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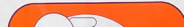
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Recycle



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THE CLEAN OCEANS PROJECT IDENTIFICATION AND PREPARATION (COPIP) PILOT PROJECT REPORT

Separation of Wet and Dry Waste at source in Mvita and Likoni

Financed by



implemented by



KENYA

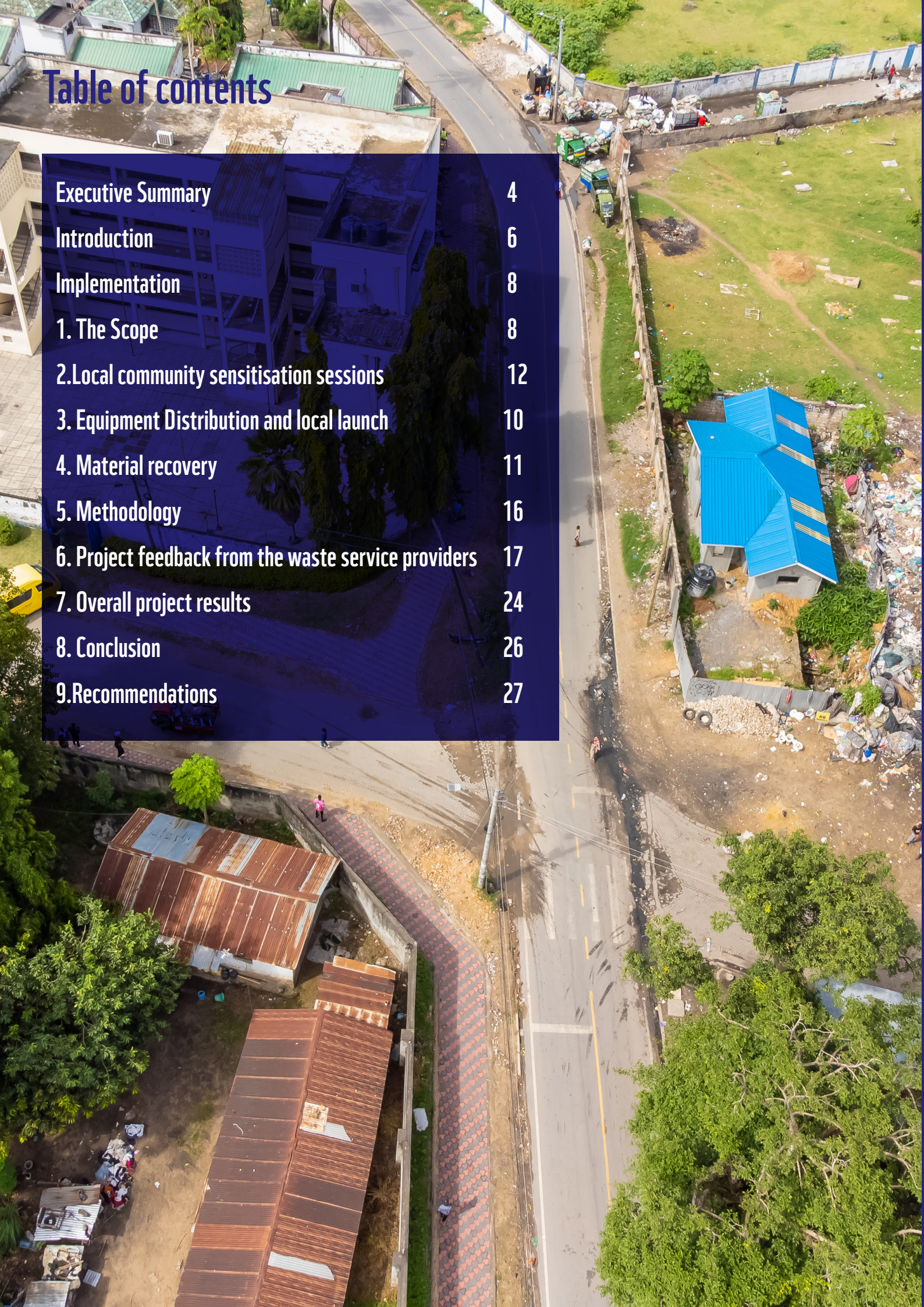


ACRONYMS

CGM	County Government of Mombasa
COPIP	Clean Oceans Project Identification and Preparation
CBD	Central Business District
NEMA	National Environment Management Authority
PAKPRO	Packaging Producer Responsibility Organization
PPE	Personal Protective Equipment
WSP	Waste Service Providers
LWRC	Likoni Waste Recyclers Cooperative
WWF	World Wide Fund for Nature
CHVs	Community Health Volunteers
NTSA	National Transport and Safety Authority
SWD	Segregation of Waste in Wet & Dry
MCA	Members of the County Assembly
CBO	Community Based Organizations
SWMA	Sustainable Waste Management Act 2022
EPR	Extended Producer Responsibility
MRF	Material Recovery Facility

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Executive Summary

The separation of wet and dry waste at source project, funded by the European Investment Bank under the Clean Oceans Project Identification and Preparation initiative, aimed to address critical waste management challenges in Kenya. The primary objectives of the project was to test segregation of waste at the source, enhance the capacity of waste managers, establish market linkages for recyclable materials, and ensure continuous monitoring and evaluation of the processes. The scope for the project was Mombasa County covering Likoni Sub County, known for its informal settlements and unmanaged illegal waste dumping sites with middle to low income levels and Mvita sub county, characterized by dense settlements and the Mombasa's Central Business District (CBD) with high to middle level of income population, these two areas provided contrasting environments to evaluate the effectiveness of source separation of waste model. The project stakeholders included 6 waste service providers, the county government of Mombasa and local administrative structures like the Nyumba Kumi, National Environmental Management Authority and 800 households.

The project implementation involved project inception, needs assessment, procurement of the segregation materials, sensitization of the household through local theaters, data collection and documentation of separation of wet and dry waste at source. In the project inception stakeholders were informed about the project six waste service providers were identified (Likoni Waste Recycler cooperative and Muungano Wa Old Town CBO) community based waste collection company (Final Enterprise Ltd, Go Green Waste Collectors, Dessmi Ltd and Virgin Waste Management Company) private companies operating in Mvita. The need assessment was carried out in partnership with the county government of Mombasa officials and the waste service providers identified and mapped the piloted household whereby there was a shift from the initial proposal that had 2- bin of wet and dry waste to 3-bin of organic, recyclable and landfill bin for effective waste segregation. The project deployed a local theater for awareness creation that engaged 300 people, photography, videography, and documentation to raise awareness of the new waste management system. Data collection was done on a weekly basis and spot check to monitor the project progress.

The project implementation on active collection took 8 weeks whereby piloted households segregated waste at source using color coded bin liners and bins. The segregated waste was transported separately to aggregators for recyclables, organic sites for organic waste and landfill to the dumpsites in Shonda and Mwakirunge. The findings of the pilot project record a total of 50,396.71 kilograms of waste organic being 50.4%, 24.3% recyclables and 25.3% being landfill waste this indicates that segregation of waste at source has a great potential of reducing the quantity of waste to be transported to the landfill and the cost involved in the waste management. There was a 40-60% success rate of waste segregation at source by the piloted households. The weekly monitoring exposed the need for constant sensitization to households that enhanced behavioral change.

The pilot project successfully tested and validated that both households and waste service providers are willing and capable of undertaking waste segregation at source in Likoni and Mvita sub-counties. By improving waste recovery rates, reducing illegal dumping, and enhancing waste collection businesses, the project not only met its objectives but also laid a strong foundation for future waste management initiatives in the region. The positive outcomes observed in this pilot underscore the potential for broader application and scalability of waste segregation at source to other areas facing similar waste management challenges.



Introduction



The pilot project on segregation of waste at source under Clean Oceans Project Identification and Preparation (COPIP) programme was funded by the European Investment Bank and implemented by WWF Kenya. The pilot project promoted waste segregation at source within 800 selected households in Likoni and Mvita sub-counties, in Mombasa. The project vouched for sustainable waste management systems in these communities in line with existing legal frameworks in Kenya and catalyzed the transition to a circular economy that enhanced effective waste management systems and improvement of livelihood. The main stakeholders in this pilot were landlords, tenants, designated waste service providers (collectors), women and youth community waste management groups, the department of solid waste management - County Government of Mombasa (CGM), National Environment Management Authority (NEMA), Packaging Producer Responsibility Organization (PAKPRO) and recyclers.

The project objectives were:

- To test the 3-bin waste collection system in a bid to enhance waste recovery rates and reduce the quantity of waste transported to the dumpsite or illegal dumpsites
- To enhance the business of waste collection and valorization in order to improve livelihoods and create decent jobs
- To document through videography the pilot project for purposes of raising awareness on the 3-bin waste collection system

**The project was
officially launched
28th March 2024**

The SWD project was implemented for 10 months during which inception of the project was done in September 2023, selected waste service providers were taken through the design of the pilot highlighting their key roles as pivotal stakeholders in the project's success. Further, a needs assessment was done in October 2023 to determine the needs of the pilot project including capacity building and equipment support. The project team in collaboration with NEMA and the Department of Solid Waste Management and Environment, County Government of Mombasa designed promotional and awareness creation materials including color coding of waste separation bins, bins designs and the flow of waste from generation to value addition and safe disposal. Contracting and procurement for the local theater was done between November 2023 to March 2024.



The project was launched in March 2024, during the project's graced by His Excellency, Hon Francis Thoya, the Deputy Governor of Mombasa County, the county government reiterated its commitment towards promoting sustainable solid waste management in the city of Mombasa. Immediately after, a series of community sensitization workshops, local theatre and equipment handover activities followed by implementation from May 2024 to July 2024.



Implementation

1.1 The Scope

The pilot project covered 800 households spread in Likoni and Mvita sub-counties with the support of trained waste managers and the local administrative structures such as the Nyumba Kumi elders. Most communities were found to be clustered around 5-25 households. Apartments hosting 15-25 households in Mvita were a common occurrence. Likoni, an informal settlement that lies adjacent to the shoreline, is famously the “gateway” to the South Coast. According to the 2019 National Census, Likoni’s population was 250,358 people and 81,191 households. Ferry services link Likoni/South Coast and the Island. The same year, Mvita’s population was 147,983 people and 38,995 households. For many years, Likoni has experienced unmanaged dumping of solid and liquid waste materials mainly due to unplanned housing structures. The rise of numerous and scattered dumping zones in the informal settlements of Shika-Adabu and Ng’omeni continues unabated. Mvita on the other hand, is largely part of the central business district for the county of Mombasa. However, it is characterized by dense settlements in multi-storey buildings as well as small communes as per the local Swahili culture. Given its proximity to the central business district, the county government prioritizes collection of waste from all its transfer stations through the help of the designated waste managers.



1.2 Stakeholders

The main stakeholders were household owners covering 800 households spread in Likoni and Mvita sub-counties, designated waste service providers (collectors), county government officials under the department of solid waste management and other partners running similar projects in Mombasa. The selected households were provided with segregation bins and bin liners throughout the project. The County government of Mombasa’s Department of Environment and solid waste management played in the need assessment aspect of the project. The National Environment Management Authority ensured compliance by guiding color coding of bins and bin-liners management protocols.

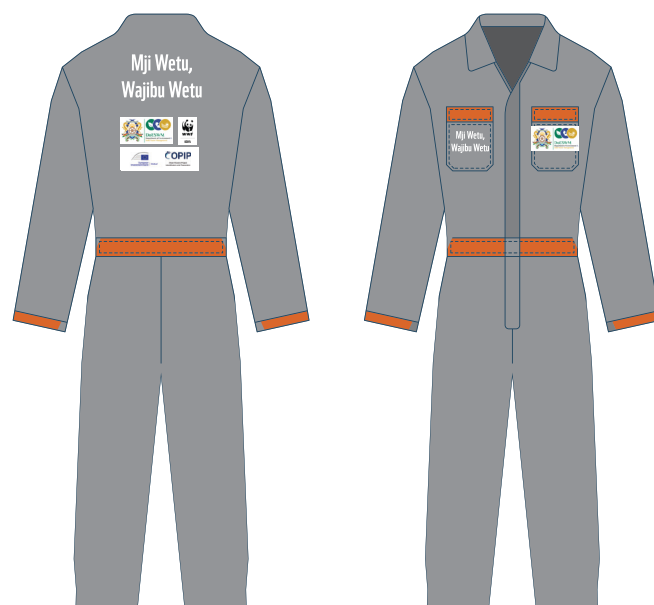
Stakeholder	Roles and Responsibilities
Household Owners	<ul style="list-style-type: none"> -Segregate waste at source and place it in the correct color coded waste bins -Care for the segregation equipment
National Environmental Management Authority (NEMA)	<ul style="list-style-type: none"> - Provision of licenses and ensuring that the project is fully compliant with legislative and constitutional requirements
County Government of Mombasa : Department of Environment and Solid Waste Management	<ul style="list-style-type: none"> - Regulatory guidance, approvals, policy alignment. - Participate in the needs assessment and regular monitoring spot checks
Waste Service providers	<ul style="list-style-type: none"> - Waste collection, transportation, sorting stations - Data collection and reporting - Awareness campaign and sensitization to the household
Kenya Marine and Fisheries Research Institute (KMFRI)	<ul style="list-style-type: none"> -Develop a datasheet for the pilot project on the TakaConnect APP -Train the Waste Service Providers on how to use the TakaConnect App -Maintain and provide data from the TakaConnect APP

1.3 Needs assessment

During the initial stakeholder inception meeting, six Waste Service Providers (WSP), operating in Mvita and Likoni Sub County, were selected to participate in the pilot project. The waste service providers were (Likoni Waste Recycler cooperative and Muungano Wa Old Town CBO) community based waste collection company operating in middle to low income areas (Final Enterprise Ltd, Go Green Waste Collectors, Dessmi Ltd and Virgin Waste Management Company) private companies operating in high to middle income area. These WSPs were assigned key responsibilities, including household mapping, sensitization and awareness creation to the mapped households, equipment deployment for this pilot, data collection and transmittal through the TakaConnect application and waste transportation in a segregated manner. A total of 800 households were mapped in consultation with the waste service providers. The selection criteria was based on demographic and economic levels of the households.

Data was systematically collected to inform the necessary equipment for effective project implementation. This data encompassed the geographic location of each household, the number and type of waste bins needed. Mombasa County's Department of Environment and Solid Waste Management, was pivotal in the project's design and implementation. Further contributions included designing the project framework, co-creation of artwork for Personal Protective Equipment (PPE), branding materials and development of color codes for bins.

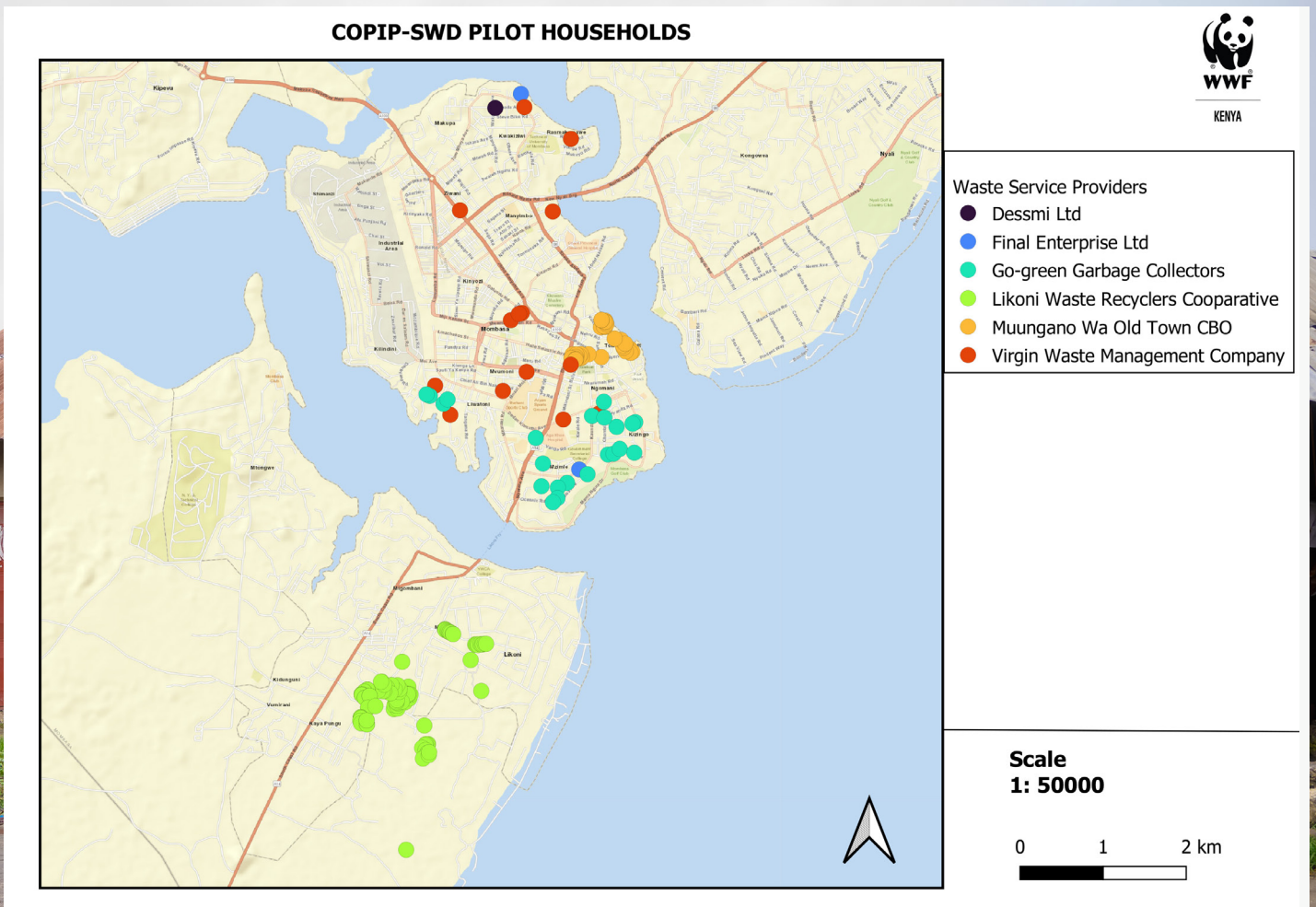
Personal Protective Equipment (PPE) Mockups.



Besides actively participating in the needs assessment and stakeholder engagement workshops, the department supported the project monitoring activities to track implementation. Monthly reports were generated and shared with the county government and the project donor for updates. The project team appreciates the collaborative efforts between the county government and the selected waste service providers registered in this project. An inception report is attached as an annexure.

The County Government of Mombasa officials participated in the needs assessment visits and stakeholder engagement meetings post-assessment. Field visits were carried out to monitor project progress. Monthly reports were generated and shared with the county government to provide updates on the project's advancement. The collaborative efforts between the county government and the selected waste service providers have been pivotal in the initial phases of this pilot project. An inception report was generated during this period below as follows:

Map with the distribution of the sampled household and waste service providers



Sample distribution of households as serviced by the six waste service providers in the pilot in Mvita and Likoni Sub-Counties.

2. Local community sensitization sessions

2.1 Local Theater Sensitization Sessions

The project embraced performing art as an innovative approach for awareness creation. This two-week event focused on sensitizing households in Likoni and Mvita sub-counties on the significance of proper waste segregation practices at the household level. The two shows were held on the 7th and the 9th of March, 2024 in Majengo social hall, Mvita Constituency and Timbwani in Likoni Constituency respectively. A total of 300 local community members were reached through this performance (120 Majengo and 180 Likoni). The local community leadership fully supported the initiative as evidenced by representation from the office of the MCA of Mvita and Sauti ya Wanawake, area Chief, Assistant Chief and Ward Administrator.

The WWF-Kenya team was on standby to clarify any points of concern that emanated from the audience. Through this platform, community members expressed their opinion and experiences on waste management, including laws and regulations. They were also sensitized against open burning of waste, which is a common practice in Mombasa neighbourhoods. This methodology worked well for areas within informal settlements since community mobilization is easier. Notable feedback from the community members included house versus bin sizes. It was reported that some house sizes were small to accommodate all the bins. However, majority of community members felt that the separation of waste at source was a game changer in waste handling within their neighborhood. Feedback like this continually informed adaptive management for effective project implementation within the informal areas of Likoni.



2.1.2 Household sensitization sessions

In the formal settlement areas, sensitization initiatives used a multi-faceted approach. The approach incorporated apartment meetings, WhatsApp groups, and personalized door-to-door calls to ensure effective communication. Apartment meetings served as interactive sessions where residents learnt the importance of waste segregation directly from experts, while dedicated WhatsApp groups facilitated ongoing communication, allowing residents to ask questions, receive communications and updates. Personalized door-to-door visits ensured every resident received direct information while grievances and concerns addressed spot on.

Waste service providers and county government officials played a crucial role in leading the initiative, adding credibility and authority by being actively present during meetings and visits. The project also involved the distribution of more than 800 informational fliers to households. These fliers included contact information for the waste service provider company, ensuring residents reached out for further assistance. This multi-faceted approach effectively informed and engaged a wide range of residents, fostering community responsibility and collaboration. The visible involvement of official bodies emphasized the importance of the initiative and encouraged compliance, making the project a comprehensive and effective educational campaign on waste segregation.



3. Equipment Distribution and local launch

The project provided a total of 378 color-coded waste bins. The bin capacity was 100 liters (276 bins) that was issued to stand-alone households in middle to high-income areas and swahili rental houses in low to middle income areas. Additionally, 200 liters capacity (102 bins) were issued to apartments and commercial areas with enough space for larger bins. The project also leveraged on the already existing infrastructure by labeling existing bins in the apartments. For effective transportation of waste in a segregated manner, the project procured tricycles. The project deployed 2 electric and 3 petrol powered tricycles to test out the effectiveness of clean mobility options. The tricycles facilitated separate transportation of waste from the household to material recovery points for both organic and recyclables fractions. Upon comprehensive consideration during the needs assessment and the inception phase, the project in consultation with the WSPs acquired and distributed color-coded bin liners that were distributed based on the established frequency of collection. The two additional bin liners supplemented the one-liner usually provided by the waste service providers. This ensured that segregation of waste at source was fully supported, given the fact that the primary item for separation was the bin liners in households that did not receive physical bins. Waste service providers successfully distributed color coded waste bins and bin liners to all the selected **800** households participating in the pilot by April 15th, 2024. The color codes used were as follows:

Green – Recyclable waste.

Black – Compost/organic waste.

Orange – Landfill waste.

In order to influence the adoption of this waste management model from the Mombasa County top leadership team, a set of three bins were distributed to the residences of the County Governor and the Deputy Governor. A waste service provider within the pilot was assigned to service the bins.



4. Material recovery

To effectively recover materials from the collected waste, each separated waste fraction was collected and transported separately to a material recovery facility. Organic waste collected through this pilot within Mvita sub-county was taken to a composting facility managed by Virgin waste near Mwakirunge dumpsite. During the project period a total of 25,401.84 kilograms of organic waste were collected. Most of the organic waste collected in Mvita was taken to an organic site operated by Virgin Waste Management, one of the WSP participating in the project. The project purchased a shredder to assist this organic waste management site in its operations. There was a challenge in organic waste management in Likoni due to scarcity of land, it was quite a challenge to establish a composting facility within the short period of this pilot. However, plans are underway to collaborate with the Likoni Waste Recyclers cooperative and an organic waste management company known as BioBuu to deploy an innovative solution for organic waste management using Black Soldier Fly. WWF-Kenya will leverage the existing memorandum of understanding with BioBuu to develop organic waste management technology in Likoni. This engagement will continue post the pilot period, for sustainability.

On the other hand dry recyclable waste collected was sold to recyclers such as Mr Green Africa, Jil Industries and Baus Taka in Mvita sub-county and to Likoni Recyclers Cooperative in Likoni. A total of 12,254.45 kilograms of dry recyclables was collected during this pilot period. Likoni waste recyclers cooperative has a mini-material recovery facility that has been established through a framework of collaboration among partners in Mombasa comprising the County Government of Mombasa, Young Women Christian Association, Hand in Hand Eastern Africa and WWF-Kenya. The construction phase of the site is almost complete with minor final works that should not impede material processing that involve crushing and bailing plastic waste.

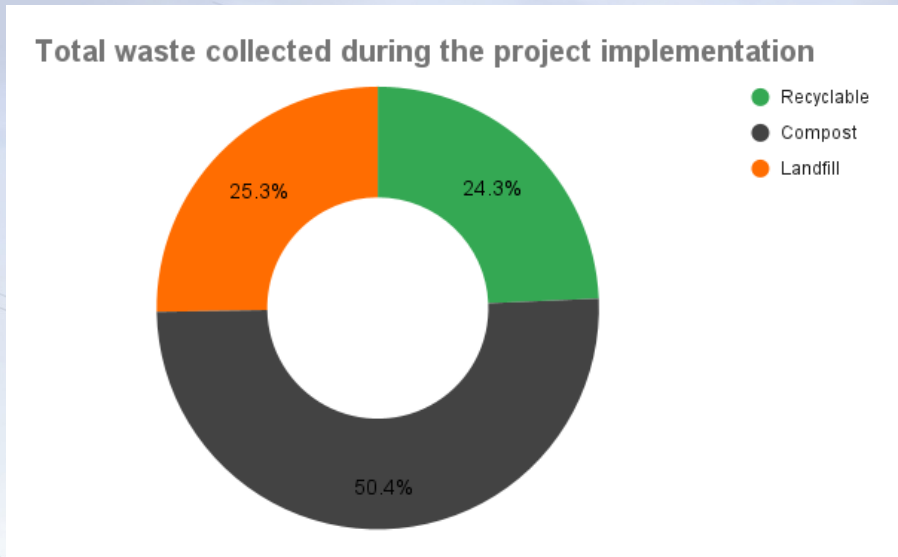


5. Methodology

The project used both qualitative and quantitative methods to record data at inception, implementation and close-out phases. For quantitative data, waste service providers recorded the volume of different types of waste collected, using the TakaConnect application on mobile phones and provided data sheets for each waste service provider company. Qualitative data was gathered through videos, pictures, and interviews with key stakeholders. The collected data was analyzed weekly, with the results presented in tables and charts to track the project's progress. This comprehensive documentation process ensured thorough monitoring and provided valuable insights throughout the project. Integrating technology on data collection in the project recorded a 50% success whereby out of the 6 companies 3 managed to use the application for data collection. A central data collection center makes it easy for data analysis.

Table of collected data during the project implementation

Type of waste collected	Recyclable	Compost	Landfill
Kilograms	12,254.45	25,401.84	12,740.43
Total			50,396.71



5. Project feedback from the waste service providers



(a) Likoni Waste Recyclers Cooperative (LWRC)

LWRC conducted a community launch on 8th April 2024 at the Approved area in Likoni. The community launch served as an awareness and sensitization event on waste segregation at source. The launch was graced by local leaders such as Area MCA, Area Chief and Village Elders. In attendance were representatives from WWF Kenya, the Public Health Office and the community. 300 households were targeted for the pilot project.

Collection schedule: The cooperative collected segregated waste twice a week (Wednesday and Saturdays) for households serviced by Approved and Gurufu and on Saturday or Sunday for households serviced by Boresha, Mwananguvuze and Safisha Timbwani groups.

Economic status of the households: Middle to low income level whereby the households have a low willingness to pay for waste collection within their areas since waste management is not viewed as a priority by the household.

Short-term impact:

The project improved LWRC's community reputation as a decent and trustworthy waste collection services provider, unlike before when they were regarded as junkies (locally known as mateja) or people who have lost focus in the community. Members from LWRC recorded increased incomes by more than 50%. This is partly because their clients were willing to pay for waste service management. Before the pilot project, LWRC charged Kes 20 per collection per household; During the project implementation, LWRC charged between Kes 150 to Kes 200 per household per month. As aggregators and recyclers of waste materials, they got uncontaminated recyclables fetching a better price from buyers. The amount of recyclables increased rapidly as compared to before the COPIP pilot project.



Challenges:

A few households were found to mix waste even after sensitization and awareness creation campaigns. By the 6th week into the pilot project, only 80% of the households had managed to segregate their waste properly. LWRC recommended continued awareness creation and support to ensure all households shifted to separation of waste. Further the cooperative suggested some sort of modification of electric tricycles for efficient operation in waste management tasks. Transporting collected separate waste together in one trip sends the wrong message that the waste will eventually be mixed as is the current status. This was feedback from the households



Adaptive Management

LWRC continuous sensitization households participating in this pilot. Waste Collection groups were emphasized on collection of the waste in a segregated way as well as transportation of different waste streams at different times or days.





(b) Go-green Garbage Collectors

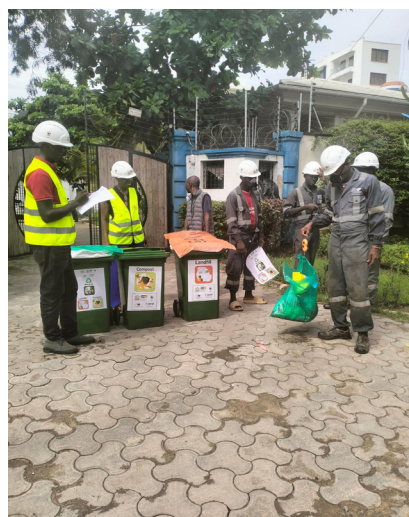
The company had 100 sampled households participating in the pilot project that were stand alone households and apartments within Mvita Subcounty. Waste from the piloted households is collected separately and transported in a segregated manner to the material recovery sites, local aggregators for recyclables and Virgin Waste Company Organic Waste recycling site. Landfill waste was transported to the landfill in Mwakirunge.

Collection schedule: Waste collection done twice a week on Tuesday and Thursday

Economic status of the households: High to middle income levels households whereby households have contracted the company for waste collection services. The households purchase one bin liner from the waste collection company that is part of the collection fee paid the collection fee which is determined by the company based on the quantity of the waste generated by the household monthly.



Household waste collection in Kizingo, Mombasa.



Success factors:

Witnessed willingness from clients to cooperate in separation of waste at source albeit lack of consistency prompting constant sensitization efforts. Increased value of recyclable materials recovered through waste segregation.



Challenges:

Delayed acquisition of the electric tuk tuk inspection report impeded separate transportation of the collected waste necessitating use of alternative transportation in some cases. Organic waste transportation complications due to lack of coordinated communication with the other waste service providers in Mvita.

As a recommendation Go-Green emphasized the need for enhanced awareness and possible value addition for non-recyclable waste and market linkage for compost manure.



(c) Muungano Wa Old Town Community Based Organization

The CBO had sampled 100 households participating in the pilot project that are majorly in a swahili-house with one house containing an average of 5-10 households and 5 commercial entities that are small businesses serviced by the CBO. The location of the households are within the Old Town area. Waste was sorted at the household level using bin liners and a suck provided by the group to the household. The bins were shared among households due to the limited space available for placement of the three bins in one household.

Collection schedule: Piloted households grouped into seven zones; each zone led by a Nyumba Kumi leader and the Community Health Volunteers (CHVs). Waste collection was done twice a week on Tuesday and Friday.

Economic status of the households: Middle to low income level with a low willingness to pay for waste collection services. Based on the location, the household can easily access the transfer station set by the county government, therefore preferring to transport their own waste to the transfer station.

Success factors: The CBO received significant community support. Additionally, previous training on waste segregation helped CBO members pass the message to their target clients. Availability of initial equipment to pilot the project provided a good basis for behavior change.

Flow of waste

Collected waste was taken to a sorting station in Mvita. Some recyclable materials were taken to the recycling center run by the waste service provider while others were sold to local aggregators.



Challenges:

The CBO faced issues with thin and weak liners, weather disruptions, and waste mixing at source. Slow adoption of source separation of waste



Adaptive strategy

The CBO collaborated with the village elders (Nyumba Kumi elders) to broadcast the message on waste separation at source. Advocated for collaboration with relevant authorities for effective waste management.





(d) Virgin Waste Management Company

The company had sampled 100 households in the pilot project that included stand alone households, apartments, gated communities and commercial entities (hotels, schools). Waste collected from the household and the commercial entities was transported separately to the organic recycling site in Mwakirunge and recyclables to the local aggregators.

Collection schedule: Collection was done twice a week on Tuesday and Friday. The collected waste was transported separately to the different recycling sites operated by the company. The household willingness to pay is high since the household and business entities contact the company for waste collection services.

Economic status of the households: High to middle income level households and commercial entities

Short-term impacts.
The company managed to sell recyclables, create jobs at the organic site and utilize organic waste for their Black Soldier Fly Project.

Challenges:
The company experienced slow adoption of source separation of waste by both households and the commercial entities. There was some degree of ignorance from some clients on waste segregation at source. Further the company cites operational and time constraints, along with difficulty in managing medical waste. The company advocated for stringent waste management measures by the government.

Adaptive management:
The company ensured proper labeling of the already existing waste bins and more sensitization on the importance of segregation.





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The company had 100 households to sample in the pilot project that consisted of 1 apartment that had 80 households. The company was also involved in servicing the bins given to the county government officials. The waste was collected segregated from the sampled household, segregation in the household was done in bin liners then placed in the color coded bins in the waste point. The collected waste was transported segregated to local aggregators, organic waste was taken to the organic site and residual was taken to the transfer station.

Collection schedule: Waste collection was conducted twice a week (Tuesday and Friday) while recyclables waste was collected once a week (Friday)

Economic status of the households: Middle to high income level with high willingness to pay for waste collection services they had low interest in investing in the waste segregation equipment such as the bins and the bin liners.

Short term impact: Dessmi limited reported a 60% success rate in waste segregation willingness by the households to segregate waste at source. The company has witnessed cases of improved livelihoods through the sale of recyclables from the household.

Adaptive management
The company continued with the sensitization of the households on waste segregation at source. The company sought to share a transportation tuk tuk with other companies within Mvita as the number plate issuance was fast tracked by the project team and the supplier.
The company coordinated with the organic recycling company on how their waste will be picked and schedule of collection.

Challenges:
The company faced transportation challenges since the tuktuk issued to them did not have the metallic plate. Additionally, high cost of fuel made transportation of organic waste to the Virgin Waste Management organic site in Mwakirunge an uphill task.
Further, the company cited that clients/households were reluctant to purchase the additional black bin liner since the pilot project issued two liners, a complete revelation of lack of awareness in some households. There was also slow adoption of separation of waste at source practice.





(f) Final Enterprise Limited:

The company had 100 households that comprised apartments with an apartment comprising 25- 40 households. The waste collected was transported separately with the recyclables sold by aggregators and the organic waste had to be taken to the organic site in Mwakirunge.

 **Collection schedule:** Collection of waste done twice a week on Tuesday and Friday

Economic status of the households:

High to middle income level households have a high willingness to pay for waste collection service since they have contacted the company to offer the service for them. The collection fee is determined by the company based on the agreement with the apartment and the number of households in the apartment.

Short term impacts

Created jobs for casual waste collectors as an extra source of income through the sale of recyclables.

Observed successful waste segregation in targeted areas and positive responses from households on waste segregation at source

Challenges

Noted challenges with waste segregation consistency and proposed involving more waste service providers for a unified approach. The company experienced problems with the tricycle due delayed acquisition of metallic plates by the supplier. The company also reported slow adoption of source separation of waste

The company had a challenge in transporting the waste to the recycling site due to the cost implication on the company

Adaptive management:

Final enterprise continued to sensitize households on waste segregation at source. The company opted to share transportation tuk tuk with other waste service providers who didn't have problems with their tricycles.

The company coordinated with the organic recycling company on how their waste will be picked and schedule of collection.



Comparison between electric and petrol-powered tricycles under this project.

To ensure that the collected waste was transported separately, the project procured five tricycles shared among the six waste service providers. Two of the tricycles were electric while three were petrol powered. In the original project plan it was envisioned that all tricycles would be electric for the purposes of the pilot. However, due to negative feedback from the waste service providers supported by WWF-Kenya's market survey, it became apparent that in country electric tricycle suppliers and the attendant infrastructure such as service stations and charging ports were not sufficient especially in the informal settings such as Likoni. However, upon further consultation with the project donor, a decision was made to embrace a hybrid model mixing both electric and petrol powered tricycles for this pilot.



Left: Petrol-powered tricycles.



Right: Electric tricycles. Photo | Curtis obimbo WWF-Kenya

During procurement of these tricycles, two of the petrol powered ones didn't not have the metallic number plates. This was due to delays in number plate production and issuance by the National Transport and Safety Authority (NTSA). In the meantime, despite frequent police checks, the tricycles could still operate using the temporal laminated paper plates. On the other hand, the electric tricycles lacked the NTSA inspection report occasioning a few cases of police checks while on transit. The project team liaise with the supplier to have all the tricycle outstanding issues settled.

Feedback from the waste service providers indicate that, besides the above slight challenges, the tricycles have been pivotal in the transportation of separated waste. The electric tricycles have the lowest operational cost since there is minimum to no maintenance cost. Likoni Waste Recycler Cooperative added that with tokens units of Kes 50, the electric tricycles collected twice a week. In contrast, the petrol powered tricycle cost Kes 600 for the similar work. Since the electric tricycle supplier was based in Mombasa town, seeking guidance and a few maintenances issues was spot on. Feedback such as further modification of the electric tricycles to balance the load weight on the equipment came forth. Additionally, it was claimed that the electric tricycles consumed a lot of power when going uphill with load, constraining the users to only flat areas in order to save power.

The electric tricycles have no environmental impact since they are powered by clean energy as opposed to the petrol driven ones. The units are easy to operate with zero noise pollution.

Key results and discussion

A. Behavioral Change in 40-70% of Households on Waste Segregation at Source

The pilot project effectively prompted a notable behavioral shift in a large number of households, with 40-70% starting to practice waste segregation at the source. This change was vital for the project's success since proper segregation at the household level is essential for efficient waste management. Households began sorting their waste into three bins: compost, recyclables, and landfill materials. For some participants, the separate transportation of waste from households served as an incentive for waste segregation at

C. Integration of technology in data collection and provision of market linkages

Half of the waste service providers incorporated technology into their data collection using the Taka Connect Mobile Application, developed by the Kenya Marine and Fisheries Research Institute. This platform simplified the collection and recording of data for the waste service providers. Additionally, it allowed them to connect with available and potential buyers for the various recyclables recovered from households.

B. Improved Waste Management Within Neighborhoods Where Waste Segregation at Source Was Practiced

In neighborhoods where households practiced waste segregation, overall waste management significantly improved. The separated waste facilitated more efficient collection and processing by waste managers. Recyclable materials were easier to identify and divert from landfills, decreasing the amount of waste transported to dumpsites or illegal dumping areas. This improvement resulted in cleaner neighborhoods, reduced environmental pollution, and more organized waste handling. The success in these areas underscored the direct impact of community participation in waste management initiatives.



D. Community Engagement and Awareness Creation Through Local Theatre and Videography

The project utilized innovative approaches to engage the community and raise awareness about the new waste segregation system. Local theater and videography were effectively employed to educate and motivate residents. Local theater offered a relatable and interactive means of communicating the importance and benefits of waste segregation, making the information more accessible and engaging for diverse audiences. Videography documented the project and its impact, serving as both an awareness tool and a record of progress. These methods fostered a sense of community involvement and ownership, encouraging more households to actively participate in waste segregation.



E. Economic Benefits

The pilot project also showcased substantial economic benefits. Enhanced waste segregation and management practices opened up better business opportunities in waste collection and recycling. Waste collectors discovered that a more systematic approach to collection boosted their efficiency, enabling them to handle more waste in less time and with fewer resources. This increased efficiency led to higher incomes and more stable jobs for those in the waste management sector. Furthermore, the project generated new opportunities in the recycling industry, contributing to local economic growth. The improved livelihoods of waste collectors and the creation of decent jobs highlight the project's significant socio-economic impact.

8. Conclusion

The pilot project has demonstrated substantial success in various areas, leading to significant improvements in both waste management practices and socio-economic conditions within the community. The initiative effectively encouraged households to adopt waste segregation practices through innovative community engagement methods, such as local theater and videography. This heightened awareness and motivation among residents who have played a crucial role in the widespread acceptance and implementation of waste segregation.

As a result of these behavioral changes, overall waste management saw notable enhancements. The practice of waste segregation at the household level has streamlined the collection and processing of waste, significantly reducing the amount of waste directed to landfills and illegal dumping sites. This improvement has not only environmental benefits but also practical advantages for waste management systems.

Economically, the project has had a positive impact by creating better business opportunities in waste collection and recycling. Waste collectors have experienced increased efficiency and higher incomes, leading to more stable employment conditions. Additionally, the initiative has spurred local economic growth by generating new opportunities within the recycling sector.

Technological integration, particularly through the Taka Connect Mobile Application, has further supported the project's goals. This application has enhanced data collection processes and facilitated connections between waste service providers and potential buyers for recyclables, resulting in more organized and efficient waste handling.

Beyond these practical and economic benefits, the project has significantly improved the livelihoods of waste collectors by creating decent jobs. The emphasis on community participation and ownership has been vital to the project's success, highlighting the importance of local involvement in waste management initiatives. Overall, the pilot project has not only achieved its immediate goals but has also demonstrated a broader socio-economic impact, underscoring the value of comprehensive and inclusive waste management strategies.

9. Recommendations

1. Continuation community engagement in the Waste Segregation Efforts with Regular Data Sharing

Sustained engagement with households and community members through education campaigns, workshops, and incentives is highly recommended. These engagements can be complemented by strengthening partnerships with local schools, businesses, and NGOs to promote waste segregation at source and expand outreach. Additionally, the TakaConnect Application is a good platform to ensure centralized information and data collection as well as enhance trade in recyclable materials. The application can also provide functionality for feedback, where community members can provide input on waste segregation efforts, helping to identify areas for improvement.

2. Monitoring of Progress and Collaboration Among Waste Service Providers

The favourable legal provisions at both the national and county governments present a perfect opportunity for the county government of Mombasa to initiate enforcement of source separation, collection and transportation. It is recommended that this enforcement is directed at the waste service providers in order for them to trigger their engagement with their clients and effectively start putting plans on their compliance journey. This enforcement should begin after adequate and effective sensitization and provision of clear timelines for specific milestones by the county government to waste service providers and the residents of Mombasa.

3. Evaluation and Modification of Electric Tuk Tuks for Efficient Operation in Waste Management Tasks

Source separation, collection, transportation and treatment of solid waste is resource intensive. Public financing is therefore not sufficient in the context of Mombasa to fulfill this important basic service. It is therefore recommended, based on the findings of the pilot with 800 households, to conduct a comprehensive feasibility study on how best to leverage both public and private funding to roll out source separation, collection, transportation and treatment at a large scale. Key outputs from the feasibility study include aspects of strong business cases for the private sector to consider investments in the sector, unlocking private sector funding such as extended producer responsibility (EPR) fees and how best to optimize public funding to ensure the capital-intensive costs such as green transportation, material recovery facilities, composting sites, and properly engineered landfills will be established and operationalized.

4. Scaling up and sustainability of waste segregation at source through systems modification and improvement

Non-state actors working in Mombasa on various projects need to be convened by the county governments and encouraged to align their efforts towards promoting waste segregation of waste at source. These organizations have a unique opportunity to build synergies between their various projects that target the same waste service providers across the length and breadth of Mombasa in order to sustain the efforts of the county government of Mombasa. In addition, new projects in the county of Mombasa touching on solid waste management are to be inducted on the vision of ensuring effective source separation, collection and transportation of waste. This pool of ideas will unlock unprecedented resources both technical expertise and financial to scale up efforts towards sustainable waste management in Mombasa, guided by the circular economy principles.



Annexures.

[COPIP Project branding](#)

[Inception Report -COPIP](#)

[Awareness creation brochure.](#)

TakaConnect App back-end data. [Project Data](#)

Project documentary/video- <https://www.youtube.com/@WWF-Kenya/videos>





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