EcoKigali
Resilient Waste & Water Solutions

MONITORING AND EVALUATION FINAL REPORT

MAYORS CHALLENGE PROJECT

Rainwater Harvesting and Smart Solid Waste Management at Busanza and Mpazi neighborhoods

Reporting Period December 2022 – September 2025

Kigali, Rwanda

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EXECUTIVE SUMMARY

The Rainwater Harvesting (RWH) and Smart Waste Management (SWM) Project is a flagship initiative of the City of Kigali, designed to mitigate high water costs and address persistent sanitation service gaps in rapidly urbanizing communities. Implemented in the Mpazi and Busanza Resettlement Sites, the project stands out as one of the winning innovations of the 2021 Global Mayors Challenge. With a total investment of US$1,000,000, the project directly improved the living conditions of 1,354 households comprising 1,260 in Busanza Resettlement Site and 94 in Mpazi Resettlement Site.

The initiative was executed under the leadership of a multidisciplinary team that included a Project Supervisor, Project Engineer, and Monitoring & Evaluation Specialist, ensuring strong professional oversight, efficient coordination, and accountability throughout the implementation period.

The initiative employed an integrated approach, combining Rainwater Harvesting (RWH) and Smart Waste Management (SWM) systems to improve household water access, reduce dependence on municipal supply, and enhance waste segregation and disposal practices. The planned infrastructure included two reservoirs and seven smart waste management stations, all of which were successfully established and brought into operation at the designated sites. This comprehensive strategy was designed to deliver immediate household benefits while fostering long-term improvements in urban water and sanitation management.

The project achieved significant progress in both RWH and SWM interventions. Connectivity targets for RWH were fully met, with 228 households connected at the Busanza Resettlement Site and 94 households at the Mpazi Resettlement Site, demonstrating strong community uptake. Although reductions in WASAC water bills fell short of the targets 23% achieved versus 36% targeted in Busanza, and 24% achieved versus 49% targeted in Mpazi the intervention nonetheless contributed to measurable improvements in household water management.

Outcomes in SWM exceeded expectations: seven solid waste collection and segregation stations were established, with 100% of households in Busanza and 94% in Mpazi adopting proper waste segregation practices, and waste collection was carried out with zero delays. These results were further reinforced by the elimination of fly nuisance, odors, and littering, supported by the installation of smart bins. In addition, resident training in both waste segregation and RWH operation and maintenance surpassed planned targets, reflecting a high level of community engagement.

The interventions proved to be highly effective, relevant, efficient, and sustainable, as they addressed critical community needs in both water access and sanitation. They successfully promoted positive behavioral change while being implemented efficiently despite challenges such as budget limitations and below-average rainfall. Long-term sustainability has been reinforced through strong community engagement, capacity building, and the adoption of best practices in rainwater harvesting and waste management.

To further strengthen impact, regular monitoring and maintenance of RWH systems, household guidance on efficient water use, and continued training programs are recommended. At the policy level, integrating RWH and SWM practices into municipal frameworks, offering incentives for household adoption, and scaling the integrated model to other rapidly urbanizing communities are strongly encouraged. Overall, the project stands as a successful model of integrated water and waste management with strong potential for replication and long-term impact across diverse urban contexts

TABLE OF CONTENTS

Executive Summary....1

Table of Contents....3

Table of Tables....5

Table of Figures....6

List of Abbreviations....7

I. Introduction / Background....1

Ii. Objectives of The Intervention. 1

Iii. Purpose And Scope of Project....2

Iv. Methodology 3

V. Project Indicators 4

Vi. Project Achievement and Key Outcomes 7

Vii. Project Performance and Key Outcomes. 9

Viii. Smart Waste Management 22

Ix. Challenges and Lessons Learned from the Busanza and Mpazi Resettlement Sites Project.... 26

X. Project Handover and City Ownership 28

Xi. Conclusion And Recommendations 28

Annexes.... 31

TABLE OF TABLES

Table 1: Project Hierarchy, Strategic Objectives, and Indicators 4
Table 2: Outputs and Indicators 5
Table 3:List of key performance indicators (KPIs). 5
Table 4: Baseline, targets, and means of verification. 7
Table 5: Monthly Water Consumption and Billing 11
Table 6:Comparison of WASAC and RWH Water Consumption at Busanza Resettlement site.12
Table 7: Monthly Water Consumption and Billing 14
Table 8:WASAC and RWH Water Consumption at Mpazi Resettlement Site 15
Table 9:Comparison of indicator for WASAC and RWH 17
Table 10: Distribution of WASAC and RWH Consumption Busanza Resettlement site. 18
Table 11: Performance Results at Busanza Resettlement Site (June 2025) 19
Table 12: Comparison of WASAC and RWH consumption at Mpazi resettlement site. 20
Table 13:Distribution of WASAC and RWH Consumption Mpazi Resettlement Site, June 202521
Table 14:Comparison of Planned Versus Actual Achievements at Mpazi Resettlement Site.22
Table 15: Waste segregation and delays in waste collection 24
Table 16: Planned vs. Achieved Results in Smart Waste Management 28

TABLE OF FIGURES

Figure 1:Busanza Resettlement Site: WASAC Water Consumption Trends (2022–2025) 11
Figure 2:Mpazi Resettlement Site: WASAC Water Consumption Trends (2022–2025) 15
Figure 3: Distribution of WASAC and RWH Consumption Busanza Resettlement Site. 18
Figure 4:Distribution of WASAC and RWH Consumption Mpazi Resettlement Site 21
Figure 5:Busanza and Mpazi resettlement sites waste segregation trend 26

LIST OF ABBREVIATIONS

M&E: Monitoring and Evaluation

WASAC: Water and Sanitation Corporation

RWH: Rainwater Harvesting

SMS: Short Message Service

SWM: Solid Waste Management

UNDP: United Nations Development Programme

UN SDG: United Nations Sustainable Development Goals

1. BACKGROUND

The Rainwater Harvesting and Smart Waste Management Project is a flagship initiative of the City of Kigali, implemented between December 2022 and September 2025 in the Mpazi and Busanza Resettlement Sites. As one of the winners of the 2021 Global Mayors Challenge, the project was funded by Bloomberg Philanthropies and delivered in partnership with the UN SDG Action Campaign and UNDP, with technical support from Delivery Associates.

With a total budget of US$1,000,000, the project directly benefited 1,354 households, comprising 1,260 in the Busanza Resettlement Site and 94 in the Mpazi Resettlement Site, and was implemented by a dedicated team comprising a Project Supervisor, Project Engineer, and Monitoring & Evaluation Specialist. The initiative sought to address the high cost of water and persistent sanitation service gaps in rapidly urbanizing communities through an integrated approach that combined Rainwater Harvesting (RWH) and Smart Solid Waste Management (SWM) systems. At its outset, the project targeted the construction of two reservoirs and seven smart waste management stations, all of which were successfully developed and operationalized as sustainable solutions within the designated sites.

2. OBJECTIVES OF THE INTERVENTION.

The intervention aimed to improve water access and sanitation in rapidly urbanizing communities by reducing household water costs and addressing persistent waste management challenges.

2.1 Project Objectives

The Rainwater Harvesting and Smart Waste Management Project aimed to enhance living conditions in rapidly urbanizing communities by improving solid waste management services through the promotion of household-level segregation and efficient collection systems. It sought to increase access to affordable and sustainable water sources by implementing rainwater harvesting infrastructure, while also fostering sustainable behavior change in water conservation, hygiene, and waste management practices. Through these combined efforts, the project endeavored to ensure long-term community ownership, engagement, and lasting impact.

2.2. Project Key Interventions

To achieve its objectives, the project implemented several key interventions. It strengthened solid waste management by distributing household waste segregation

bins and establishing community waste collection stations, thereby improving service coverage and operational efficiency. It also expanded access to affordable water through the construction of two underground rainwater harvesting (RWH) tanks, providing households with alternative and sustainable water sources. In addition, the project promoted sustainable behavior change by engaging communities in awareness-raising campaigns and capacity-building activities focused on water conservation, hygiene, and effective waste management practices.

3. PURPOSE AND SCOPE OF PROJECT

3.1 Purpose of the Project

The Rainwater Harvesting and Smart Waste Management Project was designed to address the dual challenges of high water costs and persistent sanitation service gaps in rapidly urbanizing areas of Kigali. Its primary aim was to provide affordable, sustainable, and community-driven solutions for water access and solid waste management. By combining innovative infrastructure with behavior-change strategies, the project aimed to enhance household well-being, alleviate the financial burden of water bills, improve environmental health, and contribute to the city's progress toward achieving the Sustainable Development Goals (SDGs). Through this integrated approach, the initiative not only addressed immediate community needs but also promoted long-term sustainability and urban resilience.

3.2 Scope of the Project

The project was implemented between December 2022 and September 2025 at two priority sites: The Mpazi Resettlement Site and the Busanza Resettlement Site, directly benefiting 1,354 households, 1,260 in Busanza Resettlement Site and 94 in Mpazi Resettlement Site. With a total budget of US$1,000,000, the project's scope encompassed several key activities. These included the design and construction of infrastructure, comprising two underground rainwater harvesting tanks and seven smart waste management stations; the distribution of household-level facilities, including waste segregation bins; and community engagement and behavior change initiatives, such as awareness-raising and capacity-building campaigns focused on water conservation, hygiene, and proper waste management practices.

4. METHODOLOGY

The Rainwater Harvesting (RWH) and Smart Solid Waste Management (SWM) Project was structured around six interrelated workstreams to ensure systematic planning,

implementation, monitoring, and the sustainability of project outcomes. The initial phase involved comprehensive assessments and design work, including a socio-economic needs assessment to establish baseline data and understand community priorities. Detailed designs for both the smart SWM system and RWH facilities were developed, tailored to the specific contexts of Mpazi Resettlement Site and Busanza Resettlement Site. A mid-term monitoring and evaluation (M&E) assessment was conducted to track progress and inform adaptive project management. Data collection during this phase employed household surveys, key informant interviews, and observational checklists, targeting representative households across the project sites to ensure reliable and actionable insights.

During the implementation phase, SWM and RWH infrastructure were constructed by specialized contractors. In SWM, waste bins and shelters were installed at Mpazi Resettlement Site and Busanza Resettlement Site, followed by the establishment of a sensor-based SMS monitoring system and designation of local focal persons to record bio-waste and non-bio-waste collection. For RWH, households were connected to

Underground reservoirs, and data on water usage, harvested volumes, and commercial water bills were systematically recorded. Data collection tools included digital logs, monitoring forms, and sensor-generated SMS alerts, enabling accurate and timely tracking of both waste management and water harvesting performance. Purposive sampling targeted households directly linked to the interventions, as well as community focal points responsible for operational reporting.

Several challenges and limitations were encountered during data collection. These included inconsistent participation from some households, occasional sensor malfunctions in the SWM monitoring system, and variability in rainfall, which affected water harvesting measurements. Despite these challenges, the combination of structured assessments, monitoring tools, community engagement, and targeted sampling ensured the generation of robust and actionable data to inform project implementation, adaptive management, and the long-term sustainability of project outcomes.

5. PROJECT INDICATORS

The project's indicators track progress and impact, including the number of households with rainwater tanks, the percentage practicing proper waste segregation, reductions in monthly water bills, improved access to safe water, enhanced sanitation services, and adoption of sustainable water and waste management behaviors. The specific objectives and corresponding indicators for this project are detailed below, outlining

how each goal is monitored and evaluated to ensure successful implementation and measurable impact.

5.1 Logical framework (Log frame) / results framework.

Table 1: Project Hierarchy, Strategic Objectives, and Indicators

Project Hierarchy	Strategic Objectives	Indicators	Source and Means of Verification
Goal	Improved access to sustainable water and efficient waste management in the Mpazi and Busanza Resettlement Site communities.	• Number of households with access to RWH • % of water bill reduction- Reductions in monthly water consumption • Access to improved sanitation services • % of households practicing proper waste segregation	Project reports / M&E reports, Endline survey
Outcome 1	Enhanced solid waste management services	• Number of waste bins and shelters installed with sensors • Number of residents using Waste collection facilities • Number and % of households utilizing the collection stations and segregating waste • Number of days of delay in waste collection	Monitoring reports, SMS sensor reports, and Community focal points reports
Outcome 2	Increased access to affordable and sustainable water	• Number of households connected to RWH • Volume of rainwater harvested (m^3) • Reduction in commercial water bills	RWH monitoring reports, WASAC data reports
Outcome 3	Improved community knowledge and practices in water conservation and waste management	• Number of training courses conducted • Number of participants trained	Training attendance lists, Community meeting attendance lists, Observation checklists

Table 2: Outputs and Indicators

Outputs	Indicators	Source and Means of Verification
1. Smart SWM infrastructure constructed	• Number of waste stations at both sites • Number of household waste bins distributed	Construction completion reports, Site visits
2. RWH facilities constructed	• Number of reservoir tanks constructed and operational • Number of households connected to the RWH system	Construction reports, Site inspections
3. Monitoring and data collection system operational	• SMS sensors are functional • Regular reporting of waste collection and water usage	M&E reports, Sensor data logs
4. Community trainings delivered	• Number of SWM and RWH training sessions conducted	Training reports

• Participant attendance recorded

5.2 List of key performance indicators (KPIs).

Table 3:List of key performance indicators (KPIs).

KPI	Description	Target / Measurement
Households connected to RWH systems	Measures the number of households benefiting from installed rainwater harvesting facilities, ensuring access to alternative water sources.	322 households (228 in Busanza, 94 in Mpazi)
Volume of rainwater harvested (m^3)	Tracks the total quantity of rainwater collected through RWH water meters to evaluate water savings and system utilization.	Measured monthly per site
Reduction in commercial water bills per household	Assesses the financial impact of RWH on households by comparing pre- and post-intervention water bills.	Average reduction of m^3 per household per month
Number of residents using waste collection facilities	This refers to the total number of residents in two neighborhoods (1260 Households at Busanza, 94 Households at Mpazi)	Local authorities report
Number of SWM waste bins and waste collection constructed	Measures the physical delivery of smart solid waste management infrastructure to improve waste segregation and collection.	2708 household bins distributed (1354 for organic waste and 1354 for inorganic waste); seven community waste stations constructed (4 at Busanza and 3 at Mpazi)
Percentage of households practicing waste segregation	Assesses behavioral adoption of waste management practices promoted through training and awareness campaigns.	Target: 100% of households actively segregating waste
Number of community training sessions conducted(RWH &SWM)	Evaluates the reach of capacity-building activities in water conservation, hygiene, and waste management.	Number of training courses conducted, community meetings, and community

Number of participants trained	Tracks community engagement and the scale of knowledge transfer on RWH and SWM practices.	100% of focal households represented; gender-inclusive participation
Functionality of monitoring systems (RWH and SWM)	Measures the operational status of sensor-based SMS monitoring for SWM and data recording for RWH.	Sensors are functional, and regular reporting is maintained
Reservoir and system maintenance frequency	Monitors maintenance activities to ensure the sustainability of RWH and SWM infrastructure.	Quarterly maintenance checks for all facilities

5.3 Baseline, targets, and means of verification.

Table 4: Baseline, targets, and means of verification.

WORKSTREAM / INDICATOR	BASELINE	TARGET	MEANS OF VERIFICATION (MOV)
Rainwater Harvesting System			
Number of RWH reservoirs constructed	0(both sites)	2(1 Busanza,1Mpazi)	Monitoring reports, sites visit
Number of households connected to the rainwater harvesting system	0 (both sites)	322 (94 HH Mpazi, 228 HH Busanza)	RWH connection logs, site inspection reports
Percentage reduction in WASAC water bills per household (average/month)	4,512 RWF Busanza / 5,145 RWF Mpazi	36% Busanza / 49% Mpazi	WASAC records, RWH monitoring reports
Average volume of water consumption per household (WASAC + RWH) (m^3)	5.4 m^3 Busanza & 6 m^3 Mpazi (all from WASAC)	WASAC: 2 m^3 Busanza & 3 m^3 Mpazi; RWH: 3 m^3 Busanza & 3 m^3 Mpazi	Household water consumption records, RWH monitoring logs
Smart Waste Management			
Number of solid waste collection and segregation stations in place	0 (both sites)	4 Busanza, 3 Mpazi	Construction reports, site inspections
Number of households utilizing collection stations and segregating waste	0 (both sites)	1,260 HH Busanza, 94 HH Mpazi	Community monitoring reports, focal person records
Number of days of delay in waste collection	4	0	Waste collection logs, sensor reports

Percentage of households segregating waste	0	100%	Household surveys, monitoring records
Change in waste management behavior (fly nuisance, odors, littering, common dumping)	Poor practices across both sites	• Zero fly nuisance• No bad odors in front of household doors • No litter in compounds or drainage channels • Smart waste bins installed in neighborhoods	Field observations, community surveys, M&E reports
Residents' Training			
Number of residents/households trained in SWM operation and maintenance	0 (both sites)	150 HH Busanza, 50 HH Mpazi	Training attendance lists
Number of residents/households trained in RWH operation and maintenance	0 (both sites)	150 HH Busanza, 50 HH Mpazi	Training attendance lists

6. PROJECT ACHIEVEMENT AND KEY OUTCOMES

6.1 Busanza Resettlement Site

Achieved Objectives: At Busanza Resettlement Site, the project successfully met its core objectives in both water access and sanitation services. The Rainwater Harvesting (RWH) infrastructure was fully implemented with the construction of one underground smart rainwater tank, which was connected to 228 households, providing a reliable alternative water source. This intervention directly addressed the objective of increasing access to affordable and sustainable water, contributing to a 36% reduction in monthly WASAC bills per household. In parallel, the Smart Solid Waste Management (SWM) infrastructure was established through the installation of four smart waste collection stations and the distribution of 2520 household waste segregation bins (1260 organic waste and 1260 for inorganic waste), achieving the objective of improving solid waste management through organized collection systems and community-level participation.

Key Outcomes: The project has generated tangible benefits for residents and the broader community. The RWH system has improved both water accessibility and affordability, with households actively integrating harvested rainwater into their daily

water use alongside municipal supply. Behavioral change in waste management is evident, as households consistently segregate waste, effectively eliminating fly nuisances, odors, and litter in compounds and drainage channels. Additionally, all households trained in SWM and RWH demonstrate proper operation and maintenance of the systems, fostering long-term sustainability, community ownership, and resilience. Overall, the combined infrastructure and capacity-building interventions have strengthened service efficiency, environmental hygiene, and household well-being at Busanza.

6.2 Mpazi Resettlement Site

Achieved Objectives: At the Mpazi Resettlement Site, the project successfully met its primary objectives in water access and sanitation services. The Rainwater Harvesting (RWH) infrastructure was implemented through the construction of one underground smart rainwater tank, connected to 94 households, providing an average of 3 m^3 of harvested water per household per month. This system reduced reliance on municipal water supply and lowered monthly water bills by 49%. In addition, the Smart Solid Waste Management (SWM) infrastructure was established with the installation of three smart waste collection stations and the provision of 188 household waste segregation bins(94 of organic waste and 94 for inorganic waste), streamlining waste collection and eliminating previous operational delays.

Key Outcomes: The project has delivered significant benefits to the community. Households now enjoy increased access to affordable and sustainable water, complementing the municipal supply and promoting water conservation practices. SWM interventions have fostered positive behavioral change, including proper segregation of bio and non-bio waste, and reduction of waste-related nuisances. Furthermore, fifty households trained on RWH and SWM have demonstrated competence in system operation and maintenance, enhancing community ownership and ensuring the long-term sustainability of the interventions.

7. PROJECT PERFORMANCE AND KEY OUTCOMES

7.1. WASAC Water Usage Trends at Busanza Resettlement Site (2022–2025)

Analysis of WASAC water consumption at the Busanza Resettlement Site from 2022 to 2025 shows fluctuations in both consumption (in cubic meters) and billed amounts over the years. Overall, water usage exhibits a pattern of seasonal variation, with peaks generally occurring in the first half of each year. Between 2022 and 2024, monthly

consumption ranged from 271 to 1,150 cubic meters, reflecting variations in household demand as well as operational factors affecting supply.

In 2025, data for May and June indicate a notable reduction in municipal water consumption compared to previous years. May 2025 recorded 943 cubic meters, averaging 4 cubic meters per household, while June 2025 declined to 742 cubic meters, or 3 cubic meters per household. This decrease aligns with the integration of Rainwater Harvesting (RWH) systems, which supplement household water supply. The trend underscores the effectiveness of RWH in reducing reliance on municipal water, lowering household water bills, and promoting sustainable water management practices. The corresponding billed amounts 586,567 RWF in May and 448,703 RWF in June 2025 further highlight the financial benefits to households, demonstrating that RWH contributes to both water efficiency and affordability at the Busanza site, as illustrated in the figure and table below.

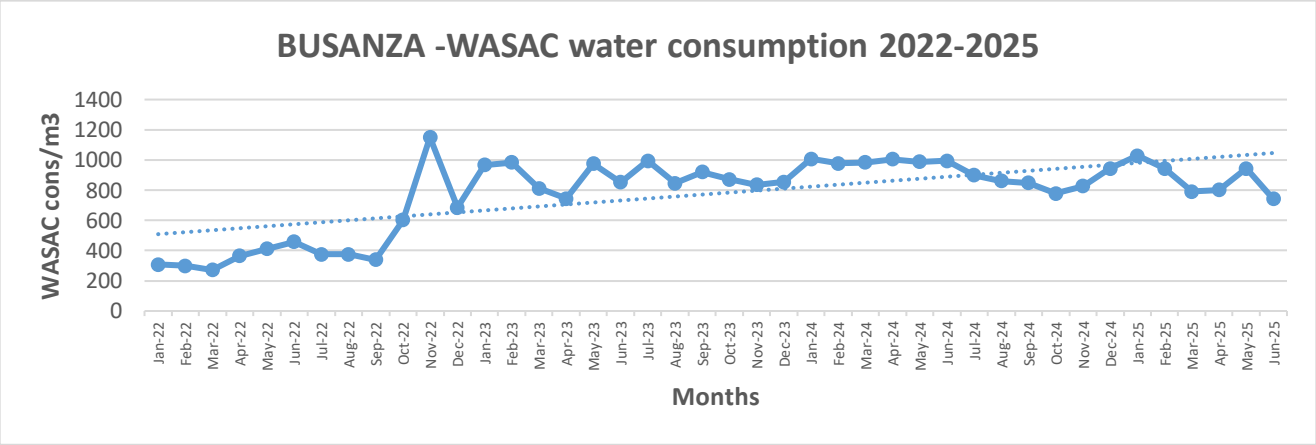


Figure 1:Busanza Resettlement Site: WASAC Water Consumption Trends (2022–2025)

7.1.1 Busanza Resettlement Site: Monthly Water Consumption and Billing.

At the Busanza Resettlement Site, municipal water consumption totaled 943 cubic meters in May 2025, averaging 4 cubic meters per household, and decreased to 742 cubic meters in June, equivalent to 3 cubic meters per household. This reduction of 1 cubic meter per household was compensated by an additional 685 cubic meters of harvested rainwater, also averaging 3 cubic meters per household. The integration of RWH effectively reduced reliance on municipal water, lowered household water bills, and enhanced the sustainability and reliability of the community's water supply, as summarized in the table below.

Table 5: Monthly Water Consumption and Billing

Month	Year 2022		Year 2023		Year 2024		Year 2025	
	Cons (M^3)	Billed	Cons (M^3)	Billed	Cons (M^3)	Billed	Cons (M^3)	Billed
Jan	307	226,409	967	656,333	1,007	662,427	1,029	689,820
Feb	300	196,182	983	633,800	977	629,139	943	604,026
Mar	271	155,801	811	486,105	983	661,016	790	552,239
Apr	364	218,249	745	471,124	1,004	687,962	801	459,623
May	412	271,388	975	650,465	988	654,028	943	586,567
Jun	458	314,179	852	505,768	995	891,707	742	448,703
Jul	375	232,418	994	637,027	899	574,281	–	–
Aug	375	238,579	845	506,560	860	533,930	–	–
Sep	339	203,069	919	589,418	849	513,150	–	–
Oct	602	344,995	871	526,798	778	458,592	–	–
Nov	1,150	901,748	835	513,161	826	503,865	–	–
Dec	684	408,664	855	530,925	943	623,225	–	–

7.1.2 Water Consumption and Rainwater Harvesting Contribution

In May 2025, at Busanza Resettlement, households relied exclusively on municipal water provided by WASAC, with a total consumption of 943 m^3, averaging 4 m^3 per household. This period represents the baseline level of municipal water dependency, as no rainwater harvesting (RWH) systems were in use. By June 2025, a notable shift occurred with the introduction of RWH. Municipal water consumption decreased to 742 m^3, or 3 m^3 per household, while RWH contributed an additional 685 m^3, also averaging 3 m^3 per household. This change reflects a reduction of 1 m^3 per household in WASAC-supplied water, fully offset by harvested rainwater. The outcome demonstrates a significant decrease in reliance on municipal water without compromising household water availability, highlighting the potential of RWH as a complementary and sustainable resource as show in the table 6.

Table 6: Comparison of WASAC and RWH Water Consumption at Busanza Resettlement site.

Site	Month	Total WASAC Water (m^3)	Average WASAC per Household (m^3)	RWH Water (m^3)	Average RWH per Household (m^3)	Notes/ Outcomes

Busanza Resettlement	May 2025	943	4	–	–	Baseline municipal water consumption
Busanza Resettlement	June 2025	742	3	685	3	1 m³ reduction per household offset by RWH, lowering WASAC reliance

7.2. WASAC Water Usage Trends at Mpazi Resettlement Site (2022–2025).

The analysis of monthly WASAC water consumption and billing at the Mpazi Resettlement Site shows a steady upward trend in demand from 2022 through 2024, with consumption levels generally ranging between 271 m³ and 1,150 m³. This growth reflects both increasing household needs and broader service coverage.

In 2025, the most recent data highlight a significant reduction in municipal water usage. Consumption decreased from 943 m³ in May 2025 (billed at 586,567 RWF) to 742 m³ in June 2025 (billed at 448,703 RWF), representing a drop of 201 m³ within one month. This decline coincides with the operationalization of Rainwater Harvesting (RWH) systems, which supplemented household supply and reduced dependency on WASAC water. The outcome demonstrates both improved water affordability for households and greater sustainability in water resource management, as rainwater harvesting offset municipal demand while lowering billing costs as illustrated in the table and figure.

7.2.1 Mpazi Resettlement Site: Monthly Water Consumption and Billing.

The table presents monthly water consumption and corresponding billing trends at Mpazi Resettlement Site from 2022 to 2025. Overall, water consumption and costs have shown a marked increase between 2022 and subsequent years, reflecting growing demand and higher reliance on municipal supply. For instance, monthly consumption rose from an average of about 400 m³ in 2022 to over 900 m³ in 2023 and 2024, with bills rising proportionally. In 2025, available data for the first six months indicate continued high consumption levels, though June shows a notable reduction (742 m³) compared to previous years, likely reflecting the impact of rainwater harvesting

interventions. This trend highlights both the escalating demand for water services over time and the potential benefits of complementary water sources in reducing costs and municipal dependence.

Table 7: Monthly Water Consumption and Billing

Month	Year 2022		Year 2023		Year 2024		Year 2025	
	Cons(m^3)	Bill(RWF)	Cons(m^3)	Bill(RWF)	Cons(m^3)	Bill(RWF)	Cons(m^3)	Bill(RWF)
Jan	307	226,409	967	656,333	1,007	662,427	1,029	689,820
Feb	300	196,182	983	633,800	977	629,139	943	604,026
Mar	271	155,801	811	486,105	983	661,016	790	552,239
Apr	364	218,249	745	471,124	1,004	687,962	801	459,623
May	412	271,388	975	650,465	988	654,028	943	586,567
Jun	458	314,179	852	505,768	995	891,707	742	448,703
Jul	375	232,418	994	637,027	899	574,281	–	–
Aug	375	238,579	845	506,560	860	533,930	–	–
Sep	339	203,069	919	589,418	849	513,150	–	–
Oct	602	344,995	871	526,798	778	458,592	–	–
Nov	1,150	901,748	835	513,161	826	503,865	–	–
Dec	684	408,664	855	530,925	943	623,225	–	–

7.2.2 Mpazi Resettlement Site: WASAC Water Consumption Trends (2022–2025)

The figure illustrates monthly WASAC water consumption at Mpazi Resettlement Site from January 2022 to June 2025. Consumption levels were relatively low and stable in 2022, averaging below 500 m^3, before rising sharply towards the end of the year, peaking at over 1,000 m^3 in November 2022. From 2023 onwards, usage generally stabilized at higher levels, fluctuating between 800–1,000 m^3 per month, with minor seasonal variations. In 2024, consumption showed a gradual decline during the second half of the year, followed by a similar downward trend in early 2025. A notable reduction is observed in June 2025 (742 m^3), which may be linked to the introduction of rainwater harvesting, reducing dependence on WASAC supply.

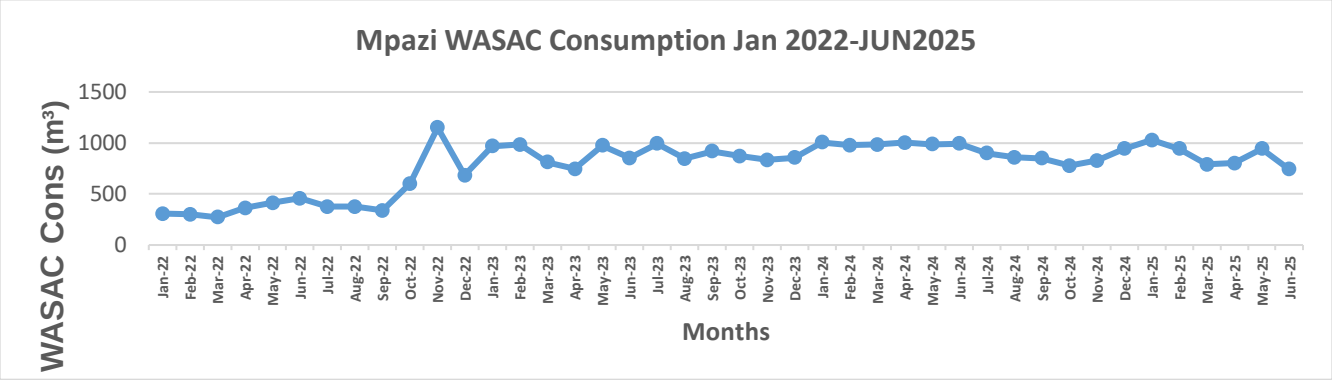


Figure 2:Mpazi Resettlement Site: WASAC Water Consumption Trends (2022–2025)

7.3 Mpazi Project Performance and Key Outcomes.

At the Mpazi Resettlement Site, municipal water consumption decreased from 277 m³ in May 2025 (averaging 3 m³ per household) to 221 m³ in June 2025 (2 m³ per household). During the same period, 137 m³ of water were supplied through Rainwater Harvesting (RWH), equivalent to 1 m³ per household, effectively compensating for the reduction in municipal water use. This outcome highlights the effectiveness of RWH in reducing dependence on municipal supply, lowering household water costs, and promoting sustainable water management within the community.

Overall, the project achieved significant improvements in household water access. The RWH system provided a reliable supplementary source, helping to offset municipal consumption and reduce bills while strengthening long-term sustainability of water resources, as summarized in the table below.

Table 8:WASAC and RWH Water Consumption at Mpazi Resettlement Site

Site	Month	Total WASAC Water (m³)	Average WASAC per Household (m³)	RWH Water (m³)	Average RWH per Household (m³)	Notes / Outcomes
Mpazi Resettlement Site	May 2025	277	3	–	–	Baseline municipal water consumption
Mpazi Resettlement Site	June 2025	221	2	137	1	1 m³ reduction per household offset by RWH, contributing to lower bills

7.4 Comparison of WASAC and RWH Consumption at Busanza Resettlement Site (June 2025).

The analysis of water consumption at the Busanza Resettlement Site shows that most households use relatively small amounts of municipal water, with a median of 2 m³ and a few outliers reaching up to 26 m³. Rainwater Harvesting (RWH) consumption is comparable on average (mean of 3 m³) but displays much greater variability, with extreme values up to 78 m³, indicating that while many households use minimal amounts, some depend heavily on rainwater as their primary source. The presence of zero values, representing less than 1 m³, highlights minimal or no usage among certain households for both sources. Overall, RWH demonstrates higher variability compared to WASAC, suggesting differences in access, storage capacity, or household reliance. As summarize in the table below.

7.4.1 Comparison of indicator for WASAC and RWH

The table summarizes household-level water consumption at the Mpazi Resettlement Site, comparing municipal (WASAC) supply and Rainwater Harvesting (RWH) across 228 households. The average consumption was 3.25 m³ for WASAC and 3 m³ for RWH, with median values of 2 m³ for both, indicating that typical households drew similar amounts from each source. However, variation was greater for RWH (Std. Dev. 6.13) than for WASAC (Std. Dev. 3.61), reflecting uneven utilization of harvested rainwater among households. Consumption ranged from 0 to 26 m³ for WASAC and from 0 to 78 m³ for RWH, showing that while some households did not access either source, others relied heavily on RWH. These findings emphasize the complementary role of RWH in supplementing municipal supply, albeit with greater variability in household use, as illustrated in the table below.

Table 9:Comparison of indicator for WASAC and RWH

Indicator	WASAC Consumption (m³)	RWH Consumption (m³)
Households	228	228
Mean	3.25	3
Std Dev	3.61	6.13
Min	0	0
Median	2	2
Max	26	78

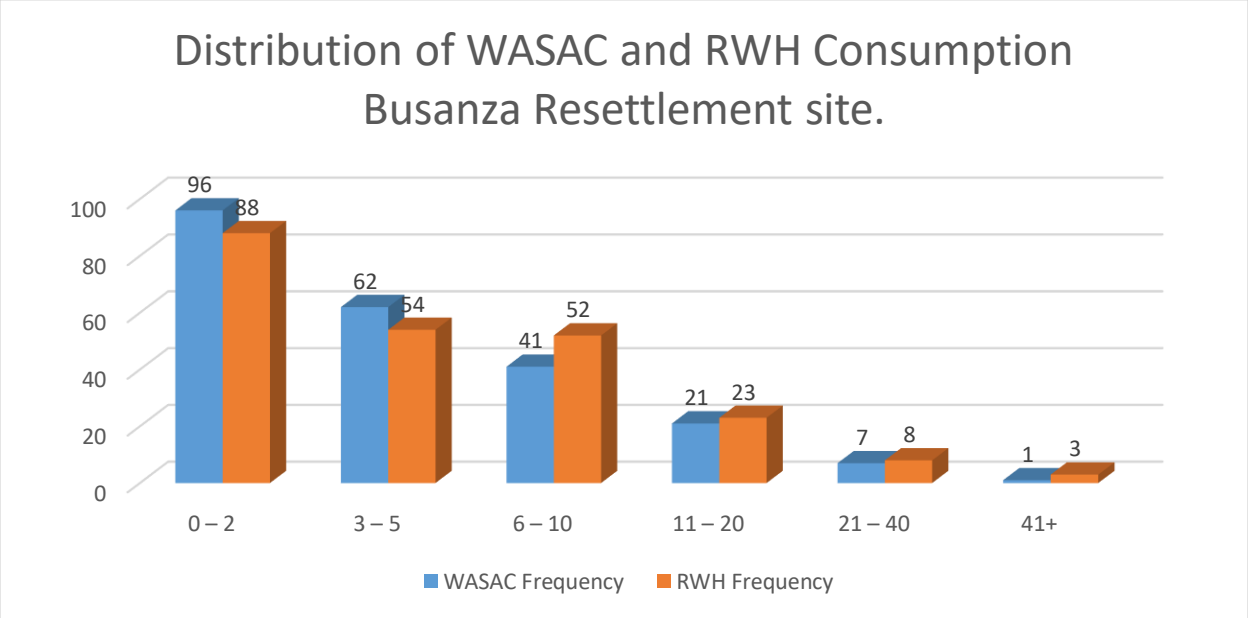
7.4.2 Distribution of WASAC and RWH Consumption Busanza Resettlement Site, June 2025

The table presents the distribution of household-level water consumption at the Mpazi Resettlement Site for both municipal (WASAC) and Rainwater Harvesting (RWH) sources, categorized into six class intervals (in cubic meters, m³). Most households consumed between 0 and 2 m³, accounting for 42.1% of WASAC users and 38.6% of RWH users, indicating that a substantial proportion relies on minimal water quantities. Moderate consumption, ranging from 3 to 10 m³, comprised 45.2% of WASAC households and 46.5% of RWH households, reflecting comparable patterns of mid-range usage. Higher consumption levels, above 10 m³, were observed in a smaller subset of households, representing 12.7% for WASAC and 14.9% for RWH, suggesting relatively few high-volume users. Overall, the data indicate that typical household water consumption is low to moderate for both sources, with RWH exhibiting slightly more households in the higher consumption categories (>40 m³). This distribution provides valuable insights into water demand patterns and underscores the potential role of RWH in complementing municipal supply as summarized in the table and figure below.

Table 10: Distribution of WASAC and RWH Consumption Busanza Resettlement site.

Class Interval (m³)	WASAC Frequency	WASAC %	RWH Frequency	RWH %
0 – 2	96	42.1%	88	38.6%
3 – 5	62	27.2%	54	23.7%
6 – 10	41	18.0%	52	22.8%
11 – 20	21	9.2%	23	10.1%
21 – 40	7	3.0%	8	3.5%
41+	1	0.5%	3	1.3%
Total (HHs = 228)	**228**	**100%**	**228**	**100%**

Figure 3: Distribution of WASAC and RWH Consumption Busanza Resettlement Site.



7.4.3 Comparison of planned vs. achieved results

The Rainwater Harvesting (RWH) intervention successfully achieved its connectivity target, with 228 households connected as planned. However, the expected 64% reduction in WASAC water bills was not fully realized, with households instead recording an average reduction of 23% between May and June 2025. This indicates partial effectiveness in cost savings. In terms of water consumption, households reported an average of 3.25 m³ from WASAC and 3 m³ from RWH, compared to the target of 2.0 m³ and 3 m³ respectively. This shows progress toward integrating RWH into household water use, though reliance on WASAC water remains higher than anticipated. Overall, while connectivity goals were met, further optimization is needed to maximize financial savings and fully shift consumption patterns toward RWH.

Table 11: Performance Results at Busanza Resettlement Site (June 2025)

Work Stream / Indicator	Baseline	Target	Achieved Results (June 2025)
Number of households connected with the RWH system	0 (both sites)	228 households	228 households connected
Percentage reduction in WASAC water bills per household (average/month)	4,512 RWF	36%	Average household billing reduced from 2,572 RWF (May) to 1,968 RWF (June), equivalent to 23%
Average volume of water consumption per household (WASAC + RWH) (m³)	5.4 m³ (WASAC only)	WASAC: 2.0 m³RWH: 3 m³	WASAC: 3.25 m³+ RWH: 3 m³

7.4.4 Analysis of trends and performance gaps.

Positive Trends: At the Busanza Resettlement Site, notable progress was achieved through the full connection of households to the Rainwater Harvesting (RWH) system, resulting in a measurable reduction in both WASAC water consumption and billing. This shift demonstrates the effectiveness of RWH as a reliable alternative source, with households increasingly adopting sustainable rainwater use to complement municipal supply. The transition highlights growing community reliance on environmentally friendly practices, reducing financial burdens while enhancing water security and long-term sustainability.

Key Gaps: The progress in integrating Rainwater Harvesting (RWH), WASAC usage at the Busanza Resettlement Site remains above the intended target, while RWH utilization continues to vary across households. The reduction in billing has been recorded at 23%, which falls below the expected 36%, indicating that the financial impact is less significant than planned. Additionally, extreme consumption outliers reveal inefficient water use in some households, suggesting the need for strengthened monitoring, awareness campaigns, and capacity-building efforts to promote more efficient and equitable water consumption practices.

7.5. Comparison WASAC and RWH Consumption at Mpazi Resettlement Site (June 2025).

The analysis of water consumption at the Mpazi Resettlement Site in June 2025 shows distinct differences between WASAC and Rainwater Harvesting (RWH) usage. On average, households consumed more municipal water (mean = 2.35 m³) than rainwater (mean = 1.5 m³). However, the median reveals a different trend over half of the households recorded zero usage of WASAC water, while RWH consumption was more consistent, with a median of 1 m³. Variability in consumption is also notable: WASAC shows a high standard deviation (4.8) and extreme outliers up to 36 m³, suggesting irregular usage patterns and potential inefficiencies among certain households.

Table 12: Comparison of WASAC and RWH consumption at Mpazi resettlement site.

Indicator	WASAC Cons (m³)	RWH Cons (m³)
Count (Households)	94	94
Mean	2.35	1.5
Median	0	1
Standard Deviation (SD)	4.8	1.5
Minimum	0	0
Maximum	36	5

7.5.1 Frequency Distribution of WASAC and RWH Consumption Mpazi Resettlement Site, June 2025.

The table presents household water consumption distribution at the Mpazi Resettlement Site for both municipal (WASAC) and Rainwater Harvesting (RWH) sources. The majority of households consumed very low quantities of water, between 0–1 m³, representing 65.96% of WASAC users and 63.83% of RWH users. Moderate consumption (2–4 m³) accounted for 14.89% of WASAC households and a higher 32.98% of RWH households, indicating that RWH contributes significantly to mid-range consumption. Higher consumption levels (5–36 m³) were relatively uncommon, comprising less than 20% of WASAC households and only 3.19% of RWH households, with no RWH users recorded above 10 m³. Overall, the data show that typical household water usage is concentrated in the low to moderate range, with RWH slightly more important for mid-range consumption as shown in the table and figure.

Table 13:Distribution of WASAC and RWH Consumption Mpazi Resettlement Site, June 2025

Class Interval (m³)	WASAC Frequency	WASAC %	RWH Frequency	RWH %
0 – 1	62	65.96%	60	63.83%
2 – 4	14	14.89%	31	32.98%
5 – 9	14	14.89%	3	3.19%
10 – 19	3	3.19%	0	0%
20 – 36	1	1.06%	0	0%
Total	94	100%	94	100%

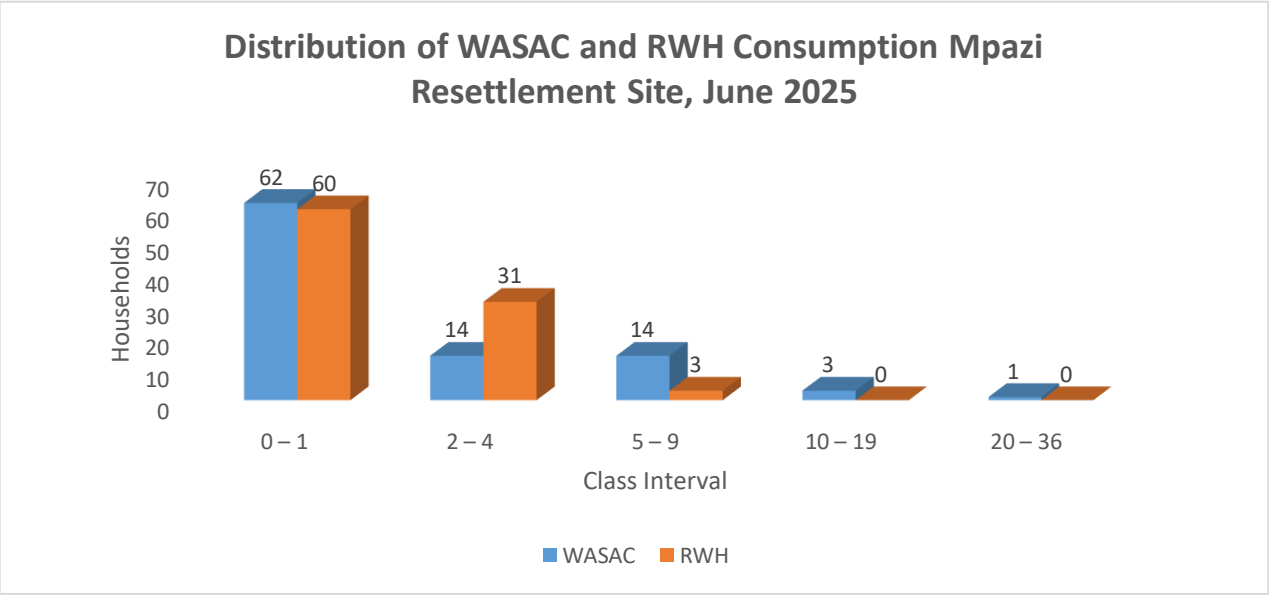


Figure 4:Distribution of WASAC and RWH Consumption Mpazi Resettlement Site, June 2025

7.5.2 Comparison of Planned Versus Actual Achievements at Mpazi Resettlement Site

The table summarizes the work stream results for June 2025. The project successfully achieved its target of connecting 94 households to the Rainwater Harvesting (RWH) system, up from a baseline of zero connections. In terms of cost savings, households recorded an average reduction of approximately 24% in WASAC water bills, which falls short of the targeted 49% reduction. Average household water consumption, combining WASAC and RWH sources, decreased from a baseline of 6 m³ (WASAC only) to 3.85 m³ (2.35 m³ WASAC + 1.5 m³ RWH), indicating partial achievement of the intended balance of 3 m³ from each source. Overall, while the RWH connections were fully implemented, the project did not fully meet the targets for cost savings and water consumption redistribution, as illustrated in the table below.

Table 14:Comparison of Planned Versus Actual Achievements at Mpazi Resettlement Site.

Work Stream / Indicator	Baseline	Target	Achieved Results (June 2025)
Number of households connected with the RWH system	0 (both sites)	94 households	94 households connected
Percentage reduction in WASAC water bills per household (average/month)	5,145 RWF	49% Reduction	An average household billing reduced from 6240 Rwf in May to 4773 Rwf in June, equivalent to 24 %
Average volume of water consumption per household (WASAC + RWH) (m³)	WASAC (6m³)	WASAC(3 m³) + RWH(3 m³)	WASAC(2.35 m³)+RWH(1.5 m³)

7.5.3 Analysis of Water Consumption Trends and Performance Gaps at Mpazi Resettlement Site

Positive trends: The introduction of Rainwater Harvesting (RWH) has significantly reduced reliance on WASAC water, lowering household water costs. Additionally, billing now more accurately reflects actual consumption, improving transparency and fairness in water charges.

Performance gaps: Significant variability in WASAC consumption, dependence on rainfall-dependent RWH, and historical metering challenges highlight key areas for operational improvement and enhanced monitoring. Addressing these gaps will be essential to ensure a consistent water supply, accurate billing, and efficient resource management

7.5.4 Sustainable Rainwater Harvesting Management: Enhancing Water Security and Community Resilience.

Regular maintenance of water meters is essential to ensure accurate measurement of household water consumption and to maintain trust in billing systems. Routine checks and timely calibration not only prevent discrepancies in recorded data but also support the effective management of both municipal water and Rainwater Harvesting (RWH) resources. By sustaining precise readings, institutions can strengthen accountability and improve decision-making in water resource management.

In addition, continued awareness and training initiatives are critical for fostering sustainable water use behaviors. Educating households on the efficient utilization of RWH systems and proper water management practices helps to reduce wastage, enhance reliability of supply, and increase the overall impact of such interventions. These programs also provide opportunities for newly resettled families or tenants to quickly adapt, ensuring long-term compliance and maximizing the benefits of available water resources.

Furthermore, addressing non-functional meters and expanding RWH systems are important steps in reinforcing water security. Prompt repair or replacement of faulty meters eliminates risks of inaccurate monitoring and potential billing disputes, thereby maintaining system integrity. At the same time, extending access to RWH infrastructure, particularly for households with limited municipal supply, diversifies water sources and strengthens resilience against shortages. Collectively, these measures ensure efficient, equitable, and sustainable water management within the community.

8. SMART WASTE MANAGEMENT

After the waste collection systems were established and household bins distributed, a total of 1,354 residents, 1,260 in Mpazi Resettlement Site and 94 in Busanza Resettlement Site, began utilizing them by transporting their waste to the designated stations and separating it into biodegradable, non-biodegradable, and electronic categories. The objective was to achieve 100% compliance with segregation, thereby facilitating timely waste collection by transporters. The bins are equipped with sensor systems that monitor and signal the fill level, helping to ensure efficiency and prevent delays. All households have been trained on proper waste segregation through project-organized trainings and community meetings, ensuring that residents are well-informed and actively participating in the program.

Table 15: Waste segregation and delays in waste collection

Date	**Waste Segregation Rate (%)** Mpazi	**Waste Segregation Rate (%)** Busanza	**Collection Delays (Days)** Mpazi	**Collection Delays (Days) –** Busanza
Nov 24	0	90	Not started	4
Dec 24	0	92	0	2
Jan 25	85	99	0	1
Feb 25	86	100	0	0
Mar 25	99	100	0	0
Apr 25	100	100	0	0
May 25	90	100	0	0
Jun 25	92	100	0	0
Jul 25	94	100	0	0
Aug 25	94	100	0	0

Waste Segregation: Busanza Resettlement Site consistently demonstrates excellent waste segregation performance, maintaining rates above 90% throughout the reporting period. In contrast, Mpazi Resettlement Site initially recorded very low segregation rates (0% in November and December 2024) but showed significant improvement from January 2025 onwards, reaching over 90% by June 2025. The temporary decline in May 2025 is attributed to the arrival of 688 new households in Mpazi who were not initially included in the project scope and lacked segregation bins. Following orientation and training through community meetings, these households adopted proper segregation practices, leading to improved compliance.

Collection Delays: Waste collection at Mpazi Resettlement Site experienced no delays during the reporting period, reflecting the effective training of waste management companies on smart collection practices, including the use of sensor notifications and efficient waste station operations. Busanza, on the other hand, experienced minor delays of four days in November 2024, two days in December 2024, and one day in January 2025, after which collection became timely. Overall, the combination of community engagement and operational training has contributed to both improved segregation rates and minimized collection delays at both sites.

8.1 Busanza and Mpazi resettlement sites waste segregation trend from November 2024 to August 2025.

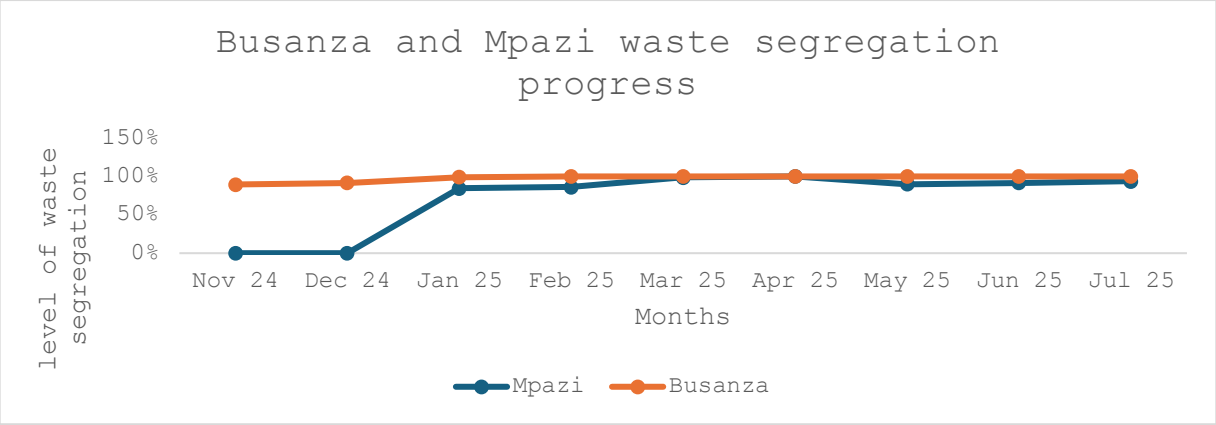


Figure 5:Busanza and Mpazi resettlement sites waste segregation trend

The figure illustrates the trends in waste segregation at Busanza and Mpazi resettlement sites from November 2024 to July 2025. At Busanza, the level of segregation remained consistently high throughout the period, maintaining rates above 90%, which demonstrates sustained adherence to proper waste management practices. In contrast, Mpazi recorded no segregation during the initial two months (November–December 2024), but from January 2025 onward, the site exhibited a rapid and steady improvement, reaching levels comparable to Busanza by March 2025 and maintaining this progress thereafter.

Overall, the data highlight strong performance across both sites, with Busanza demonstrating early adoption and Mpazi showing remarkable catch-up progress. This positive trajectory reflects the effectiveness of awareness campaigns and capacity-building initiatives provided to residents, resulting in a well-established culture of responsible waste segregation.

8.2 Impact on smart management and community behavior

The implementation of the smart waste management system has yielded measurable improvements in operational efficiency, environmental hygiene, and community participation. By deploying sensor-equipped bins, waste collection has become timelier and more responsive, minimizing delays and ensuring that waste is removed before bins reach capacity. This has significantly reduced overflow and unsanitary conditions around collection points, thereby enhancing neighborhood cleanliness and overall public health. The system's ability to streamline collection logistics has also optimized the use of resources, contributing to a more reliable and cost-effective waste management process.

Equally important, the system has fostered positive behavioral change among residents. Training sessions and sensitization campaigns have equipped households with the knowledge and skills needed to properly segregate waste, resulting in consistent improvements in segregation rates across resettlement sites. The adaptability of newly arrived tenants, who readily adopt segregation practices after orientation, demonstrates the sustainability of this model and its potential for long-term impact. These outcomes affirm that the integration of technology with community engagement strategies can drive both environmental and social benefits, setting a strong precedent for scalable waste management interventions.

8.3 Planned vs. Achieved Results in Smart Waste Management at Busanza and Mpazi Resettlement Sites.

The comparison between baseline, target, and achieved results demonstrates that the project not only met but, in several aspects, exceeded expectations. In the area of smart waste management, all targets were successfully achieved. Seven waste collection and segregation stations were established as planned, and household participation reached remarkable levels, with 100% adoption in Busanza Resettlement Site and 94% in Mpazi Resettlement Site. Delays in waste collection, which initially averaged four days, were eliminated, resulting in more efficient service delivery. Furthermore, noticeable behavioral improvements were recorded across both sites, including the eradication of fly nuisance, bad odors, and littering, supported by the installation of smart bins.

Similarly, residents' training outcomes reflect strong community engagement and ownership. While the project initially planned to train 200 households across both sites, the actual achievements were far higher 1,260 households in Busanza Resettlement Site and 94 in Mpazi Resettlement Site. This demonstrates not only effective mobilization but also a high level of household commitment to adopting sustainable practices. Training in Rainwater Harvesting (RWH) operation and maintenance fully met the targets, ensuring that selected households are well-prepared to manage and sustain the systems. Collectively, these results highlight the project's effectiveness, efficiency, and sustainability, while also showcasing the transformative impact of integrating technology with community-based approaches.

Table 16: Planned vs. Achieved Results in Smart Waste Management

Workstream / Indicator	Baseline	Target	Achieved Results
Smart Waste Management			
Number of solid waste collection and segregation stations in place	0 (both sites)	4 in Busanza, 3 in Mpazi	4 in Busanza and 3 in Mpazi established
Number of households utilizing collection stations and segregating waste	0 (both sites)	1,260 HH in Busanza, 94 HH in Mpazi	1,260 HH in Busanza and 94 HH in Mpazi utilizing stations
Number of days of delay in waste collection	4 days	0 days	0 days (no delays)
Percentage of households segregating waste	0%	100%	100% in Busanza; 94% in Mpazi
Change in waste management behavior (fly nuisance, odors, littering, common dumping)	Poor practices across both sites	• Zero fly nuisance • No bad odors • No litter • Smart waste bins installed	• Zero fly nuisance • No bad odors • No litter • Smart waste bins installed
Residents' Training			
Number of households trained in waste segregation	0 (both sites)	150 HH in Busanza, 50 HH in Mpazi	1,260 HH in Busanza and 94 HH in Mpazi trained
Number of households trained in RWH operation and maintenance	0 (both sites)	5 HH in Busanza, 5 HH in Mpazi	5 HH in Busanza and 5 HH in Mpazi trained

9. CHALLENGES AND LESSONS LEARNED

9. 1 Constraints Encountered in Project Implementation

The project encountered several constraints that affected both the pace and scope of implementation. Budgetary limitations restricted the timely procurement of essential equipment and materials, which in turn led to delays in certain planned activities. Furthermore, the procurement process presented logistical challenges, resulting in minor setbacks in the delivery and installation of Rainwater Harvesting (RWH) systems and smart waste management infrastructure.

In addition, climatic variability posed another challenge, with periods of low rainfall reducing the performance of RWH systems. This limitation affected the anticipated volumes of harvested water and, consequently, the expected reductions in reliance on WASAC supply. While these constraints did not prevent the successful completion of project activities, they underscored the importance of adaptive planning, efficient

procurement processes, and the consideration of environmental factors in future project design and implementation.

9.2 Analysis of Factors Affecting Project Performance in Busanza and Mpazi Resettlement Sites

Several factors influenced the overall performance of project interventions at Busanza and Mpazi resettlement sites. For the Rainwater Harvesting (RWH) systems, a key challenge was the lower-than-expected adoption of harvested water, as many households continued to rely predominantly on WASAC-supplied water. This behavior led to partial achievement of cost reduction objectives, with observed reductions (e.g., 23%) falling significantly below the targeted levels (36% at Busan in some sites). In the Smart Waste Management (SWM) component, household behavioral adherence posed a notable risk; although most performance targets were met, sustaining proper segregation and disposal practices required continuous monitoring and community engagement to prevent regression. Overall, these factors underscore the importance of aligning interventions with user behaviors and maintaining ongoing oversight to optimize project outcomes.

9.3 Success Stories and Best Practices at Busanza and Mpazi Resettlement Sites

Despite the constraints and risks encountered, the project achieved significant successes across both sites. The Rainwater Harvesting (RWH) intervention successfully met connectivity targets, linking 228 households at Busanza and 94 households at Mpazi, demonstrating strong community uptake and acceptance. The Smart Waste Management (SWM) initiatives exceeded expectations, with seven solid waste collection and segregation stations established, and a high proportion of households adopting proper waste segregation practices (100% in Busanza and 94% in Mpazi). These improvements led to the elimination of fly nuisances, odors, and littering, facilitated by the installation of smart bins. Moreover, residents' training outcomes surpassed initial targets, reflecting effective community engagement and enhanced capacity in both waste management and RWH operation and maintenance. In addition, the project generated temporary employment opportunities during construction and implementation phases, providing short-term income and skills development for residents.

9.4 Overall Lessons Learned

The project underscores the critical role of community involvement, continuous behavioral reinforcement, and adaptive planning in achieving sustainable

environmental and water management outcomes. While the installation of infrastructure can be completed efficiently, maximizing impact on cost savings and consumption behavior requires ongoing monitoring, targeted awareness campaigns, and system optimization in response to operational and environmental realities. These lessons highlight that coupling technical interventions with proactive community engagement is essential for sustaining long-term project benefits and fostering positive behavioral change.

10.PROJECT HANDOVER AND CITY OWNERSHIP

The project was formally handed over to the City of Kigali, ensuring continuity, sustainability, and integration within municipal systems. Local government authorities, in collaboration with community representatives, assumed full ownership of both the Rainwater Harvesting (RWH) and Smart Waste Management (SWM) interventions. City structures were engaged throughout the implementation process, which facilitated smooth transfer of responsibilities and alignment with existing urban development plans. Operational guidelines and maintenance protocols were developed and shared with city technicians and community focal points to guarantee long-term functionality of the systems. This transition not only reinforced local accountability but also enhanced the City of Kigali's capacity to scale up similar initiatives across other resettlement sites.

11. CONCLUSION AND RECOMMENDATIONS

11.1 Summary of Overall Performance

The project achieved substantial progress across both Rainwater Harvesting (RWH) and Smart Waste Management (SWM) interventions at Busanza and Mpazi resettlement sites. The RWH systems successfully met connectivity targets, connecting 228 households at Busanza and 94 households at Mpazi, reflecting strong community engagement and adoption. Although reductions in municipal water bills fell below expectations 23% achieved versus 36% targeted at Busanza and 24% versus 49% at Mpazi households demonstrated measurable improvements in water management practices. Water consumption patterns indicate a growing integration of harvested water with existing WASAC supply, although reliance on municipal water remains higher than initially projected.

Smart waste management initiatives exceeded planned targets, with seven solid waste collection and segregation stations established, full adoption of proper waste segregation by households in Busanza (100%) and high compliance at Mpazi (94%), and

zero reported delays in waste collection. Behavioral improvements were significant, including the elimination of fly nuisances, odors, and littering, supported by the installation of smart bins. Training outcomes surpassed expectations, with a larger number of households gaining skills in waste segregation and RWH operation and maintenance than initially targeted, demonstrating effective community participation and capacity building.

11.2 Effectiveness, Relevance, Efficiency, and Sustainability of Interventions

The interventions proved highly effective in achieving infrastructure and behavioral change objectives, particularly in waste management. They were relevant to community needs, addressing critical gaps in water access, household water management, and sanitation practices. Implementation was efficient, as evidenced by the timely delivery of infrastructure and comprehensive community training, despite minor constraints such as budget limitations and periods of low rainfall.

Sustainability is reinforced through active community engagement, enhanced capacity, and adoption of improved waste management and water harvesting practices. To further optimize impact, particularly for RWH systems, additional measures are recommended to balance harvested and municipal water consumption and maximize cost savings. Overall, the project presents a strong model for integrated water and waste management interventions, with high potential for replication in similar contexts.

11.3 Recommendations

11.3.1. Optimize Rainwater Harvesting (RWH) Performance

To maximize the effectiveness of Rainwater Harvesting (RWH) systems, it is essential to conduct regular monitoring and maintenance, ensuring optimal collection efficiency and uninterrupted service. Complementing this, household-level guidance on efficient water usage should be provided to reduce reliance on municipal supply and promote sustainable consumption practices. Additionally, introducing performance indicators that track both water consumption patterns and cost savings will enable precise measurement of impact, inform adaptive management, and support data-driven decisions to enhance the overall effectiveness of the RWH interventions.

11.3.2 Enhance Community Engagement and Capacity Building.

Sustaining the positive outcomes of the project requires ongoing community engagement through continuous training programs focused on Rainwater Harvesting

(RWH) operation, maintenance, and proper waste segregation. These programs reinforce behavioral change, ensuring households maintain best practices over time. In parallel, establishing structured community feedback mechanisms allows for the timely identification of operational challenges and the adaptation of interventions in real time, fostering responsive management and enhancing the long-term effectiveness and sustainability of the project.

11.3.4 Supportive Policy Frameworks.

To promote the long-term adoption and sustainability of Rainwater Harvesting (RWH) and Smart Waste Management (SWM) practices, local authorities need to integrate these interventions into municipal water and sanitation policies. Embedding such practices within official frameworks ensures consistent support and alignment with broader community development goals. Additionally, incentivizing households through measures can encourage wider adoption of RWH systems, enhancing both environmental outcomes and cost savings while reinforcing the community's commitment to sustainable water and waste management practices.

11.3.5 Replication and Scaling

To extend the benefits of the project, there is an opportunity to scale the Rainwater Harvesting (RWH) and Smart Waste Management (SWM) models to other communities facing similar water and sanitation challenges. Expanding these interventions can replicate proven successes in improving household water management and waste practices. Furthermore, fostering public-private partnerships can enhance the provision, maintenance, and sustainability of infrastructure, leveraging shared resources and expertise to support long-term operational efficiency and broader community impact.

11.3.6 Sustainability and Long-Term Planning

Ensuring the long-term success of Rainwater Harvesting (RWH) systems and waste management infrastructure requires the development of comprehensive strategic plans that prioritize continuous supply, regular maintenance, and systematic monitoring. Such plans provide a structured approach to sustaining operational efficiency and maximizing the impact of interventions. In parallel, integrating behavioral change communication campaigns into ongoing community development programs reinforces sustainable practices, fostering consistent household engagement in both water conservation and proper waste management. Together, these measures enhance the durability and effectiveness of project outcomes while promoting lasting environmental and community benefits.

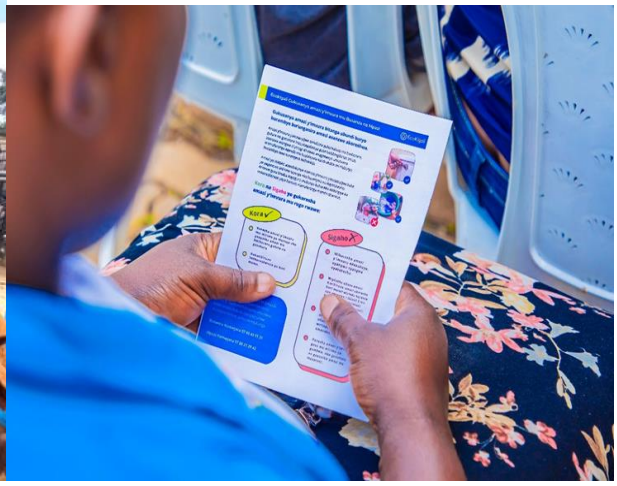
Annexes

Before and after SMW implementation

Household bins distributed (blue for inorganic waste and Green for organic waste

SWM residents trainings

Elevated underground tanks constructed



RWH residents trainings