to charge a monthly waste collection tax of LKR.100.00 from the citizens. However, the elected members rejected the proposal even without taking it in to debate. An elected member of the local council asked from me; are you trying to reduce our voter base. Do you want us to lose?" (In-depth interview, 2019).

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

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, apparent by the account of the officer, elected members tend to support decisions that are popular among voters with the aim of reelection. 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 the local councils in the long run as these ad hoc decisions reduce the efficiency of services offered and becomes a burden to local councils.

3.3.3 Satisfaction regarding municipal solid waste management

Data gathered using the survey suggests that a majority (over 55%) of respondents are satisfied with municipal solid waste management services provided by the local council. Many residents affirmed this finding during in-depth interviews. Sumanga[16], a 32-year-old male living in stage 2 stated that "*the waste workers do a good job. For me that 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 use to take garbage everywhere. Flies were everywhere. The situation became better when the local council and the JICA came together and implemented many programmes"* (In-depth interview, 2022).

3.11 Satisfaction or dissatisfaction with waste collection by stage

Stage	Satisfied	Dissatisfied	Total
Stage 1	36	26	62
Stage 2	104	66	170
Stage 3	85	48	133
Stage 4	18	27	45
Stage 5	47	56	103
Stage 6	45	49	94
Total	335	272	607
	55.2%	44.8%	100.0%

Source: Survey data, 2022

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

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

3.12 Main reason 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 done systematically	Because waste collection is carried out without interruptions	Because the waste workers are friendly	Total
Stage 1	5	19	5	2	5	0	36
Stage 2	6	63	7	4	25	0	105
Stage 3	4	54	7	2	16	1	84
Stage 4	0	8	8	0	2	0	18
Stage 5	7	26	7	1	6	0	47
Stage 6	0	28	4	10	2	1	45
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 as 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 out of 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 a responsibility of someone else (waste workers, the municipality) as a result, detaching 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 household level becomes a complicated mechanism that demands large amounts of resources, technical knowledge, and intervention of multiple stakeholders. Further, as municipal waste management is a socio–ecological system, invisibility contributes to complicate the lives of many secondary stakeholders who are part of sub-systems such as informal waste workers, local council officials, elected members, farmers and etc.

3.13 Main reason for dissatisfaction by stage

Stage	The collection days for biodegradable waste are not adequate	Lack of bins to store waste in households	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
Stage 2	23	16	19	5	3	66
Stage 3	6	7	25	3	8	49
Stage 4	6	5	10	0	6	27
Stage 5	24	11	14	1	5	55
Stage 6	11	14	9	5	10	49
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 municipal solid waste management 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 biodegradable waste collected is insufficient and over 23% stated that the lack of communal bins to collect biodegradable is dissatisfying. Nearly 13% of respondents expressed their dissatisfaction as waste collection is not carried out in certain sections of 3rd, 4th and 5th stages 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[17] 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 caught waste dumped to the canal up stream. Most of the wastes you see here aren't waste thrown by the residents. Rather*

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

they are thrown into the canal upstream in Dehiwala. However, as the canal becomes curved near the settlement, the flowing speed of the canal reduces …. Thus, the waste gets 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 stage 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. The canal is blocked from three locations, one at the beginning of stage 3; near the bridge between stage 3 and 2, second, in the middle of the canal route between stage 4 and 5 and thirdly near the secondary bridge that connects stage 4 to a by-road that leads to Galle Road. The canal had become a hot bed for breeding of mosquitoes and flies. It is of paramount importance that the council attends to this issue (even though management of the canal is not directly linked to municipal solid waste management of the local council) as the situation of the canal directly impacts cleanliness in the settlement and health of the community.

3.14 Main Suggestion of respondents to improve waste management system 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
Stage 2	23	15	15	15	4	72
Stage 3	19	10	18	10	1	58
Stage 4	6	6	3	3	0	18
Stage 5	23	9	10	6	1	49

Stage 6	12	6	18	9	1	46
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 biodegradable waste is collected since there is difficulty in storing 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 has a major impact on the cleanliness and the hygiene of the settlement. In this light the proposition of the respondents to clean the canal on a monthly basis should be considered by the council.

Over 17% of respondents requested the local council to collect waste from the roads located in the center of the community. This particular finding was reiterated during qualitative interviews. Sameera[18] 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 within the stage. The waste collection vehicle of council do 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 the vehicle 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).*

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.

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

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 Dehiwala-Mt.Lavinia Municipal Council and the relatively inexpensive space it offered for small businesses to prosper. The location assured access to majority of the middle and high income earning communities, thus assuring the availability of economically viable waste items such as metal, glass, paper, electronics, 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 roadsides. Waste collectors utilized their stores to further segregate collected waste items and sold items to entrepreneurs who convert them into raw material 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, findings of the study suggest that the number of informal waste collectors that operate in the community had reduced over time. Most respondents (nearly 65%) that only two waste workers are active in the community while nearly 20% of respondents thought that there is only one informal waste collector.

3.15 Number of waste workers active within the settlement by stage

Stage	1 collectors	2 collectors	3 collectors	4 collectors	Total
Stage 1	9	40	6	7	62
Stage 2	44	104	15	7	170
Stage 3	21	89	16	7	133
Stage 4	8	33	3	1	45
Stage 5	14	72	11	6	103
Stage 6	25	54	13	2	94
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 from Ovita. However, only two of these waste workers are settled in the settlement.

Findings from qualitative data reveal key factors that have contributed to the decrease in the number of informal waste collectors. Respondents stated that majority of residents

living in the settlement hand over economically viable waste to the waste collection vehicle of the municipal council. Asitha[19] 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 have contributed to the decrease in the number of informal waste collectors.

According to the respondents, another factor that might have contributed to the decrease of 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 monetary 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 cash compensation to a barter system seems to have discouraged respondents from storing economically viable waste to be handed over to informal waste collectors. Tissa[20] a male respondent living 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 always 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 substandard basin or jug for anything you give. 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 would still give you a basin. How many basins a man need? Even the plastic items they give are substandard. You cannot use the jugs to make tea or any 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[21], a 56-year-old male daily paid labourer living in stage 1 expanded 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*

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

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

Types of waste collected by informal waste workers

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

3.16 Informal waste workers number of collection dates

Stage	Once a week	Twice a week	Once a month	No specific date	Total
Stage 1	11	13	27	11	62
Stage 2	37	26	56	51	170
Stage 3	23	41	41	28	133
Stage 4	5	17	10	13	45
Stage 5	15	19	37	32	103
Stage 6	13	21	36	24	94
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 by Waste entrepreneurs. Waste workers do not have a contract that specifies their remuneration or period of appointment. According to the accounts of respondents, many informal workers consume drugs for recreational purposes. Jayasekara[22], 41 a self-employed resident of stage 1 stated "*these workers are addicts of heroin and Ice (Methamphetamine). The Waste entrepreneur pays them a daily wage according to the amount of waste they collect on a given day. Whatever they earn on a day is spent to consume drugs. The next day, they again need to work for the Waste entrepreneur waste collector to finance their habit*" (In-depth interview, 2022).

The authors also observed that most informal waste workers are employed on a daily wage basis and that they obtain the support of their family members to run the business. For an 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 book-keeping. 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 which is used by the most prominent Waste entrepreneur waste collector of the Ovita settlement, "paying with drugs". This was witnessed during multiple visits as waste workers arrive at the household of the waste collector for their 'payment'. 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 arrive from the room after 10 to 15 minutes 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 is relative to the amount of waste collected.

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

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

and a waste worker. The waste worker complained 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. Therefore this finding requires further research on this particular topic.

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 the failure of the programme.

In the period between 1997 and 2001 a local non-governmental organization 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 upon the request of a community leader and the Community Development Council (CDC) of the settlement (Roberts, 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 book-keeping, communal waste management and segregation to selected members of the CDC. After training and improving the awareness of residents, 3 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 in 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 Dehiwala-Mt.Lavinia Municipal Council.

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

3.17 Participation in the programme by stage

Stage	Yes	No	Total
Stage 1	16	46	62
Stage 2	45	125	170
Stage 3	26	107	133
Stage 4	6	39	45
Stage 5	21	82	103
Stage 6	21	73	94
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 and 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
Stage 2	5	35	40
Stage 3	4	33	37
Stage 4	1	8	9
Stage 5	2	20	22
Stage 6	1	19	20
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% of the respondents 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[23] 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 main 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 appointed to manage waste	Lack of involvement of community members	Lack of involvement of municipal council	Total
Stage 1	2	2	4	1	1	10
Stage 2	9	14	8	0	3	34
Stage 3	6	9	10	3	1	29
Stage 4	1	0	4	2	0	7
Stage 5	4	7	7	1	0	19
Stage 6	6	6	8	1	1	22
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 officers (three elected members) mishandled the funds of the programme. Sumangala[24] 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 officials. It is them who stopped collecting waste*" (In-depth interview, 2022).

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

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.

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 municipal solid waste management activities and household waste management activities.

4.2 Collapse of the Meethotamulla waste dumping site

On 14th April 2016 the 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
Stage 2	56	75	39	170
Stage 3	60	48	25	133
Stage 4	15	19	11	45
Stage 5	40	44	19	103
Stage 6	42	28	24	94
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[25] 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[26] a 39-year-old daily 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 formal waste worker 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 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

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

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 Main Impact 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
Stage 2	24	2	0	24	6	56
Stage 3	25	2	0	27	6	60
Stage 4	9	1	1	4	0	15
Stage 5	19	2	0	17	2	40
Stage 6	23	0	0	19	0	42
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. Nalayani27 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

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

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 was a 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
Stage 2	34	120	16	170
Stage 3	49	68	16	133
Stage 4	9	26	10	45
Stage 5	37	49	17	103
Stage 6	32	45	17	94
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 Main 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
Stage 2	4	1	26	3	34
Stage 3	2	1	37	9	49
Stage 4	0	0	8	1	9
Stage 5	3	1	26	7	37
Stage 6	2	2	27	1	32
Total	12	5	131	26	174
	6.9%	2.9%	75.3%	14.9%	100.0%

Source: Survey data, 2022

Banuka[28] 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 had informed my wife that segregating waste as food and plastics was a must. We did not really care for it, as in previous instances, when the local council also 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 den for the drug addicts. 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. 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 a brainchild of the president at the time and thus had significant support from the government. Communal waste segregation points were introduced to collect non-biodegradable waste, such as glass, metals, paper, plastics and polythene as part of the project. The government invested in constructing temporary huts to collect the above mentioned types of waste. However, since it was not compulsory 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

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

communal settings had failed miserably except for those implemented by schools in Colombo. These collection points 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[29], a 60-year-old housewife from stage 5 further explained how they resorted to segregate 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 over to them on 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 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 the 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 considerable 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 municipal solid waste management activities in the underserved settlement. The quantitative data suggests that a significant proportion of residents had felt an impact. As depicted by table (4.5) below, 58% of respondents stated that they experienced a change in waste management activities.

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

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

Stage	Yes	No	Total
Stage 1	36	26	62
Stage 2	85	85	170
Stage 3	78	55	133
Stage 4	29	16	45
Stage 5	64	39	103
Stage 6	60	34	94
Total	352	255	607
	58.0%	42.0%	100.0%

Source: Survey data, 2022

Both qualitative data and quantitative data depict that changes that took place mainly because waste collectors were infected. Ill health of waste collectors had contributed to reduce the frequency of waste collection, disrupt waste collection activities and initiated the collection of mixed waste.

4.6 Perceived main changes in the waste collection activities by stage

Stage	Waste collection activities stopped for few weeks	The number of waste collectors reduced significantly	bio degradable and non-biodegradable waste was collected together	The frequency of waste collection was reduced	Total
Stage 1	8	10	11	7	36
Stage 2	22	15	20	29	86
Stage 3	23	14	17	22	76
Stage 4	3	8	10	9	30
Stage 5	19	13	14	18	64
Stage 6	16	14	14	16	60
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 halted completely for a significant period and qualitative data suggests that the most difficult days was during the lockdown period. Ciril[30] 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

[30] Ciril is a pseudonym used to protect the identity of the respondent.

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 the 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 reduced significantly during time period.

This was further confirmed by the account of Dimantha[31] 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 one time 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 the respondents stated that mixed waste was collected. According to Ishara[32], 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 are 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 collection of waste irrespective of the type could have been a result of the pressure exerted on waste collectors by the elected members of the council. As mentioned previously, the patron-client relationship that exist between residents and the elected members of the council dictates majority of the relations the respondents have with the council and its services. This is also true in terms of municipal solid waste management activities. In previous interviews carried out with elected members of the DMMC members revealed that residents of the council informed them if waste collection activities are not carried out properly in an area of the council or if waste is 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 in the COVID-19 lockdown periods.

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

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. However, this number was reduced to two workers during the pandemic. Kamala[33] 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 is stopped on a road, two waste workers would collect waste from one house while the other two collect 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 [the protective gear] were not helping that much. As some workers told us, it's difficult to breath with the masks and the boots get slippery when they climb on top of waste" (In-depth interview, 2022).*

As depicted in table 4.7, a significant proportion (over 34%) of respondents living in the underserved settlement had stated that household waste management activities had to be changed due to impact of the COVID-19 virus. Nevertheless, a large majority (nearly 66%) stated that they did not experience any major change at 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[34] a 48-year-old housewife living in stage 1 explained how she managed waste at household level *"I segregated the waste as usual into 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 to the flowing water of the canal and I 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 their 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 service 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.

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

4.7 Changes of solid waste management at household level by stage

Stage	Yes	No	Total
Stage 1	25	37	62
Stage 2	49	121	170
Stage 3	41	92	133
Stage 4	19	26	45
Stage 5	35	68	103
Stage 6	39	55	94
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 household level. Quantitative and qualitative data suggest that all changes occurred in relation to disposal and not storage of waste. Household members employed adoptive measures such as disposing waste to the roadsides (Over 30%), burning garbage near the canal (over 25%), handing waste to neighbours who work as waste collectors (nearly 24%) and disposing waste in the canal (nearly 21%) to face the challenges posed by disrupted waste management activities.

4.8 Perceived main Change 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
Stage 2	13	8	9	19	49
Stage 3	6	12	10	13	41
Stage 4	6	5	2	6	19
Stage 5	11	10	8	6	35
Stage 6	4	15	7	13	39
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 collection or disposal of waste on roadsides. Residents had disposed waste on the road

that runs through the settlement or on the bank of the canal. As Oshan[35] 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 to it. 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 her account also explains why it was easier for her to manage the waste on the roadside. According to her, the officials who come to check on residents were mostly concerned about preventing the spread of COVID-19 and were less concerned with the waste management.

This account also reveals the importance of having a separate unit dedicated to carryout waste management activities. Even though there is a waste management committee in the DMMC, the responsibilities of its members ranges from safeguarding public health, enforcing regulations of the local council and responding to emergency situation such as the pandemic. For an 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 health promotion and enforcement of public health law (Ministry of Health, 1986). It is clear that a PHI has to manage a large array of activities that limits his/her capacity to be committed to waste management activities alone since they have to priorities the activities they can invest in based on contextual and situational needs. Thus, this finding points to the importance of introducing a cardre 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, it is recommended to introduce new Disaster Risk resilience strategies and more effective reliable and technologically advanced communication mechanisms to the formal MSWM mechanism.

Moreover, some respondents had resorted to burn waste near or on the bank of the canal. Prasadi[36] a 40-year-old housewife living in stage 3 stated *"Since waste collection workers*

[35] Oshan is a pseudonym used to protect the identity of the respondent.
[36] Prasad is a pseudonym used to protect the identity of the respondent.

delayed coming for collection, I opted to burn some of the waste items for safety reasons and also due to lack of space. In the aftermath of the lockdowns, I resorted to burn face masks and threw 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 burnt 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 burning of medical waste (though harmful to the environment and health of individuals), is based on strong logic and reason. In the case explained above, the respondent had resorted to burn waste as it is "unhealthy" and "unsafe". This shows how individuals rationalize their actions with their own reasoning and logic constructed by values, norms and realities around them. These realities might differ from technical and formal realities constructed by experts and technocrats yet are effective and coherent. The academic community has a responsibility bridging 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 the creation of a dialogue between the technocrat's version of reality affiliated with waste management and a lay person's version of reality that facilitates co-learning and knowledge sharing.

The respondents also resorted to utilize available social capital to counter the changes in municipal solid waste management. Some respondents handed over the waste in their household to their neighbours who work as either waste collectors or drivers of waste collection lorries. Namali[37] a 49- year 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 has been successful enough to cater to the needs of the communities.

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

4.4 Discussion

The section revealed challenges experienced by respondents in the aftermath of the Meethotamulla disaster and during the COVID-19 pandemic. Normalization of invisibility as well as employment of effective strategies have reduced the impact of crisis events on the lives of the residents. Nevertheless, 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 in order to demand and agitate for a more effective waste management services. The approach of treating residents of an underserved settlement as an underprivileged group that require support and guidance by the government, on-governmental organization and experts will continue to retain them within the vicious cycle of invisibility.

5. Conclusions and Recommendations

5.1 Conclusions

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 services offered by the DMMC, due to their disadvantaged position in society. The findings revealed that the settlement was neglected in terms of providing solid waste management services from the early 1990s. This neglect caused the settlement to be a testing ground for community-based waste management activities implemented by international and local non-governmental local organizations. Further, these experiments have done very little to improve the waste management of the community in the long run but had managed to improve the quality of waste management in the period the programmes were in action. Moreover, the community-based waste management activities implemented by NGOs had been somewhat successful as long as the implementing agency was active in the field. This reveals that the community-based waste management programmes have failed to actually integrate the community into the community programmes

In terms of waste management, the residents' approach towards waste management is similar to other respondents living in DMMC who were interviewed in previous surveys of the study (Fernando et al, 2020; Fernando & de Silva, 2021; Fernando & de Silva, 2022). The "out of sight-out of mind" mindset is evident in the waste management activities carried out by residents. The positive elements of municipal solid waste management, 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 (called SEWA in Sinhalese) approach of the local council (considering waste management as a "SEWA" to the community) are the root causes for the existence of this mindset. As revealed in the previous studies, the local councils carry out the MSWM activities while facing significant financial challenges and minimum resources. Often a significant portion of the annual budget of the local councils are spent on MSWM and to cover financial deficits they have obtained credit facilities from government and private banks. Therefore, it is difficult for the local councils to expand the existing waste management activities further. Thus, a change in the "out of sight out of mind" mindset is compulsory to achieve sustainable waste management as sustainable systems demand greater contribution from the community. Responsible waste management by the community through mechanisms such as 3R (reduce, reuse and recycle) can contribute significantly to reduce the expenses local councils have to incur on waste management.

The findings of 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, the residents have to priorities 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 is 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 processes of changing the 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 hails from middle- and high-income areas too had the "out of sight-out of mind" mindset. Therefore, the best approach would be introduce a waste collection system that can answer the key concerns of the community. Such a waste management system can utilize smaller vehicles such as three-wheelers and bikes to collect waste from narrow roads, catchment nets in the upper segments of the "Weras canal" that floats through the settlement and alter the collection dates and times according to the requirements of the community.

Further, it was revealed that programmes implemented by local government agencies, the central government and NGOs focus only on post–generation 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 support the existence of the “out of mind-out of sight” mindset.

The crisis situations of the collapse of the Meethotamulla dumping site and spread of the COVID-19 virus has had an impact on waste management activities of the settlement. These impacts included changes in the waste management activities and waste collection activities by the local councils. It is evident that the local councils as well as provincial and national level organizations does not have plans and standard operational procedures to face crisis situations. Thus, all the efforts they have had implemented in the 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 the waste management and had made the residents question the very point of taking 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 social capital available to them.

Finally, it is also evident that due to the normalization of failing or delays in the services (including MSWM) provided by the local councils, the settlers have become significantly resilient to crisis situations and the challenges they bring forth. They have devised alternative methods such as dumping waste to the canal, illegally dumping waste to roadsides and using the services of drug users to get rid of waste. However, the local council should not consider this as a positive outcome rather a negative outcome of the substandard services provided by the council. In the long run these alternatives the settlers have devised will create a number of new challenges to the MSWM activities of the local council and further aggravate existing challenges such as the clogging up of the canal. Therefore, the local council should consider the resilience of the settlers as a pretext to take measures to further improve the quality of services provided to the settlers of Ovita.

5.2 Recommendations

- The DMMC 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, as it has extremely low operational costs which is often limited to transportation of feed and due to the constant demand for animal feed throughout the year.

- 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 biodegradable and non-biodegradable 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 and social media posts etc. The second option is to introduce communal waste disposal bins in the settlement. Residents should be encouraged to dispose non-biodegradable waste in communal bins.
- In order to provide an equitable waste management service to the residents living in stage 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 reveal that residents struggle to store biodegradable waste, these communal bins can be utilized to collect only biodegradable 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 congested roads of stage 5 and 6. As the local council or any other entity is yet to design and initiate a plan to create a parking space for 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 into narrow roads and will also be cost effective in terms of operational costs.
- According to the data 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 are the key issues experienced by the council when managing waste in the COVID-19 period. This is an aspect of the life of waste workers that health officials, administrators and even researchers often fail to comprehend. An effort should be made to record the experiences of waste workers when collecting waste while using recommended equipment and utensils, the compatibility of the recommended safety items and their aptness. The findings derived from such data would be instrumental to improve the quality of the work life of waste collectors in a similar pandemic situation.

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Annexures

Case study 1 -Saman

Saman[38] 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 3 common toilets in the beginning, and 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 mechanism 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 had 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 burnt 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 mosquitos, 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 in 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 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*

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

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 travelled around the community with a push cart, collecting polythene and plastics. At the end of the month, they would pay the households who 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 to 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 had 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. Lavini 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 plastics with masks and sanitizer bottles. We had to put kitchen waste to the canal as the country was in a lockdown. We couldn't do anything else*".

Case study 2 - Mallika

Mallika[39] 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 them in bags and carrying them to the adjoining road for the waste collection vehicles of the local council to collect waste. "*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 over in 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 GN officer of the settlement at the time informed her to attend a meeting on waste management "*The meeting took place at the community centre 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 and 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 an opportunity to go to Japan and learn about waste segregation. After the training, a waste management facility was installed in the settlement. This collection centre 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 to go around the settlement and collect polythene waste. We instructed the residents to collect plastic and polythene bags as in a lager bag and also to collect and hand over paper, 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*

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

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 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 of 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 is a 26-year-old female living in stage 3 with my 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 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.".*

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 GN officer of the settlement at the time informed her to attend a meeting on waste management "*The meeting took place at the community centre 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 and 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 an opportunity to go to Japan and learn about waste segregation. After the training, a waste management facility was installed in the settlement. This collection centre 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 to go around the settlement and collect polythene waste. We instructed the residents to collect plastic and polythene bags as in a lager bag and also to collect and hand over paper, 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 a 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 of 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 4- Kalpa

Kalpa[40] s a 60 year old male living with his family in the 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 year 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 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 lorries 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. Overtime, I managed to buy a small Town Ace van lorry to collect waste, and I also employed around 10 new workers to collect waste. I mainly collected waste from Dehiwala, Nadimala, Rathmalana,Nugegoda, Gangodawila, Kohuwala, Kalubovila, and surrounding areas.*

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 km away, I can reach my house within an hour. The same with 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 some money to continue their habit. Also, let me tell you something. Drug users are hard workers, especially when they are sick and 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 the waste collection activities have changed over time "All *I always did was to 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*

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

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 to 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 anymore. I just break even every month. That is also because my wife and son help me with weighing and sorting activities."

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