Sustainable Waste Management at the Ward Level: The Building Blocks

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Programme Partners

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH is a German federally-owned public benefit enterprise, working in the field of international cooperation for sustainable development. In India, GIZ has been working jointly with partners for over 60 years for sustainable economic, ecological and social development.

Tetra Pak - In terms of offering solutions for food processing and packaging, Tetra Pak is a global innovator and market leader. They make food safe and widely accessible for everyone by working with their clients. Leading with low-carbon solutions for a circular economy and enhancing sustainability throughout the value chain are the company's key objectives. This involves reducing waste and emissions, preserving ecosystems and biodiversity, ensuring the supply of freshwater, and fostering recycling and circularity.

The Coca-Cola Foundation - The Coca-Cola Foundation's mission is to make a difference in communities around the world where The Coca-Cola Company operates and where our employees live and work. We support transformative ideas and institutions that address complex global challenges and that leave a measurable and lasting impact. Our giving is focused on sustainable access to safe water, climate resilience and disaster risk preparedness and response, circular economy, economic empowerment, and causes impacting our hometown community. Since its inception in 1984, The Coca-Cola Foundation has awarded grants of over $1.5 billion in service of its mandate to strengthen communities across the world.

Implementation Partner

Saahas, 'Not for Profit' organization was set up in 2001 under the Society's Act. Saahas primarily works for setting up Sustainable Waste Management systems with a vision of India becoming a leading Circular Economy where Nothing is Waste. The programs are based on the core concepts of 'Source Segregation and 'Decentralized Waste Management' within the framework of the Solid Waste Management Rules 2016 and principles of Circular Economy. Saahas works with government institutions, corporates, households, and schools to bring attention to best practices in the management of solid waste and also establishes collection and processing infrastructure. Our programs also provide better livelihood opportunities for the informal sector and people at the base of the pyramid.

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1.1   Background

Solid waste management is a critical global issue, exacerbated by urbanisation and industrialization. The quantity and composition of waste play a crucial role in determining appropriate collection, processing, and disposal methods, influenced by factors such as population, local infrastructure, local economy, lifestyles, and income levels. Escalating waste generation and improper disposal of solid waste has severe environmental and healthcare repercussions. In addition to polluting the soil, water and air, open dumping of solid waste also contributes to the release of carbon emissions in the atmosphere. Furthermore it also results in the loss of materials that still have the potential to be reused/recycled/reprocessed, thereby reducing the extraction of virgin materials. Hence, urgent action is required to develop sustainable municipal solid waste management strategies to preserve the environment and ensure a better future for all.

The city of Gurugram, Haryana in North India, faces a significant challenge in managing municipal solid waste due to rapid industrialization, economic growth, urbanisation, and a booming population. The Municipal Corporation of Gurugram (MCG) is responsible for solid waste collection, transportation, and its disposal. The city's waste generation estimation is 1200 metric tonnes per day.[1]

To address this pressing issue, Tetra Pak, a packaging manufacturer, and Coca-Cola Foundation, a beverage group, collaborated with Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH under the develoPPP funding programme of the German Federal Ministry for Economic Cooperation and Development (BMZ).

The program 'ALAG KARO - Har Din Teen Bin' was launched in 2017, in the city of Gurugram in the state of Haryana in north India. The program, implemented by Saahas, focused on awareness and implementation of source segregation of waste and decentralised solutions in line with SWM Rule 2016.

Furthermore, the program also contributed to the Government of India's flagship mission on solid waste management, called the Swachh Bharat Mission (SBM). SBM emphasises on the role of community awareness and community participation for the successful implementation of waste management practices[2] and this has been a vital component of the program.

The first phase of the program (2017 to 2019) focused on bulk waste generators (BWG), namely residential societies, schools, and commercial establishments. The program was successfully implemented across 42 apartments with a total of 22,000 households and enabled onsite composting of biodegradable waste in 21 of these. This diverted 30 tonnes of waste per day from the landfill and reduced GHG emissions by 12,000 tons of CO2e. The project impact was also assessed using the SROI (Social Return On Investment) framework, and found to be 2.66[3]. The learnings and best practices that emerged from the first phase are available at the www.alagkaro.com website.[4] In addition to the residentials, 39 schools with a total of 23,800 students, 412 offices and 525 informal waste workers were also reached out through the program.

After successfully implementing and institutionalising source segregation for the bulk waste generators under phase 1 it was felt that for a sustainable city, addressing all types of waste generators is required. Hence, the 2nd phase of the Alag Karo program aimed to build a Model Ward w.r.t. Sustainable Municipal Solid Waste Management in Gurugram. A Ward is the smallest administrative unit in Indian cities and has all types of waste generators - BWGs, open plotted houses, markets, commercials, shops, street vendors, urban villages, etc. It is

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[1] "No more waste dumping at Gurugram's Bandhwari landfill from Feb 1." 16 Nov. 2022, https://www.business-standard.com/article/current-affairs/no-more-waste-dumping-at-gurugram-s-bandhwari-landfill-from-feb-1-122111700056_1.html. Accessed 8 Aug. 2023.

a typical representation of a city.

Figure 1 : Program Launch of Alag Karo - ward level intervention

Ward 32, Gurugram under Municipal Corporation of Gurugram was selected to pilot this intervention.

1.2   Scope of the Document

This report documents the implementation process and its impact in Ward 32 of Gurugram, providing insights into the development of an 'Atma Nirbhar Ward' – a self-reliant ward with respect to Waste Management. The learnings are summarised in an 8-step process that local administration can follow to effectively build an 'Atma Nirbhar' ward, leading to an 'Atma-Nirbhar' city. The report weaves together technical solutions, on-ground experiences, overview of processes, outcomes and impacts of interventions, thereby showcasing an approach to address the interdisciplinary nature of solid waste management in one of the most rapidly growing cities of urban India.

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[2] Manual.pdf (swachhbharaturban.gov.in)

[3] The SROI report for the 1st phase is available at http://alagkaro.com/images/resources/case_studies_and_reports/SROI_Impact_Assesment_2017-19.pdf

[4] Recipe to implement source segregation at a residential campus is avalible at http://alagkaro.com/images/resources/case_studies_and_reports/implementing_source_segregation_in_residential_communities_alag_karo.pdf

Figure 2 : Waste collection before project implementation

The report also does a deep dive into the Ward 32 case study, detailing the challenges faced during program implementation and the innovative solutions that emerged as a result. This can serve as a blueprint for other wards and cities and inspire them to embark on this journey towards holistic waste management, envisioning a future where nothing is waste.

1.3   Waste Management in Gurugram

Waste management in Gurugram has been a significant challenge due to rapidly growing population, urbanisation and inadequate infrastructure. The city is home to a large number of residential societies, commercial & market units, schools & institutions and with an increase in population, has resulted in a substantial generation of waste, putting immense pressure on the city's current waste management systems. Gurugram produces approximately 1200 tons of waste per day, with a composition of 50% bio-degradable and 45-50% non-biodegradable.[5] The city has a concessionair EcoGreen Energy Gurugram Faridabad Pvt Limited, who is responsible for door-to-door collection, transportation and processing of waste. A waste to energy plant at Bandhwari landfill location was expected to be operational in 2019, but is still under construction by EcoGreen. Hence, currently waste is collected and dumped at the landfill for a tipping fee. Source segregation of waste and management of organic waste by BWG have been implemented in approximately 200 units across the city.[6] Source segregation is not commonly practised in other locations, across the city. Collection vehicles designed to carry segregated waste and decentralised processing units are very few in number. EcoGreen collects waste through the support of the informal sector, who also contribute to the recycling value chain in the city.

1.4   Ward: Smallest Administrative Unit in a City

A ward is the smallest administrative unit within a municipality, and plays a fundamental role in local governance. It serves as a microcosm of the larger administrative structure, focusing on the specific needs and concerns of a defined geographic area and its residents. Typically, a ward is represented by an elected ward councillor who acts as a liaison between the residents and the higher levels of government. Additionally, wards often serve as units for implementing various government schemes, managing local services, and maintaining law and order. By functioning as the building blocks of local governance, wards contribute to the overall development, efficient administration, and inclusive representation within a municipality or city. The ward officers are responsible for organising and overseeing waste collection within their jurisdiction. They work closely with municipal authorities to ensure that garbage collection services are provided regularly and efficiently. This includes coordinating the schedules, routes, and methods of waste collection to cover all areas of the ward.

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[5] "No more waste dumping at Gurugram's Bandhwari landfill from Feb 1." 16 Nov. 2022, https://www.business-standard.com/article/current-affairs/no-more-waste-dumping-at-gurugram-s-bandhwari-landfill-from-feb-1-122111700056_1.html. Accessed 8 Aug. 2023.

[6] "Gurgaon has more bulk waste generators than MCG estimates: Study." 29 Apr. 2023, https://timesofindia.indiatimes.com/city/gurgaon/gurgaon-has-more-bulk-waste-generators-than-mcg-estimates-study/articleshow/99858579.cms?from=mdr. Accessed 8 Aug. 2023.

GENERAL WASTE MANAGEMENT SCENARIO IN A WARD

The waste management scenario in any ward is influenced by diverse lifestyles and activities of its residents. The residential areas generate household waste comprising biodegradable kitchen waste, non biodegradable recyclables such as paper, plastic, glass and domestic hazardous waste & inerts like sanitary napkins, diapers, swap dust, etc. Whereas in shops and offices, the organic kitchen waste is generally low and these establishments contribute mainly to the waste stream with packaging materials and discarded products.

Waste, by the waste generator is stored in bin liners / poly bags and either given to the collection vehicle or dumped in open areas or garbage vulnerable points. The collection vehicle, operated by the informal sector takes the waste to their work locations, after salvaging the recyclables, the remaining is sent to the landfill either directly or via transfer stations.

The diagram below shows the waste flow in a typical ward:

Figure 4 : General waste management scenario in a ward
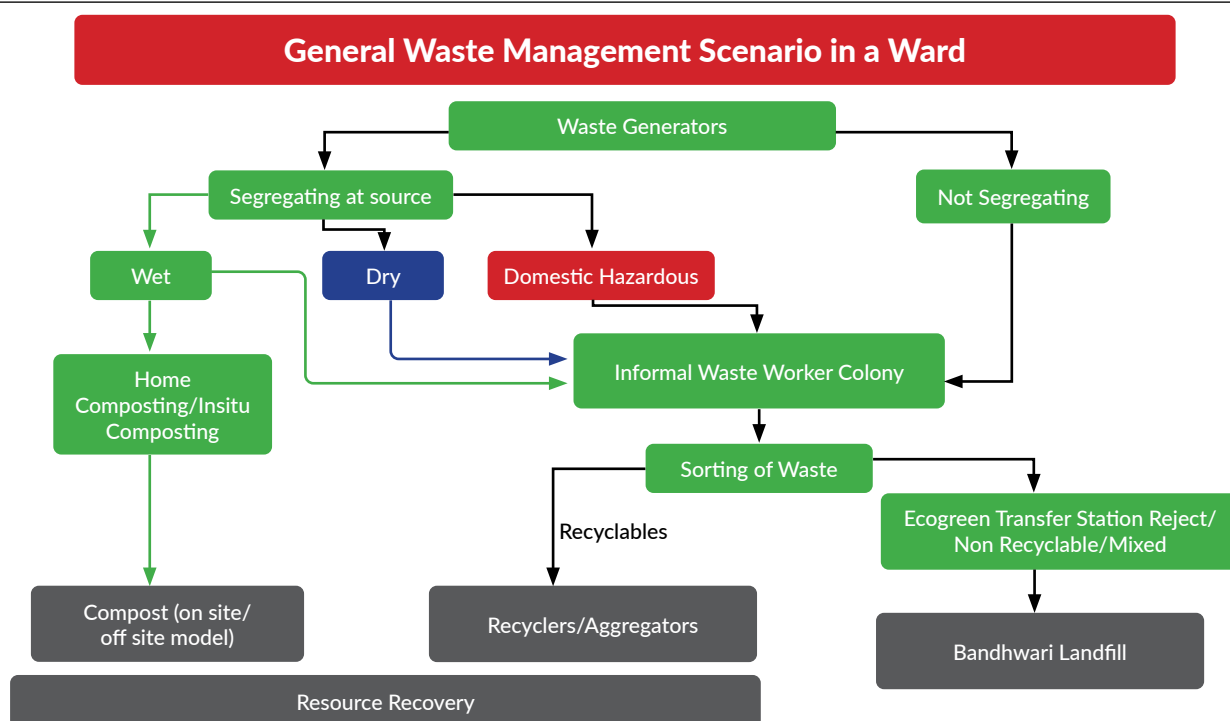
Figure 3 : Mixed waste collection in modified tri-motorcycle

SUSTAINABLE WASTE MANAGEMENT

Through our 2-year journey in implementing the Alag Karo program, we have identified 5 pillars for building a sustainable waste management system. These 5 pillars are:

Figure 5 : 5 Pillars for Sustainable Waste Management at the Ward Level

3.1 Behaviour Change Communication (BCC)

The significance of BCC in transforming people's attitudes cannot be underestimated. Citizens to truly embrace sustainable waste management principles, they also need to understand why this needs to be done, how waste dumping and burning impacts them and society at large; what role can they play and how. Education and information hold the key to empowerment, enabling individuals to make a qualitative shift in their approach towards waste.

Since a ward has many types of waste generators with diverse socio-economic backgrounds, for achieving our goal of source segregation, the program took a dynamic approach to BCC. This dynamic approach included enlightening, educating and motivating individuals belonging to different groups of waste generators such as independent plotted layouts, high-rise apartments, schools, commercial & market units, etc., about their roles, responsibilities and the benefits of adopting proper waste management, customised to their needs. The Alag Karo program developed interesting, informative and engaging IEC (Information, Education and Communication) content, both in english and hindi.

3.2 Stakeholder Capacity and Ownership Building

Capacity building of various stakeholders is essential for fostering behavioural change towards waste management policies and practices. The involvement of different stakeholders in waste management, including residents, commercial space owners, housekeeping staff, maids, waste collectors, waste workers, shop owners, collection agencies, and informal collectors, is crucial for the effectiveness of source segregation.

Among these stakeholders, the officials of the Resident Welfare Association (RWA) as well as association members of any commercial or market units play a pivotal role in ensuring the institutionalisation and long-term sustainability. Their buy-in is vital as they become leaders and owners of the program, providing the necessary capital investment for effective waste collection, transportation, processing, and infrastructure. Their influence carries significant weight in motivating the housekeeping team and addressing concerns from naysayers and defaulters. Moreover, the entire source segregation initiative must be led and owned by these association members, ensuring continuity and consistency in its implementation. Their leadership makes source segregation an integral part of the community's waste management efforts.

Volunteers also play a critical role in driving behavioural change among residents and staff. Engaging stakeholders through various events like compost distribution, maid and housekeeping staff training, and plogruns creates a buzz in people's minds and fosters a sense of belongingness. Regular engagement and involvement of stakeholders create a shared sense of responsibility and ownership in the waste management process.

Apart from the above stakeholders, the Municipality plays an important role as the guardian of the city, to ensure the enforcement of the systems.

Figure 6 : Training of stakeholders (housekeeping staff)

3.3   Streamlining Collection and Transportation of Segregated Waste

Waste collection and transportation (C&T) of source segregated waste in a segregated manner, ensures the longevity of the behaviour change and forms the cornerstone for effective waste management practices.

For effective C&T, the vital three components are:

Regular, fixed time daily collection services: Providing regular and fixed time collection services will build the behaviour among the waste generators to handover waste to the waste collector and subsequently reduce the open dumping practices. Fixed collection timing helps in building routine among waste generators which is very important for any permanent behaviour change.

Waste collected in a segregated manner: The collection vehicle must have compartments and/or separate bags to collect the source segregated waste. These compartments / bags must be in accordance with the volume of waste collected for that category. Nothing can be more demotivating for the waste generators to see their efforts to segregate, being mixed at the time of collection. It then dilutes the practice of source segregation.

C&T system as per the waste generator type: For a bulk waste generator having internal door-to-door collection and composting plant for biodegradable waste, the collection required would be for non-biodegradable and domestic hazardous only. Whereas, for non bulk generators, the collection vehicle must have provision to collect at least 3 categories of waste, biodegradable, non biodegradable and domestic hazardous wastes. In addition, the height of the vehicle should be such that an average-height person can drop the waste in the designated compartment without having to jump.

Figure 7 : Curing of compost at a community composting unit in ward 32

Figure 8 : Waste collection in segregated manner at sector 45, ward 32

The waste collectors who are the constant point of contact for a waste generator, must be trained to provide monitoring and feedback on segregation practices to the waste generators. This ensures one's a continuous feedback system for source segregation.

3.4   Resource Recovery

Nothing works better than seeing the results of one's efforts made. Hence, having decentralised biodegradable waste processing units, where compost is seen and felt plays, a vital role in continuing the practice of source segregation.

For recovery from non-biodegradable waste, non-biodegradable Waste Collection Centres with further sorting facilities ensure better quality of waste material to the recycling value.

Figure 9: Biogas unit (Distributed Architecture Model) in ward 32, set up by RWA

Figure 10: Sorting of segregated dry waste

By directly involving residents in the waste-to-resource cycle, a sense of pride and motivation in the community prevails. This strengthens the bond between the waste management system and the residents. It also acted as an incentive for sustained participation and adherence to waste segregation practices.

3.5   Monitoring & Supervision to Bring in Accountability

To bring in accountability in all stakeholders, a robust Monitoring and Supervision system is required. The minimum parameters required to be captured are: tracking of collection vehicles, waste generators giving waste, source segregation status and waste processed/recovered.

An IT enabled system can help capture real time data. The data can be analysed to understand the strengths and areas of improvements. Viewing rights to various stakeholders for consolidated data will help in bringing accountability, transparency and hence trust among the ULB, stakeholders and the citizens.

Thus, having a robust monitoring and data capturing system helps meet the following key purposes:

a)   Regularity of waste collection and vehicle movement - accountability on waste collectors

b)   Quality of source segregation - accountability on waste generators

c)   Amount of waste collected - information to help build processing infrastructure from where the resource recovery data can be gathered

d)   Amount of waste composted / sorted - resource recovery

e)   User fee status - accountability on waste generators

f)   Ease in keeping records of data - for improvement and financial understanding

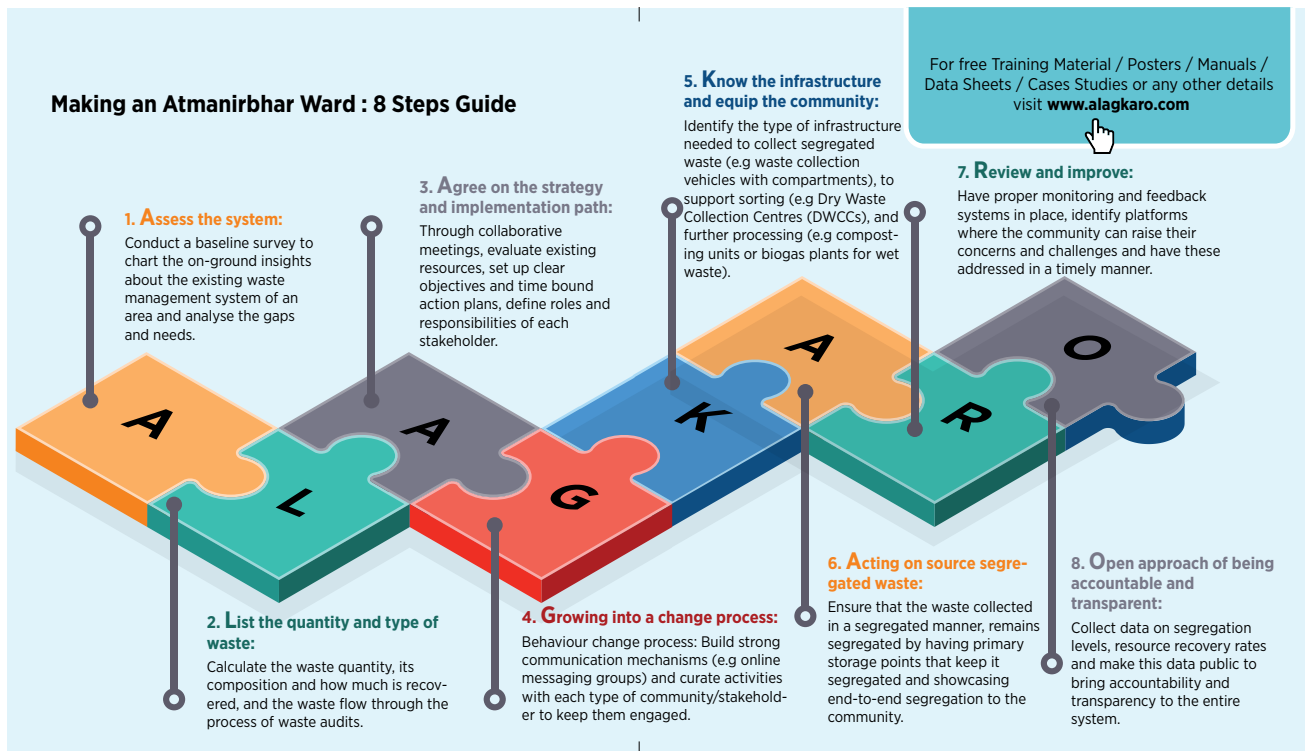**Figure 11 : Dry waste sorting by a woman waste worker using Conveyor belt at Sushant Lok DWCC**

MAKING AN ATMANIRBHAR WARD – AN 8-STEP GUIDE

The previous chapter highlighted the 5 important pillars required to a sustainable waste management system. This chapter gives a simple 8 steps guide for its implementation.

Making an Atmanirbhar Ward : 8 Steps Guide

1. Assess the system:
Conduct a baseline survey to chart the on-ground insights about the existing waste management system of an area and analyse the gaps and needs.

2. List the quantity and type of waste:
Calculate the waste quantity, its composition and how much is recovered, and the waste flow through the process of waste audits.

3. Agree on the strategy and implementation path:
Through collaborative meetings, evaluate existing resources, set up clear objectives and time bound action plans, define roles and responsibilities of each stakeholder.

4. Growing into a change process:
Behaviour change process: Build strong communication mechanisms (e.g online messaging groups) and curate activities with each type of community/stakeholder to keep them engaged.

5. Know the infrastructure and equip the community:
Identify the type of infrastructure needed to collect segregated waste (e.g waste collection vehicles with compartments), to support sorting (e.g Dry Waste Collection Centres (DWCCs), and further processing (e.g composting units or biogas plants for wet waste).

6. Acting on source segregated waste:
Ensure that the waste collected in a segregated manner, remains segregated by having primary storage points that keep it segregated and showcasing end-to-end segregation to the community.

7. Review and improve:
Have proper monitoring and feedback systems in place, identify platforms where the community can raise their concerns and challenges and have these addressed in a timely manner.

8. Open approach of being accountable and transparent:
Collect data on segregation levels, resource recovery rates and make this data public to bring accountability and transparency to the entire system.

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Step 1: Assess the Existing System

Assessment of existing systems is essentially conducting a baseline survey. The survey provides in depth and onground insights about the existing waste management system of an area and helps analyse the gaps and needs. It also maps the area, its stakeholders, types of waste generators, the existing collection, transportation and processing infrastructure.

As the first step, one needs to get the ward map and property tax data to understand the physical areas and the waste generators of the ward. This should be verified physically during the survey.

The assessment broadly involves the following:

1) Mapping the type of waste generating units (individual plots, multi storey apartments, commercial units, open markets etc.)

2) Mapping of various stakeholders/actors

3) Understanding the awareness level among citizen on waste management, specially on waste segregation

4) Capturing the existing disposal methods (open dumping, burning, door-to-door collection, common dustbin or any other).

5) Mapping collection vehicles deployed in the ward (eg Bolero, Tata Ace or pull rickshaw) - type, capacity and design.

6) Mapping of black spots, waste transfer points etc in the ward

7) Mapping the waste collectors and workers (formal and informal) and their area of operations

8) Mapping of waste processing centres for biodegradable and non-biodegradables (composting plants, non-biodegradable waste collection cum sorting centres) both formal and informal

The survey involves meeting the stakeholders like local administration, ward councillor, RWA representatives, community leaders, waste collection agencies and citizens. This provides an idea of their willingness and future ownership for sustainable waste management practices to help formulate the implementation strategy.

Under the Alag Karo program, the ward map was mapped in the MyMap tool and further converted to a shape file in ArcGIS, for detailing the sectors, lanes, streets, etc. This helped us physically verify, capture data and update the ward map in terms of number and types of generators per lane/street/sector, routes followed by the collection vehicle and various dumping points.

Figure 12: Ward 32 Map
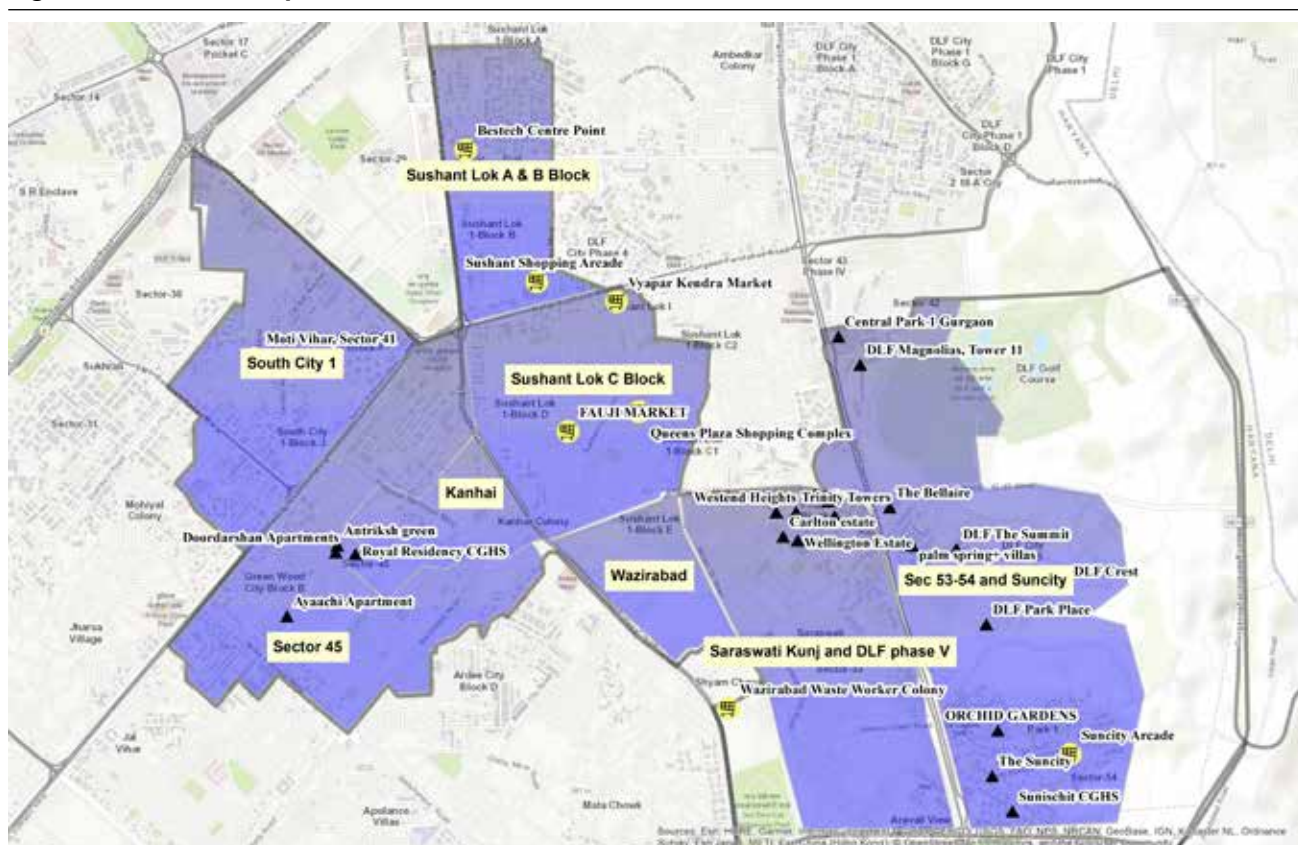
Step 2: List the Quantity, Type and Waste Flow

Efficient waste management system involves collection, transport, treatment, resource recovery and disposal processes. In this context, it is essential to understand waste quantity, its composition, recovery, and waste flow through the process of waste audits.

The process of waste audit broadly involves:

1. Preparation of a questionnaire to capture :

   a. Collection vehicle's movement to capture the waste flow and quantity - Locations/area covered by the vehicle, number of waste workers/collectors deployed, number of waste generators covered along the route, number of trips made by the vehicle per day, amount of waste collected per trip; time taken per trip, primary collection point and secondary collection point (from secondary collection points, the waste goes to recyclers through the value chain of aggregator or landfill)

   b. Waste Characterization: Location, Number Of Waste Sorting Categories, Quantity Of Each Sorted Category.

2. Execution of the audit process, involves the following:

   a. Formation of a survey team

   b. Primary data collection with the waste collection vehicle from the starting point to the end point, for all the trips made during the day, and capturing the date on the route, POGs, waste workers/collectors, etc.

   c. Weighing the waste generated at POG level (this should be done for 7-10 days to arrive at a good estimation of waste generated)

   d. Weighing the vehicle at a weigh bridge, for every trip made

   e. Repeating the same process until the vehicle covers all its route

   f. Repeating the process of all vehicles in the ward

3. For understanding the waste recovery quantity, the following steps need to be followed:

   a. Weigh the waste as per its sorted category, collected for the day at the secondary collection points

   b. Capture the quantity of reject waste and track its destination

   c. Repeat for all secondary collections points, for a period of 7-10 days.

   d. Capture the data of any waste recovered at primary collection point eg. biodegradable waste being sent for composting.

Under the Alag Karo program, the waste audits were done for the ward over 10 working days, with a team of 10 members. The ward's waste was collected using 23 motorised vehicles and 7 pull rickshaws and had 9 primary collection points and 6 secondary collection points. Total waste generated was estimated to be 55 TPD.

Step 3: Agree on Strategy and Implementation Path

Once there is an understanding of existing waste management practices, the next important step is to develop a strategy for the implementing steps to maximise resource recovery with all stakeholders.

Through collaborative meetings,setting up clear **objectives and time bound action plans**, allocation/reallocation of resources, **defining roles & responsibilities** for each stakeholder needs to be discussed and agreed upon.

Under the Alag Karo program, the findings of baseline assessment and waste audit were documented and presented to the Municipality for designing the ward-level intervention plan. Subsequently, consultation and onboarding meetings with the various stakeholders such as local leaders, ward councillor, residential welfare association, market association, concessionaire agency, waste workers, school committees and eco-conscious citizens was done to devise customised action plans.

Step 4: Growing into a Change Process: Behaviour Change Process

The first step of the action plan is to roll out the behaviour change process, as every waste generator needs to first start the practice of source segregation of waste.

Capacity building of stakeholders or hand holding into the change process is essential in order to garner support and accountability across the stakeholders. It is much more than a training. It equips every stakeholder to act effectively, eg. a ULB can develop a strategic plan and strengthens the execution through bye-laws, issues notification etc. The process of capacity building includes giving access to repositories, customized training sessions and sensitization through multiple formal presentations, meetings, focused group discussions, consultations and constant monitoring and evaluation of the desired results for the change process.

Design and Development of Information Education and Communication (IEC) materials plays a significant role in spreading information about various aspects of waste segregation. Customized messaging using posters, banners, pamphlets, games, making wall arts, Nukkad Nataks etc. are good means to engage with the waste generators.

Community engagement activities - Any waste management process/system can fizzle out if the community does not extend its support. **Participation from the community** plays a pivotal role to make a significant impact in achieving the behavioural objectives. This can be done through constant activities with each community to keep them engaged and building excitement around the need for new systems. These activities will also provide the community with platforms to express their concerns, challenges etc. and if addressed at the right time, can go a long way in keeping the community motivated to sustain action. To enable this, local volunteers can be identified who become responsible for a cluster of households / lane / street. This constant engagement needs to be carried out for 4-5 months and then tapered down for another 4-5 months, during the period, the act of source segregation would become a habit.

Under the Alag Karo program, more than 100 community meetings were held, locality wise teams of 4-5 volunteers were formed to take ownership of their locality. Indepth customised trainings were given to these teams, to enable the execution of the action plan in their locations. 3 Plogruns, 10 cleanliness drives, 1 dumpsite transformation and 4 ward level competitions with children and adults were organised over 2 years to spread awareness on source segregation of waste. The Alag Karo team went Door-to-door along with community volunteers regularly for 4-5 months in each locality.

For a 'Behaviour Change' to be effective, it is important to note that the process must be conducted patiently and continuous community engagement for 4-7 months is required. Door-to-door visits and in-person meetings is the most effective BCC activity.

Step 5: Kickstart the Readiness of Infrastructure

The fifth step towards building an 'Atma-Nirbhar' ward is readiness of infrastructure alongside the awareness and behaviour change activities. Inadequate infrastructure and poor services for collection and transportation of segregated waste can have a direct bearing on waste segregation behaviour of any individuals. It is important to have the required infrastructure for segregated waste collection, processing and disposal at the time of 'growing into the change process'.

Addressing gaps identified and recommendations made as a part of step 1, changes need to be implemented as a part of this step.

Infrastructure readiness includes:

1. Collection & Transportation:

   a. Ensuring availability of 3 bins at every waste generator to enable source segregation of waste into biodegradable, non-biodegradable and domestic hazardous categories

   b. Planning of primary and secondary collection methods including routes and timings. The designs of collection vehicle i.e. having partitions in accordance with the volume of waste collected, type of vehicle needed for primary collection, primary storage points, etc all are planned as a part of this step.

2. Infrastructure for processing units to maximise resource recovery: composting or biogas plants for biodegradable waste and dry waste sorting centres for non-biodegradable waste are the basic processing units required.

This task falls majorly within the purview of the Urban Local body, the RWAs and Associations in case of BWGs. Without the necessary infrastructure, often source segregation either does not take off or loses momentum. The ULB must select appropriate sites in order to build community composting facilities and dry waste sorting centres. The sites need to be built as close as possible to the point of generation to ensure a decentralised system.

In addition to the infrastructure readiness, the workforce (workers) required to operate and run the system also needs to be considered and planned. During the Alag Karo program, decentralized biodegradable processing units were established by the RWA, Associations and ULB in the ward, addressing a total of 13.5 tonnes per day.

Step 6: Acting on Source Segregated Waste

The readiness of infrastructure and behaviour change in people for source segregating their waste enables a smooth transition to the 6th step which essentially means starting of collection and transportation in a segregated manner till the end processing point; and processing of waste for maximising resource recovery.

This step consists of:

1. Collection of waste, end to end, in a segregated manner

2. Storage of waste at primary storage points in a segregated manner for secondary collection

3. Having the right number of vehicles and manpower for collection and transportation

4. Pre-fixed time and frequency for regular collection to build the habit of giving waste

5. Processing of waste for resource recovery

Along with the above processes and systems, having community visits to processing units helps build community connect, understanding, ownership and pride for the systems leading to its sustainability.

Under the Alag Karo program, for the gated bulk waste generators with internal housekeeping staff for primary waste collection, the process was owned by the estate manager and the RWA. For the independent open layout and non bulk generators, the waste workers/ collectors started collection as per the route plan. The operations of the waste processing units were also monitored during the duration of the program.

Step 7: Review and Get Better

This step means monitoring, evaluation, feedback and improvements to achieve the final objectives and bring in sustainability.

Monitoring of C&T is to be done at two levels

1. **Level 1:** The monitoring of waste generators in terms of giving waste and giving segregated waste is done by the waste workers/collectors. In addition, they also give on-spot feedback to waste generators to improve the segregation quality

2. **Level 2:** Monitoring of waste collectors and their vehicles is done by local authorities by forming a monitoring team which can include sanitation staff, community leaders, eco-conscious citizens and RWA members.

The parameters to be tracked are:

1. **Level 1:** tracking the segregation process

   a. Households giving waste

   b. Households giving segregated waste

2. **Level 2:** daily waste collection progress in an area

   a. Number of vehicles active vs the planned

   b. Attendance of the waste workers/collectors

   c. Ensuring waste collection is done in a segregated manner - primary and secondary

In addition,

a) Monitoring the quality of biodegradable waste - this can be done by measuring the quality of 'rejects' at the processing unit site

b) Capturing the total waste collected

c) Capturing the quantity of resource recovered - both biodegradable and non biodegradable.

Step 8: Open Approach of Being Accountable and Transparent

Building accountability in each stakeholder is the most important step to build sustainability for the waste management system. Collecting data on segregation levels, collection of waste and resource recovery are the key parameters for the stakeholders. Making this data public will help bring accountability and transparency to the entire system.

As the amount of waste generated, number of waste generators, and waste workers grows, it becomes impossible to capture and analyse data manually. Hence, it becomes imperative to use technology.

Through the Alag Karo program, an IT tool was piloted to capture the above data real time and dashboards of the consolidated data were available for public viewing. The dashboards were created for number of vehicles active vs planned, amount of waste collected, percentage of segregation at various levels - area wise and ward wise. The dashboard gives a bird's eye view and the deep dive gives the ant's view on the status based on which actions can be taken by respective stakeholder for improvements as necessary.

The 8 step guideline is documented in form of a video, please refer to the link below:

http://alagkaro.com/resources/videos

CASE STUDY OF WARD 32, GURUGRAM - AN 'ATMA NIRBHAR WARD' IN ITS MAKING

This chapter captures the implementation of Alag Karo program over its 2.5 years journey, capturing the implementation methodology, approach, learnings and impact. This will serve as a case study for any practitioner, ULB who are planning to implement sustainable waste management in their city.

5.1 Introduction

As we know, a ward is a representative of a city, hence building a sustainable waste management at ward level builds a template for city wide implementation. Based on this idea, Ward 32 in Gurugram was selected as a pilot ward. The program was launched on 5th December, 2022 by the MCG Commissioner.

5.2 Methodology and Approach Adopted

The methodology and approach adopted for implementing the program in the ward was through following the steps listed below:

1. Mapping the ward to understand the waste generators

2. Establishing a baseline to understand the waste generated, the waste flow and to mark the 'beginning parameters' to be compared with project end parameters.

3. Formation of clusters / types of waste generators to help cluster-wise rollout plan

4. Implementing the program objectives of

   a. Increasing awareness on source segregation of waste

   b. Hand holding to streamline collection and transportation, which includes building the capacities of the waste collectors

   c. Improving/building waste processing infrastructure for maximizing resource recovery and diverting waste from landfills

   d. Piloting an IT tool enabled-system to track real time data on collection, segregation levels at street / lane levels to help monitor and build accountability at various stakeholder levels on their scope of work.

The project was implemented by initiating a pilot in Sushant Lok Phase 1 C block. It was then rolled out in the ward, cluster wise. A team of 6 field staff and 4 project coordinators implemented the program in the ward over a period of 2.5 years. The team was supported by Gurugram volunteers for their respective colonies, staff of EcoGreen (the concessionnaire), MCG sanitation staff and interns hired from time to time.

5.3   Ward Geography and Demography

Ward 32 in Gurugram is one of the largest wards in terms of physical size. Spread over 17.2 sq kms, it houses prominent colony areas like DLF - V, sector 42, 43, 45, 54 Sushant Lok-1, and South City 1. In addition, four villages- Kanahi, Silokhera, Saini Khera and Moti Vihar fall under its jurisdiction.

The demography of the ward is detailed as in table 1 below:

Table 1: Category Wise Waste Generators

	Name of Waste Generators	Total Units
	Condominium HH (No of Condos – 64)	19142 households
	Horizontal open layout colonies	7644 households
	Commercial Units	767 units
	Open Market Units	1696 units
	Urban Villages	4000 households approx
	Hospitals	5 units
	Hotel	5 units
	Schools	36 units
	Total	33295

5.4 Baseline Assessment to Understand the Waste Management Scenario

A baseline assessment was conducted to understand the waste management scenario in the ward. Based on property tax data provided by MCG, the ward had 33,295 waste generators excluding street vendors, religious places and illegal settlements. This information was verified physically during the on-ground survey. An alternate way to verify this data is through details of electricity metres, however, the team did not get access to this database.

The boundary of the ward was established in MyMaps application and the data obtained from MCG was converted to Shapefile in ArcGIS marking Bulk Waste Generators, waste collection route map, dumping points and the waste aggregators.

To capture details of waste generation and its flow, a team of 10 project members accompanied 23 formal primary collection vehicles (Tata Ace, Bolero and Rickshaws) for open plotted colonies of Sushant Lok, South City 1, Sec 45, Kanhai and Silokhra Village in the ward. This mapped the waste quantity and waste flow of these areas. Physical audits were carried out for multistorey apartments, commercial buildings and open markets. This exercise was carried for 10 days to get a fair estimation of the average waste generated per day.

The following were the key findings:
- 88% units in the ward are residential; remaining are commercial, open markets, schools and hotels
- The ward generates approximately 55 tonnes of waste per day.
- For areas apart from the condominiums, less than 5% of the residents were aware of source segregation however, less than 1% practised it.
- For the condominiums, 15 out of the 64, were practising source segregation of waste.
- Considering the demography of the ward, people generally don't burn waste as a waste disposal practice. However dumping waste in open areas/plots was a practice, specially for areas where waste collection was not regular.
- While door to door collection existed, there were gaps in the vehicle design and its frequency. This was mostly observed for open layout plotted colonies of the ward.
- Approximately 50% of the motorised collection vehicles were colour coded in blue and green for collection of segregated waste. However, waste was collected in mixed manner.
- Erratic collection timings leads to an increase in open dumping, assuming no collection for that particular day.
- The waste collected is taken to 9 informal locations, where the valuable waste is salvaged and sold by the informal waste worker to aggregators. The rest of the waste (basically mixed waste of organic and rejects) is taken to transfer stations or Khatas (temporary dumpsites) from where it is taken to the landfill by EcoGreen. The logistic costs for dropping the waste to the transfer station or Khata is borned by the waste worker.
- On an average, the recovery rate was 25% which includes 3.5 MTPD of wet waste composted by 15 condominiums.
- The urban villages do not have door to door collection of waste. The condominiums and commercials have their own staff doing door to door collection. There are 31 number of waste collectors working in ward 32 for primary collection(i.e. door to door collection) majorly for open layout colonies.

Figure 13 : Poster for plog run

Figure 14: Wall Art at Vasant Kunj Dhalao

5.5 Implementing the Program Objectives

a) *Improving Awareness on Source Segregation of Waste*

Information, Education and Communication (IEC) played a major role in behaviour change and lays the foundation of a waste management system. The program adopted and undertook a variety of IEC activities ranging from audio-visual to print and social media/digital media to change the behaviour of different segments of stakeholder; residents, hotel and restaurants, commercial establishments and market units. A brief description of some of the novel IEC measures taken up for behavioural change are described below

- Development of interesting, engaging and informative IEC content with attractive colours in form of posters, banners, standees, car stickers, badges. Wall art and street arts at various prominent places in the ward were also used as a medium of communication.

- Puppet show and segregation games were useful and relevant for institutions and public events

- Organising public events on World Environment day, Earth Day, community engagement events such as cleanliness drives, Plogrun, Art competition (also organised on-line during COVID19/lockdowns) and events during festivals (Balveer Divas, Holi, Diwali) helped spread awareness.. These events engaged the participants through games and quizzes on the topic of sustainability with a clear callout for individual action on source segregation. A total of 67 such events were organised.

- Compost distribution initiatives (Compost Mela, stalls at parks in residential colonies, Thela Mela and door-to-door distribution of compost) had an outstanding impact as a behaviour change tool. It worked as a catalyst for transforming the behaviour/perspective of community towards waste. Seeing and feeling the results of source segregation was very motivating for them. A total of 21 such compost distribution events were organised. In total, 1,470 kgs of compost was distributed with each household getting approximately 1.5 kgs of compost.

- Another effective tool was the 'Community-Centric' meet where the citizens were motivated through frequent and focused meetings, stakeholder wise customised training (in local languages) and formation of Whatsapp groups to share information. A total of 4,923 volunteers, housekeeping staff and formal waste collectors were trained through 134 formal training sessions.

- InterPersonal Communication which essentially means door to door awareness. The team visited each POG to explain why and how of source segregation and handed over a pamphlet on waste segregation guidelines, spending 10-15 min per POG. In addition, the team regularly monitored the POGs on the segregation levels providing feedback for an average of 6 months, to ensure 80% plus segregation levels. This, although is the most time and manpower consuming activity, is the most effective tool and a 'must' for achieving the goal for any type of stakeholder.

- For the waste workers community, 9 formal trainings were conducted on how to improve source segregation, resource recovery, importance of personal hygiene and use of PPE. In addition, 6 events were organised to enrol the waste workers on the e-shram portal, bank account opening and health check-up camps. Movie nights were organised that further helped in building trust and support from them.

By the end of the program, over a period of 2.5 years, 85% of the ward was made aware of source segregation on waste out of which 80% started the practice of source segregation.

b) Streamlined Door-to-door Collection and Transportation

Waste collection methods followed in the ward are:

Figure 15: Put up IEC material in open markets

1. **Primary collection:** condominiums and gated colonies have internal housekeeping staff. The primary (i.e. door to door) collection is done by their housekeeping staff. The waste is stored in common points for secondary collection.

   For the open layout plotted colonies, the primary collection is done by formal waste workers (recognized by EcoGreen, the concessionaire) and or by informal waste workers. In this case, waste is taken directly to the sorting centers, hence there is no secondary collection.

2. **Secondary collection:** This is applicable to condominiums, commercial buildings and markets. Waste is collected from one common point by informal and formal waste collectors and taken to the sorting centers.

To streamline the collection and transportation system, there were two interventions made

1. **Improving vehicle design for collection of segregated waste:** based on the findings of baseline assessment, the design of collection infrastructure was modified in accordance with three way segregated waste collection. The vehicle designes were customised as per the locality they picked waste from, as listed below:

For the open plotted layout residential colonies, the following changes were made in the vehicle used for collection:

● Motorised vehicles were partitioned into a 30:70 capacity ratio for the collection of biodegradable and non-biodegradable waste in a segregated manner and a bag/box was placed at the rear of these vehicles for the collection of domestic hazardous waste. In specific areas, a 250 L drum was kept to collect the biodegradable waste which eased unloading at the composting site.

● Segregated waste collection in rickshaws was ensured by providing jumbo storage bags. In the luggage area, were placed a 100-litre drum, a jumbo bag and a gunny bag, facilitating a three-way collection process within the rickshaw.

For Commercials and Open market: A separate drum was placed in the motorised vehicles for the biodegradable waste.

Figure 16: Alag Karo Plogrun Event

Figure 17: Alag Karo puppet show

For Condominiums, the guideline built during Alag karo Phase 1 were continued to be implemented. This guideline is accessible here: https://www.alagkaro.com/images/resources/case_studies_and_reports/implementing_source_segregation_in_residential_communities_alag_karo.pdf.

2. **Improving collection frequency:** To ensure regularity in waste collection, the drivers and waste workers were trained on the importance of systematic waste collection in terms of regularity and fixed timing. They were also trained to do monitoring and provide feedback to the residents to improve segregation levels. Saahas's on-ground team accompanied the vehicles for on ground training of the waste collectors. This helped in better interactions with the residents and also helped in gaining the trust of the waste workers.

In the beginning, collection time increased due to collection of segregated waste and providing feedback to the residents which was not acceptable to the waste workers. However, soon they realised that although collection times increased initially, eventually, when residents became accustomed to it, it was reduced. Moreover, they also realised that segregating waste at source and keeping it segregated till it reaches their sorting center, reduces their sorting time and at the same time improves the quality of dry waste which results in better revenues. Further, keeping the domestic hazardous waste separate, the waste workers realised the reductions in cuts and injuries.

3. Streamlining the collection process and improving the vehicle design to ensure collection in a segregated manner played a major role towards onboarding the community. As they say 'seeing is believing', the modified infrastructure and segregation levels positively impacted citizen's behaviour and motivated them to continue segregating their waste.

Figure 18: Alag Karo Art Exhibition on World Environment Day 2023

c) Monitoring and Feedback : A Nudge Mechanism to Strengthen Behaviour Change

Streamlining of collection and transportation coupled with daily monitoring of segregation levels helps in sustaining behaviour change. The primary responsibility for the monitoring resides with the collection person.

Figure 19: Monitoring of source segregation using IT tool by a waste worker

The collection staff was accompanied and assisted by Saahas's team members on the field where daily reporting sheets were used (the baseline mapping helped in getting the PoG data in place) and a feedback system was established for both compliant (appreciating their efforts by words or distributing compost) and non-compliant households (pinpointing with regard to segregation). This exercise not only built the confidence of the waste collectors but also improved the social connection between a waste generator and the waste collector.

The team also formed WhatsApp groups in different areas with RWA members, community volunteers and collection drivers which helped communicate about segregation status and progress. The waste collectors also shared pictures of mixed waste and a house list of defaulters which the RWA body or community volunteers would address by sending them notices or visiting their homes.

To make the monitoring system more effective in terms of ease of operations and real time data available to stakeholders, an IT tool was developed. The tool captured segregation levels and real time waste collection status. It was developed in such a way that the features were mostly colour-based so that it is easy to understand even for an unskilled waste worker. A lane-based tracking system was implemented to ensure there is no extra time taken by the waste collector for entering data at household level which becomes a deterrent for a waste worker. The IT tool was piloted in two open layout colonies and one condominium in the ward.

d) Waste Processing Facilities - Improving Resource Recovery

To improve resource recovery and minimise the burden on landfills the project focused on enabling waste processing units in the ward for both biodegradable and non biodegardable waste. For non-biodegradable waste, the project facilitated the setting up of 3 Dry Waste Collection Centres (DWCCs), that ensure better resource recovery efficiently.

The various types of waste processing units are as below::

1. Biodegradable Waste

- **In Situ composting in BWGs:** This is applicable to BWGs primarily residential and commercial campuses units, with in-house housekeeping staff and who have space to set up the composting unit. The operations can be handled internally or outsourced to professional agencies. In ward 32, most BWGs outsources the operations to agencies like Balancing Bits and Green Bandhu. In total, there are 29 such plants.

- **Offsite composting units for BWGs:** These are 'offsite' plants set up by the wastepreneurs to provide composting services to those BWGs who do not have space inside their premises. Biodegradable waste of the BWG is pre-processed within the campus and then taken to these offsite facilities for composting. This model reduces the requirement of space within the campus by 70%. There are 12 number of BWGs who have implemented this model.

- **Decentralised community composting Facility:** MCG has set up one community composting plant in the ward to compost source segregated wet waste from non bulk producers. This plant handles 2 tons per day of wet waste.

- **Home composting:** Home composting was encouraged as this is the most decentralised and lowest carbon footprint method of managing wet waste. There are approximately 150 homes composting in the ward.

- **Biogas:** Biogas is an alternative to composting solution, having the benefits of lower space requirements and better value of end products (i.e. biogas and fertiliser). Two residential bulk waste generators are processing their biodegradable waste through a biogas system. Approximately 900 kgs of segregated biodegradable waste is processed on a daily basis from two societies in ward 32, The Suncity and Orchid Garden.

During the project period, in ward 32, a total of 13.5 tonnes biodegradable waste was being processed on daily basis through composting and biogas systems spread across 44 condominiums, 9 commercial units, 4 plotted colonies.

2. Non-biodegradable Waste

All the collected non-biodegradable waste in the ward either goes to a decentralised facility or to a waste worker colony where it is further sorted into various categories and sold to aggregators or recyclers.

The program provided infrastructure and technical support to these decentralised facilities set up in the ward. Care was taken not to displace any waste worker but to integrate them in the system by setting up formal DWCC centers, and provide better working conditions.

- **Decentralized Dry Waste Collection Centres (DWCC):** There were three formal dry waste collection centres setup in the ward. These are - (i)DWCC was set up by RWA of C block, Sushant Lok, Gurugram which handles upto 3 tonnes per day, (ii) centre improved for a informal waste worker Pradeep Kumar working in Wazirabad, a village adjacent to ward 32 which handles 6 tonnes per day and (iii) equipment support to informal waste workers working in Sector 44 decentralised site set up by MCG, which handles approximately 15 tonnes a day. The facilities are equipped with a hydraulic baler and 30 ft long conveyor belt. On an average, 12 MT of non-biodegradable waste is processed daily across these 3 decentralised units.

- **Waste Worker Colony:** Two major waste worker colonies adjacent to the ward boundary receive the waste from the ward's open layout plotted colonies and villages. Waste collected from condominiums and commercials, is taken to waste worker colonies in Ullawas, Ghata and Wazirabad villages that are at a distance of 1 to 5 kms from the ward.

The dry waste is sorted into 6-8 types (Low-Density Polypropylene (LDP), Multi-layered Plastic (MLP)i, styrofoam, glass, paper, aluminium, mixed paper, cardboard) and sold to aggregators for recycling.

Due to the implementation of segregation at source, the recovery rate of dry waste improved from 25% to 68%. Towards the end of the project, 22 MTs of non- biodegradable waste was recovered on a daily basis.

5.6 Project Impact

Ward 32 generates about **55,000 kgs of waste per day** catering to **33,295 waste generators**. Of these **28,906 PoGs** have been made aware and **23,000 PoGs** achieved segregation level **above 75%**. A total of **35,500 kgs** segregated daily of which **13,500 Kgs** is processed through composting and biogas and **22,000 Kgs** segregated and sorted non-biodegradable waste goes into the recycling value chain.

Ward 32

Waste Generators

Waste Generators
33,295

Made Aware

Made Aware
28,906

Above 75%

Sgergation level Above 75%
23,000

Waste Generated

Waste Generated
55,000 kgs

Segregated

Segregated waste
35,500 kgs

Biodegradable **13,500** kgs per day Composting and Biogas

Non-biodegradable **22,000** kgs per day sorted and sent for recycling
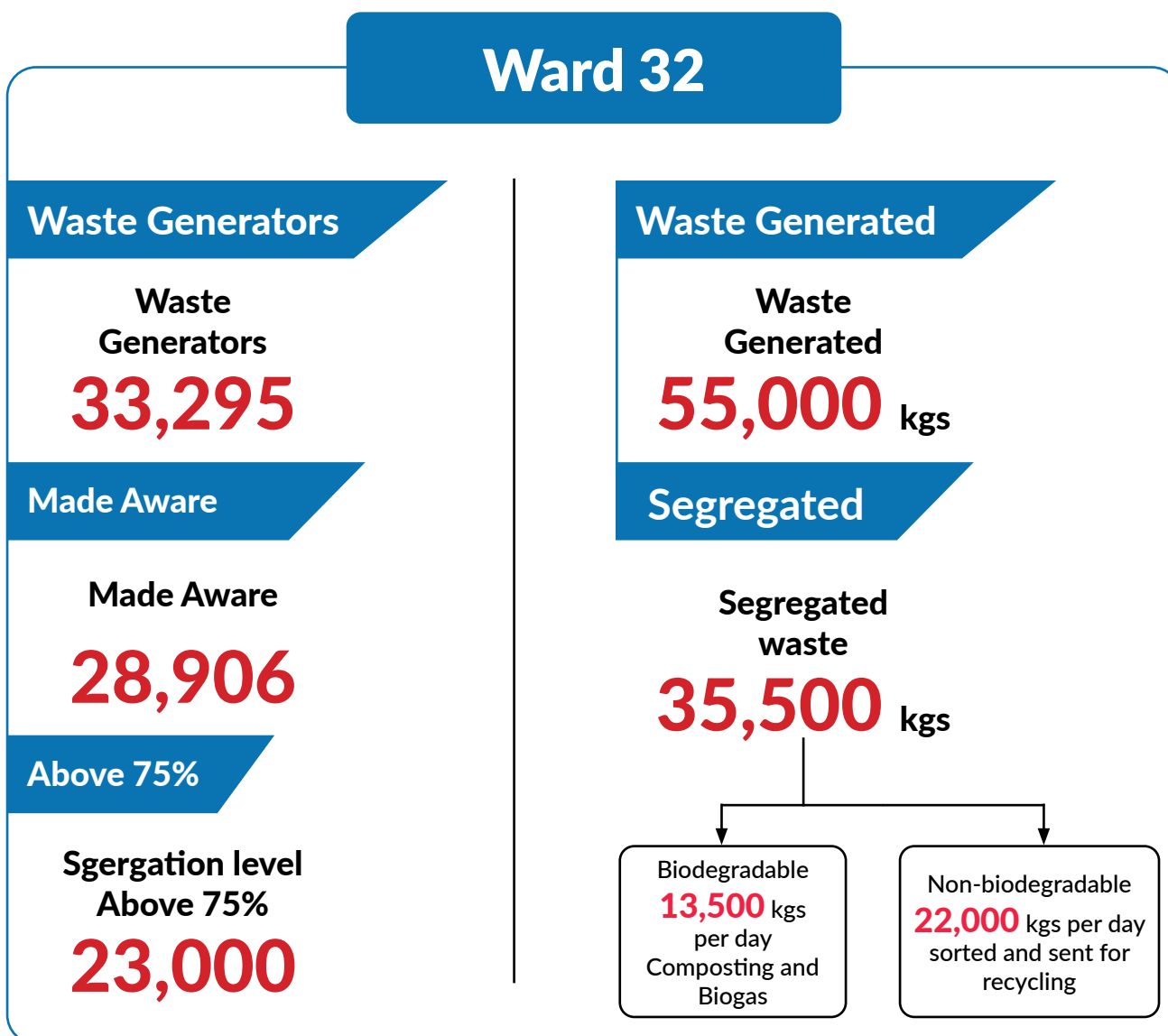
In addition, the the qualitative impact in terms of social, environmental and financial are highlighted in the table below:

Impact	Details
Social Impact	The community is now empowered and more conscious, including citizens, waste workers, housekeeping staff, and house helpers, on 'waste' and role of each stakeholders
	There has been a noticeable uptick in the level of community engagement with regards to waste management initiatives.
	Improved relationships and social acceptance among residents, waste collectors, and waste workers.
	Better community feeling due to cleaner surroundings
	Increase in employment opportunities due to setting up waste processing units
	Decrease in illness incidence due to cleaner surroundings, especially in independent plotted colonies.
	A cleaner surroundings and a reduction in dumping due to better collection services
	Non-biodegradable waste quality improvement has provided dignity and better livelihoods for waste workers. The DWCCs have improved working conditions for over 30 waste workers in the ward.
Environmental Impact	Reduced open dumping due to regular and timely collection improvement.
	Reduction in greenhouse gas due to decentralized composting and biogas plants.
	Reducing in landfill; 35.5 tonnes of daily waste diverted from landfill.
Financial Impact	Source segregation improved the recovery rates of non- biodegradable waste hence improved the revenue generation for waste workers. By the end of the program, the improvement in resource recovery was 68 % as compared to 25% earlier.
	Savings in transportation for waste workers due to less reject waste, going to transfer station
	Savings for the municipality (approximately 3000 per ton) on account of tipping fee and landfill maintenance
	Value generated from compost

WAY FORWARD / RECOMMENDATIONS

1. The demographics of the ward show that almost 85% are residential closed gated RWAs and Commercials. If the municipality strengthens the guidelines to address these BWGs through waste-entrepreneurs as per the SWM Rule 2016, a large amount of the city's waste gets addressed without putting the load on the municipality.

2. The municipality must invest in well operated decentralised waste processing units. When citizens see the process, they are motivated to continue with source segregation.

3. The vehicle design as per the waste generated is critical to ensure citizens continue to practise source segregation.

4. Communication between residents, shopkeepers, other stakeholders in the ward and the waste collectors must be streamlined and strengthened. Cohesive engagements between both the 'parties', i.e the waste producer and the waste collector will ensure sustained segregation. Not only does this motivate the citizens to segregate their waste but also facilitates a commitment from the waste collector.

5. Community frontrunners must be identified and their contribution must be considered in strengthening and sustaining segregation and monitoring activities.

6. Local challenges faced by the community must be identified and reviewed on a timely basis. Since behavioural change is a foundation for source segregation, listening to and acting upon the community's needs ensures sustained success.

Way Forward

This report suggests an 8-step mantra designed to serve as a guiding framework for ward-level interventions in waste management. The selected ward, Ward 32, has been a successful example of an optimised waste collection system, showcasing the efficient allocation of resources and a feasible model for decentralised waste management. The key insights obtained from this implementation can assist in scaling up the system to operate at the city level, creating a precedent that will contribute significantly to the creation of a circular economy.

Ward 32 was recognized by the Municipal Corporation of Gurugram (MCG) as an 'Atma-Nirbhar' ward under the Swachh Survekshan Mission of the Government of India.

However, to ensure its long-term sustainability, further attention and focus are required. Therefore, it is imperative to sustain the action in Ward 32 and replicate the lessons learned from Ward 32 across additional wards in Gurugram. By doing so, the city can demonstrate a broader commitment to effective waste management practices.

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