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DRIP FUNDI ENDLINE EVALUATION

FINAL REPORT, MAY 2025

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MILLENNIUM WATER
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TABLE OF CONTENTS

1.0. LIST OF TABLES	IV
2.0. LIST OF FIGURES	IV
3.0. DEFINITION OF TERMS	V
4.0. ACRONYMS	VI
5.0. EXECUTIVE SUMMARY	1
CONCLUSIONS	3
RECOMMENDATIONS FOR PROGRAM IMPROVEMENT AND SUSTAINABILITY	4
1.0. INTRODUCTION AND BACKGROUND	5
1.0. INTRODUCTION	5
1.1. PROJECT DESCRIPTION	6
PROGRAM PURPOSE	7
2.0 EVALUATION APPROACH AND METHODOLOGY	10
2.1. EVALUATION DESIGN	10
2.2. DATA COLLECTION METHODS	12
2.2.1. OBSERVATION CHECKLIST	12
2.2.2. HOUSEHOLD SURVEY	13
2.2.3. WATER QUALITY TESTING	13
2.2.3.1. E. COLI AND TOTAL COLIFORMS TESTING PROTOCOL	14
2.2.3.2. FRC AND PH TESTING PROTOCOL	14
2.2.4. KEY INFORMANT INTERVIEWS	14
2.3. DATA COLLECTION SUMMARY	15
2.4. LIMITATIONS AND CHALLENGES	16
3.0. SOCIO-DEMOGRAPHIC FINDINGS	17
3.1. AGE AND GENDER OF RESPONDENTS	17
3.2. HOUSEHOLD SIZE	18
3.3. INTERVENTION TYPE	19
3.4. BOREHOLE OWNERSHIP	19
4.0. WATER ACCESS FINDINGS	20
4.1. ACCESS TO PRIMARY WATER SOURCES	20
4.2. DISTANCE TO WATER SOURCES	21

4.3.	VISITS TO THE WATER POINT	21
4.4.	CONSUMPTION.....	22
4.5.	ALTERNATIVE WATER SOURCE.....	23
4.6.	WILLINGNESS AND ABILITY TO PAY FOR WATER.....	23
4.7.	WATER USES	24
5.0.	<u>INTERMEDIATE OUTCOME 1: BOREHOLE DATA FOR DECISION-MAKING AVAILABLE.....</u>	25
5.1.	OVERVIEW.....	25
5.2.	BOREHOLE INVENTORY.....	25
5.3.	SPARE PARTS INVENTORY	26
5.4.	APPLICATION OF DATA FOR DECISION-MAKING	27
5.5.	BARRIERS AND SOLUTIONS.....	27
6.0.	<u>INTERMEDIATE OUTCOME 2: BROKEN BOREHOLES ARE REPAIRED WITHIN 96 HRS.....</u>	28
6.1.	OVERVIEW	28
6.2.	BOREHOLE BREAKDOWN REPORTING AND RESPONSE MECHANISM	28
6.3.	BOREHOLE REPAIR RESPONSE TIME.....	30
6.4.	CAPACITY OF REPAIR TEAMS	32
6.5.	DETERMINANTS OF SUCCESS	34
7.0.	<u>INTERMEDIATE OUTCOME 3: BOREHOLE FUNCTIONALITY MONITORING EFFORTS STRENGTHENED</u>	35
7.1.	OVERVIEW.....	35
7.2.	ACCESS AND USE OF MONITORING DATA.....	35
7.3.	COMMUNITY AND STAKEHOLDER SENSITIZATION.....	37
2.0.	<u>8.0. WATER QUALITY AND TREATMENT.....</u>	39
8.1.	PERCEPTION OF HOUSEHOLDS ON WATER QUALITY.....	39
8.2.	WATER TREATMENT	39
8.3.	WATER QUALITY ANALYSIS	40
9.0.	FINDINGS ON PROGRAM DESIGN AND IMPLEMENTATION MODALITIES..	42
9.1.	COLLABORATION AND PARTNERSHIPS.....	42
9.2.	PRIVATE SECTOR ENGAGEMENT (PSE) APPROACH	42
9.3.	LEARNING AND ADAPTIVE MANAGEMENT	43
10.0.	CONCLUSIONS AND RECOMMENDATIONS.....	44
10.1.	CONCLUSION.....	44
10.2.	RECOMMENDATIONS FOR PROGRAM IMPROVEMENT AND SUSTAINABILITY	44
8.0.	<u>ANNEXES TO THE REPORT.....</u>	47

ANNEX A: EVALUATION TOR.....	47
ANNEX B: FINAL DATA COLLECTION TOOLS.....	48
ANNEX C: ANONYMIZED LIST OF RESPONDENTS.....	49
ANNEX D: RAW AND CLEANED DATA SETS/ BOREHOLE LIST.....	50
ANNEX E: UPDATED IPTT TABLE BASED ON AVAILABLE SOURCE DATA RECORDS	
.....	51
ANNEX F: FINAL INCEPTION REPORT	52
ANNEX G: FINDINGS ON WATER QUALITY	53
ANNEX H: PHOTOS	55
.....	56

1.0. LIST OF TABLES

Table 1: Summary of data collection.....	15
Table 2: Distance to and from the water source.....	21
Table 3: Water payment recipients.....	23
Table 4: Borehole Observation Checklist Summary.....	25
Table 5: Response time and uptime challenges.....	31
Table 6: Broken versus repaired boreholes.....	32
Table 7: Use and Experience of mWater and Sensors.....	36
Table 8: Summary of Water Points Sampled for Water Quality.....	40

2.0. LIST OF FIGURES

Figure 1 The DRIP FUNDI Target Counties.....	5
Figure 2: DRIP FUNDI Theory of Change.....	6
Figure 3: DRIP FUNDI Intermediate Outcomes.....	8
Figure 4 Endline Evaluation Phases.....	10
Figure 5 mWater portal and application interface: Source mWater.....	11
Figure 6 Map of boreholes visited in the EE.....	12
Figure 7 Overall Borehole Functionality Framework.....	13
Figure 8 Household respondent's age.....	17
Figure 9 Household respondent's gender.....	18
Figure 10: Average Household Size.....	18
Figure 11: County and Intervention Type.....	19
Figure 12: Model of borehole water user management.....	19
Figure 13: Household source of drinking water.....	20
Figure 14: Household Primary Water Source for Cooking and Washing.....	21
Figure 15: Frequency of water fetching.....	22
Figure 16: Average water consumption per household.....	22
Figure 17: Alternative sources of water.....	23
Figure 18: Water uses.....	24
Figure 19 : Feedback Loop for Reporting and Response to Borehole Breakdowns.....	28
Figure 20: Feedback and Complaint Mechanism.....	29
Figure 21: Borehole repair times.....	30
Figure 22: Borehole repair times per county.....	31
Figure 23 A snapshot of the Virridy borehole sensor dashboard.....	35
Figure 24: Water treatment methods at the household.....	39
Figure 25: Photo of FRC and pH results from Hargaal Borehole in Garissa County.....	41

3.0. DEFINITION OF TERMS

Borehole assets: Details of boreholes including their technical specifications, operational status, maintenance history, and other critical data.

County Borehole Rapid Response Teams (BRRTs): County teams tasked with the Repair and maintenance of boreholes

Downtime: Is the time when a borehole was not functioning

Intervention Boreholes: These are the boreholes that were repaired, equipped with a chlorinator or both.

Non- functional: Borehole is broken and needs repair.

Non-intervention boreholes: These were the targeted boreholes that did not have any repairs carried out or chlorinator installed but could have been installed with sensors.

Operational functionality is defined as the capacity of a borehole to provide water without interruption due to mechanical failure, maintenance, or any other cause of downtime.

Private sector firms: Firms contracted to supply spare parts, and to support repair and maintenance of boreholes.

Uptime: The percentage of time when a borehole is operational within a year. This is the period taken to repair or fix a borehole once it malfunctioned. An uptime of 96 hours (4 days) was determined as a period within which water users dependent on the borehole did not resort to accessing unsafe sources of water which would otherwise lead to environmentally unfriendly response of boiling water as a form of treatment.

4.0. ACRONYMS

AMELP	Activity Monitoring and Evaluation Plan
ASALs	Arid and Semi-Arid Lands
BHA	Bureau for Humanitarian Assistance
BH	Borehole
BRRT	Borehole Rapid Response Team
CAPEX	Capital Expenditure
CECM	County Executive Committee Member
CFU	Colony Forming Units
CIDP	County Integrated Development Plan
CWT	Community Water Treatment
	Drought Resilience Impact Platform- Fixing Uptime Now and Decision Improvement
DRIP FUNDI	
E.Coli	Escherichia Coli
DPD	Diethyl-p-phenylenediamine
EE	Endline Evaluation
FCRM	Feedback Complaint Response Mechanism
FGD	Focus Group Discussion
FRC	Free Residual Chlorine
HH	Household
IDI	In-depth Interviews
IPTT	Indicator Performance Tracking Table
KII	Key Informant Interview
MEL	Monitoring, Evaluation, and Learning
MWA	Millennium Water Alliance
NTU	Nephelometric Turbidity Unit
NDMA	National Drought Management Authority
OPEX	Operational Expenditure
TC	Total Coliforms
VQ	Vision Quest
WASH	Water, Sanitation and Hygiene (WASH)
WMC	Water Management Committee
CIDP	County Integrated Development Plan

5.0. EXECUTIVE SUMMARY

One of the core challenges facing rural water supply in many parts of sub-Saharan Africa is the issue of extended downtimes following system breakdowns. Delayed response to broken boreholes often stems from unstructured or non-existent response systems, inadequate and unskilled human resources, and inadequate finances to resolve repairs. The issue is amplified in the Arid and Semi-Arid Lands (ASALs) of Northern Kenya, where the twin challenges of insecurity and recurrent floods and droughts make it even more difficult to ensure rapid borehole repair and reliable water supply for communities¹. In order to address this challenge, the Millennium Water Alliance (MWA) and Virridy, in partnership with the County Governments, designed and implemented the Drought Resilience Impact Platform – Fixing Uptime Now and Decision Improvement (DRIP FUNDI) Program. This document presents the results of an Endline Evaluation (EE) of the program.

DRIP FUNDI was a \$2 million program funded by the United States Agency for International Development (USAID)-Bureau for Humanitarian Assistance (BHA) over 18 months from September 2023 to March 2025, and targeting five Counties in Northern Kenya: Garissa, Wajir, Isiolo, Marsabit, and Turkana. The purpose of the DRIP FUNDI Program was to improve borehole uptime (the percentage of days when a borehole is operational within a year) from the current baseline of 84.7% to 90% annually. Increasing uptime to 90% was expected to contribute to the larger activity goal of ensuring a reliable water access for 120,000 people in the ASALs. The program had four intended outcomes:

Outcome 1: Borehole data for decision-making availed

Outcome 2: Broken boreholes are repaired within 96 hours (4 days)

Outcome 3: Borehole functionality monitoring efforts strengthened

Outcome 4: Alternative financing mechanisms for repairs and maintenance established and operationalized

The scope of the EE was to measure the program achievements against three (Outcomes 1-3) of the four program outcomes; and covered only intervention boreholes (those repaired, equipped with a chlorinator, or both). For outcome 4, the program will undertake a validation survey later in the year (September 2025), hence it was dropped from the endline evaluation.

Specific objectives of the endline evaluation were:

- To assess the functionality status and uptime of the sampled boreholes.
- To conduct water quality analysis, specifically E. Coli (EC) and Total Coliform (TC) testing for all sampled boreholes.
- To conduct Free Residual Chlorine (FRC) testing of sampled boreholes installed with treatment systems.
- To evaluate the effectiveness of the program's interventions in improving operation, repair and maintenance practices.
- To assess the capacities of the county government borehole rapid response teams, water management committees, borehole operators, and private sector entities to respond to breakdowns. This is in terms of human resources (availability, skills level, and coordination) and access to data, tools, equipment, and spare parts to undertake borehole repairs.
- To identify any intended and unintended impact (positive and negative) of the program.
- To provide recommendations for program improvement and future sustainability.

¹Source: MWA, Drought Resilience Impact Platform- Fixing Uptime Now and Decision Improvement (DRIP-FUNDI) Baseline Report, 2023.

Evaluation Methods

The endline evaluation utilized a cross-sectional mixed methods approach and purposive sampling to ensure consistent, generalizable data collection for the five counties. Data collection involved observation and water testing at the boreholes, KIIs with county WASH representatives, Borehole Rapid Response Teams (BRRTs), borehole operators, the private sector (Epicenter and Solargen) as well as the MWA program team and FGDs with Water Management Committees. The fieldwork data collection commenced on April 4 and concluded on April 13, 2025.

The evaluation targeted intervention boreholes (those that were repaired, those with treatment, and those with both repair and treatment). For the household surveys, the borehole served as the reference point as this was their primary source of water. For each borehole visited, 2 HHs were selected for interviews. The water quality test was done for the functional visited boreholes; however, for the broken or closed the test was not conducted. The observation checklist was administered at all boreholes other than those in insecure, or flooded areas.

A total of 57 boreholes were observed, 132 Household Surveys conducted, 57 KII with Borehole operators, 65 water quality testing (biological) and 21 for chemical (FRC and pH), 5 KII with private sector, 6 KII with BRRTs, 6 KII with county officials, 5 FGD with Water Management Committees, and 4 KII with MWA program team.

Key Findings

- In the evaluation of results from Intermediate Outcome 1 - Borehole data for decision-making revealed, the results showed that barriers exist that affect the timeliness of the borehole repairs. The barriers include inadequate staffing, cumbersome procurement processes, logistical challenges, and lack of network service, as well as other contextual issues. The county teams also lacked the inventory of spare parts, which would come a long way in speeding up response to maintenance needs and minimizing borehole downtime.
- During the asset inventory development, it was also realized that it was easier and cheaper to register the assets above the ground. However, for below ground assets, it required complete removal of the pump and related accessories for the program to get a full list of assets. This proved operationally expensive because of the costs associated with removal of pumps, test-pumping and complications related to borehole collapse.
- In the evaluation of results from Intermediate Outcome 2– Broken Boreholes are repaired within 96 hours the DRIP FUNDI program set up a Feedback Complaints and Response Mechanism (FCRM) to facilitate reporting borehole breakdowns for repairs and maintenance. Specifically, the system consisted of a set of procedures and tools formally established and linked to other monitoring processes. During the evaluation, 64.4% of the households reported they were aware of the feedback or complaints channel, with the main reporting mechanism being, the “in-person with the operator” at 96.5% in the program; those who reported through in-person with the county government were 25.9%, phone calls with county and private sector were 7.1% and 1.2% respectively. None of the household respondents (0%) noted using the toll-free line for feedback or complains.
- In terms of repair of boreholes within the 4-day target period, data from the mWater platform indicates that indicates only 2.4% (n=1) of the boreholes were repaired within 4 days; 63.4% (n=26) within 5-30 days, 4.9% (n=2) between 31-60 days, 14.6% (6) between 61-120 days, and 14.6% took more than 121 days to be repaired. Based on the analysis, an uptime of 85.7% was attained at the endline showing some improvement from the baseline value of 84.7%

- On average, the BRRTs noted that the breakdown notification time varies between 1-30 days; and the average response time is 2 days- 2 weeks. Response might not necessarily translate to repair as there are other processes of diagnosis, procurement of spare parts and final repair. An analysis of the repair times for counties showed that most of the boreholes repaired within 5-30 days were in Wajir. Feedback from the EE signifies various technical, operational and contextual challenges in maintaining borehole uptime.
- In the evaluation of results from Intermediate Outcome 3- Borehole functionality monitoring efforts are strengthened, data from the KIs indicate that the teams are utilizing climate change (seasonal monitoring of wet and dry periods) information to prepare for dry spells. The installation of sensors and the use of mobile applications were useful for receiving data and managing their repairs and maintenance operations. The Virridy sensors and mWater dashboards were integrated and once data on non-functionality was received, the team (private sector and BRRTs) undertook diagnosis to establish the problem before procurement process for spare parts and repair were undertaken. Though, the communities appreciated water treatment, the issue of taste and smell of chlorine made communities to have a negative feeling on the sources that were installed with the Klorman Inline Chlorinators. This led to several boreholes being disconnected from the treatment system.
- In addition, the BRRTs reported that they receive information from NDMA which was used to prepare for dry spells by conducting preventive maintenance, ensuring water storage is functional, stocking spare parts and prepare for potential droughts, floods, or other weather events that could impact water infrastructure. The private sector on the other hand noted that they used the climate change information to develop borehole-specific contingency measures based on predicted risks; for example, during drought season they pre-position spares in readiness for repairs, in drought season they elevate storage tanks and ensure drainage systems are open.

CONCLUSIONS

Improving water service delivery is a challenge that draws support from county and private sector teams. DRIP FUNDI intervention introduced an innovative technological solution of using sensors to help solve the challenge of timely borehole repairs. Whilst this has improved the timeliness of the borehole repairs, a lot more needs to be done to fully realize the required uptime period for reliable water supply to the communities these boreholes serve.

In outcome 1, the program did indeed avail data for decision-making for timely borehole repairs. Development and updating of the asset inventory and spare parts was a collaborative effort between the county BRRTs and private sector. However, the major was that the inventory was only for above-ground assets. It was difficult to undertake the below-ground asset register because that required removal of pumps etc making boreholes non-functional for a long period.

In outcome 2, the program target was to improve borehole uptime from 84.4% to 90% by providing support for timely borehole repairs. To actualize this, DRIP FUNDI signed a tripartite borehole repair agreement with county administration and private sector partners. At the endline, an uptime of 85.7% was attained showing some improvement (1.3%). One of the main reasons for untimely repair was sighted as the internal procurement system which was not adapted to align with this target. This meant that procurement time was far much longer making it hard to repair boreholes within the 96 hours, target. Equally, there was also a cash-flow issue for the private sector making it difficult to stock the required spare parts.

In outcome 3, the program focus was to undertake two main activities: develop and strengthen capacities of BRRTs and the private sector partners in accessing and interpreting borehole sensor

dashboards; and sensitization of communities and stakeholders on the DRIP FUNDI model. The endline evaluation found that both the BRRTs and the private sector had access and were making use of the dashboards in receiving data relating to number of breakdowns for repositioning of fast-moving parts. Equally, by consolidating the dashboard data and secondary data from NDMA, the evaluation confirmed that, the BRRTs and the private sector developed contingency plans for all the five counties based on predicted risks for management of boreholes. On sensitization of communities and stakeholders on DRIP FUNDI model, the evaluation results show that, 52.3% of the households didn't know about the program, while 63.6% were more aware of the BRRTs. This could have shown popularity on the part of the BRRTs, a positive indication for implied sustainability of the program.

RECOMMENDATIONS FOR PROGRAM IMPROVEMENT AND SUSTAINABILITY

Based on our experience and findings, the evaluation team offers the following recommendations for future programmatic decisions:

Outcome Area	Recommendation
Intermediate Outcome 1: Borehole data for decision-making availed	<ul style="list-style-type: none"> • Include sensitization on chlorine treatment and Social Behavior Change Communication (SBCC) through hygiene education on water safety to create demand for safe water. The program did not create demand for safe water which meant that, a number of boreholes had the Klorman Inline Chlorinator disconnected either because of improper installation or a malfunction.
Intermediate Outcome 2: Broken boreholes are repaired within 96 hours	<ul style="list-style-type: none"> • Establish workshops for repair of mechanical parts of boreholes to address the notable delay in procurement processes affecting both the physical diagnosis, purchase of spare parts and actual repair of boreholes. • Increase targeted capacity building or professionalize the borehole operations • Feedback to manufacturers of specific high-value assets to provide an opportunity to encourage sharing of information on the performance of various pumps or motors.
Intermediate Outcome 3: Borehole functionality monitoring efforts strengthened	<ul style="list-style-type: none"> • Allow for multi-Use Water system based on competing water uses to support the speedy responses required in diagnosis, purchase of spare parts and repair of the borehole. • Develop clear protocols on WQ and O+M. The program over relied on the sensor without any significant human interaction which meant that, they could only trigger O+M response when a malfunction happened. • Map the water supply system for each borehole. Mapping could help establish point sources of contamination to enable development of a remedy to contamination.
Program design, administration and financing	<ul style="list-style-type: none"> • Establish a Modified Procurement Process • Explore and include other funding streams for service sustainability • Institutional support and policy on county budget allocation for WASH DRIP FUNDI to support counties in the budget-making and budget-monitoring process and encourage the ring-fencing of water funds making them available for both CAPEX and OPEX.

1.0. INTRODUCTION AND BACKGROUND

1.0. INTRODUCTION

In Kenya's Arid and Semi-Arid Lands (ASALs), frequent borehole breakdown continues to contribute significantly to the severity of drought emergencies. Over the past decade, the National and County governments, local communities and development partners have put significant effort in mitigating drought related emergencies through various efforts. The efforts have included among others development of new boreholes and water sources, installation of thousands of groundwater pumping stations, community education, institutional strengthening and others. Unfortunately, these investments have not yielded the desired improvement in the situation.

One specific area of focus that has received a lot of attention for stakeholders in Northern Kenya has been in addressing frequent borehole breakdown, repairs and maintenance with most of the efforts focusing on enhancing the monitoring of boreholes to improve their functionality. However, evidence suggests that, despite more accurate and timely diagnostics of water point breakdowns, local communities and regional governments still face challenges in effectively managing the operations, maintenance, and service delivery in these regions. According to a survey undertaken by MWA in Northern Kenya, frequent breakdowns in borehole water systems severely impact access to water, especially in drought-prone areas, due to extended repair times and reliance on external funding. Addressing these issues requires improved borehole repair and maintenance models, better financing, and increased community involvement to make water systems more resilient. The assessment revealed that motors and submersible pumps are the most frequent points of failure, accounting for 40.21% and 26.46% of breakdowns, respectively. (Source: MWA).

In order to address this challenge, the Millennium Water Alliance (MWA) and Virridy designed the DRIP FUNDI program to address the borehole functionality by improving uptime by making borehole data available and accessible to improve decision-making for better water service delivery. With support from the United States Agency for International Development's (USAID's) Bureau for Humanitarian Assistance (BHA), DRIP FUNDI program committed to provide sustainable access to water for domestic uses for one hundred and twenty thousand (120,000) people in five ASAL counties in Kenya, specifically Garissa, Isiolo, Turkana, Wajir and Marsabit. The program was designed to enhance the operational uptime of boreholes - defined as the percentage of months when a borehole is operational within a year - from a baseline of 84% to a targeted 90 annually.



Figure 1: The DRIP FUNDI Target Counties

This report presents the findings from the Endline Evaluation (EE) of the DRIP FUNDI Program. The report begins with background on DRIP FUNDI followed by details of the evaluation purpose and

design, including a description of data collection methods for both quantitative and qualitative analyses. Next the report provides in-depth results corresponding to the EE’s focus outcomes then presents findings from the water testing done in the boreholes. The report also summarizes results from the KIs and FGDs conducted with local water users in the target counties and concludes with a summary of key findings of the EE and recommendations to improve water service delivery.

1.1. PROJECT DESCRIPTION

The DRIP FUNDI is a \$2 million program funded by the USAID - BHA for 18 months from September 2023 to March 2025. The program was implemented by MWA in partnership with Virridy, with a goal of improving sustainable access to water for domestic uses for 120,000 people in the five Counties of Garissa, Wajir, Isiolo, Marsabit and Turkana, by improving the functionality of 200 boreholes.

Program Theory of Change: IF remote borehole monitoring data is utilized for timely decision-making on repair and maintenance, repair teams are supported to respond to borehole breakdown to improve borehole and carbon financing generated to sustain repairs then communities in Arid and Semi-Arid Lands will have sustainable access to water for domestic uses.

As graphically represented in Figure 2, the program theorized that if remote borehole monitoring data was utilized for timely decision-making on repair and maintenance, repair teams were supported to respond to borehole breakdown to improve borehole uptime and carbon financing was generated to sustain repairs, then communities in the ASALs will have sustainable access to water for domestic use.

A key component of the theory of change is that officials in charge of water management used this information for timely borehole repairs. The sensors provide alerts of breakdowns which prompt a response for diagnosis and repairs. Alongside the sensors, other sources of information are utilized as triangulation of the alerts such as phone calls from borehole operators and WMCs to BRRTs and Private Sector or in some instances, in person reports during routine checks. The reports inform responses to breakdowns, coupled with timely access to borehole spare parts and supporting BRRTs to procure tools and logistics. The borehole sensor

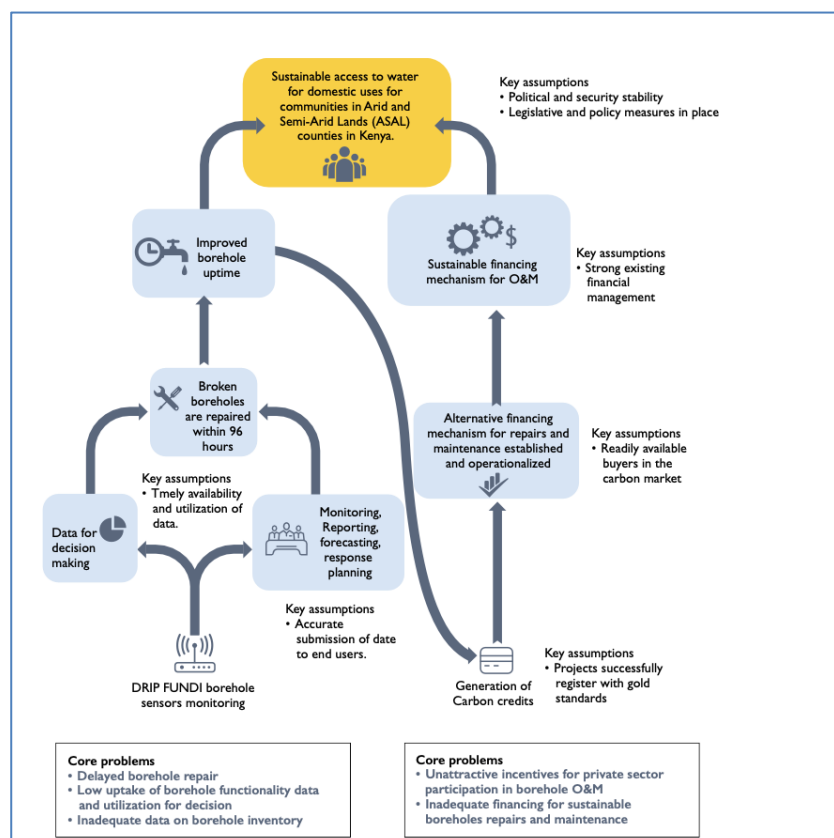


Figure 2: DRIP FUNDI Theory of Change

dashboards/ mobile phone-based data collection tools should have been used for continuous monitoring.

Cognizance of the fact that the DRIP FUNDI activity was at the confluence of humanitarian and development assistance, MWA was designed to layer, sequence, and integrate its interventions with some of the longer-term development activities in the five counties to empower pastoralist communities in Northern Kenya to withstand and recover from recurrent drought. The humanitarian assistance under DRIP FUNDI was expected to act as a platform upon which the development and resilience programs above can build on while the integration of DRIP FUNDI with the resilience and development projects was expected to reduce humanitarian caseloads in these arid counties. Coordination with the programs was done through existing forums such as the county water forums that meet regularly, individual County Steering Group (CSG) forums, the national WASH stakeholder forum and the USAID Partnership for Resilience and Economic Growth (PREG) platform.

Another key focus of DRIP FUNDI was the engagement of the private sector to support the implementation of the interventions under the activity as well as sustain the interventions beyond the life of the award. Private sector stakeholders were enlisted to provide repair and maintenance services for the broken boreholes during the activity implementation period under a result-based financing model.

PROGRAM PURPOSE

The purpose of the DRIP FUNDI program was to improve borehole uptime (the percentage of days when a borehole is operational within a week) from the baseline of 77%² to 90%³ annually. This baseline uptime was derived from an analysis of borehole sensor data by Virridy while the target uptime is recommended based on peer-reviewed research. Increasing uptime to 90% was expected to contribute to the larger activity goal of ensuring a reliable water supply for 120,000 people in the ASALs. To achieve the overall goal and theory of change, the program focused on the following four intermediate outcomes:

a) Intermediate Outcome 1: Borehole data for decision-making availed – To achieve this, the program committed to collect county-specific data on barriers and solutions for timely borehole repairs. Additionally, the creation of a borehole asset inventory was also developed to support quick decision-making processes for the boreholes in focus, enhancing the efficiency of addressing reported breakdowns.

b) Intermediate Outcome 2: Broken boreholes are repaired within 96 hours (4 days) – This was to be accomplished by leveraging data from borehole sensors and facilitating:

- i. Timely access to spare parts necessary for repairs and maintenance and
- ii. Supporting the Borehole Rapid Response Teams (BRRTs) to acquire tools and logistics. A tripartite borehole repair agreement involving MWA, the county administration, and a private sector partner was to be signed, alongside a transparent, verifiable, and accountable payment system for borehole repair works, which was meant to guarantee accountability to MWA and stakeholders involved.

² Thomas, E., Wilson, D., Kathuni, S., Libey, A., Chintalapati, P., & Coyle, J. (2021). A contribution to drought resilience in East Africa through groundwater pump monitoring informed by in-situ instrumentation, remote sensing, and ensemble machine learning. *Science of The Total Environment*, 780, 146486. <https://doi.org/10.1016/j.scitotenv.2021.146486>

³ Brown, J., & Clasen, T. (2012). High adherence is necessary to realize health gains from water quality interventions. *PLoS one*, 7(5), e36735.

Intermediate Outcome 3: Borehole functionality monitoring efforts strengthened - MWA committed to enhance knowledge and practices related to borehole response planning and monitoring using information and communication technologies. This included:

- Developing and strengthening capacities of BRRTs and private sector partners in accessing and interpreting borehole sensor dashboards, as well as utilizing mobile phone data collection tools for continuous monitoring,
- Collaborating with RAPID+ for the maintenance of borehole sensors to minimize disruptions in the remote monitoring system; and
- Sensitization of communities and stakeholders on the DRIP FUNDI model.

d) Intermediate Outcome 4: Alternative financing mechanism for repairs and maintenance established and operationalized - DRIP FUNDI aimed at registering the project with the Gold Standard for Global Goals Carbon Registry. This move was intended to facilitate the generation of carbon credits from the project’s activities for onward sale in the carbon markets. The revenues obtained from these transactions were designated for financing the repair and maintenance of boreholes. This innovative financial mechanism was envisioned to bolster the project’s sustainability and ensure continuous access to water in the targeted communities.

The program outcomes are summarized in figure 3 below;

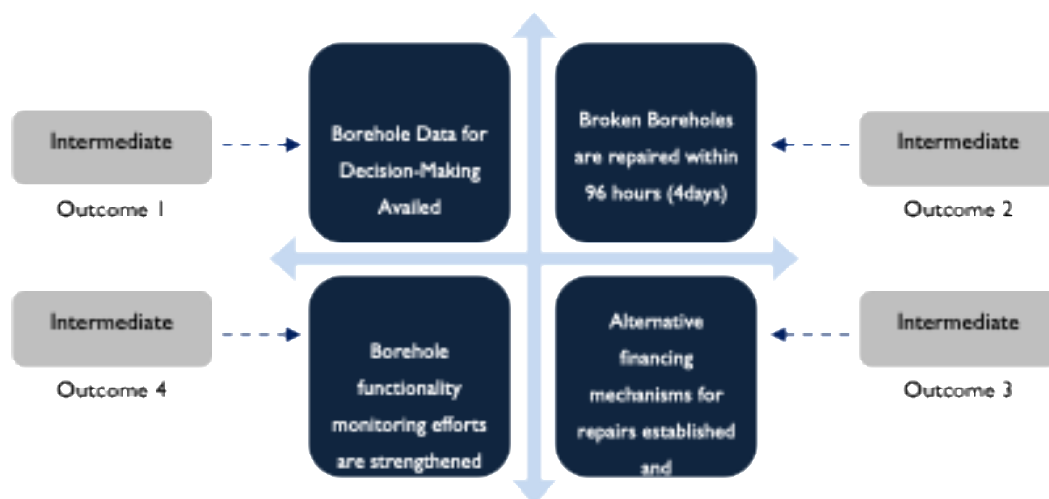


Figure 3: DRIP FUNDI Intermediate Outcomes

During implementation, DRIP FUNDI committed to making borehole data available and accessible to improve decision-making for better water service delivery. To monitor borehole functionality, Virridy sensors were installed on 153 boreholes across the five counties: Isiolo (41), Marsabit (27), Garissa (27), Wajir (22), and Turkana (36). These sensors enabled continuous monitoring of borehole functionality, providing valuable data for responsive repairs and preventative maintenance.

A borehole asset inventory and a list of fast-moving spare parts for the target boreholes were also developed to facilitate rapid decision-making on the spare parts needed for borehole repairs. To ensure broken down boreholes are repaired within 96 hours, MWA developed a collaborative framework with the County Borehole Rapid Response Teams (BRRTs) who supported the borehole repair and maintenance; and two private sector partners (Solargen Technologies Limited and Epicenter Africa Limited) who were contracted to supply spare parts, and to support the repair and maintenance of boreholes. Solargen Technologies Limited was contracted in Isiolo, Marsabit, and Wajir counties,

and Epicenter Africa Limited was contracted in Garissa and Turkana counties. To strengthen borehole functionality monitoring efforts, BRRT technicians were trained on the Virridy borehole sensor dashboard and mobile based monitoring tools.

2.0 EVALUATION APPROACH AND METHODOLOGY

2.1. EVALUATION DESIGN

The evaluation broadly adopted a 4 phase approach which included the inception phase; fieldwork and data collection phase; data analysis and reporting phase as well as dissemination phase. The data collection exercise was undertaken from April 4-13, 2025. A cross-sectional study approach and purposive sampling were utilized during the endline evaluation of the program to ensure consistent, generalizable data collection for the five counties. Data collection involved administering a household survey, water quality testing, KIIs with borehole operators, BRRT, county department officials, private sector and the MWA program team and FGD with water management committees. The approach to each of the phases is outlined alongside.

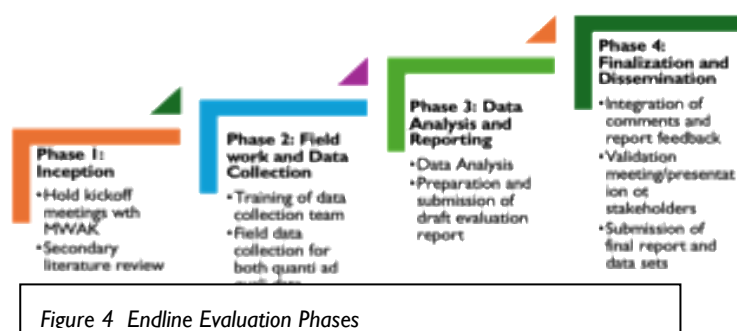


Figure 4 Endline Evaluation Phases

Phase I: Inception Phase/ Document Review

During the inception phase, Vision Quest (VQ) conducted the endline kick-off meetings with the MWA-K team mainly for orientation purposes as well as in-depth discussion on the study scope of work, data collection tools, sampling process, and final study sample size. During this phase, our team also conducted a comprehensive review of secondary data from the project proposal, project Activity Monitoring and Evaluation Plan (AMELP), baseline report, and annual report. The main deliverables for this phase included an Inception Report outlining detailed study methodology, fieldwork plan and detailed end term review schedule as well as study tools and instruments.

This phase included development of the draft data collection tools and guides comprising of the quantitative and qualitative instruments (Annex B). A total of 9 tools were developed 1) a household survey 2) borehole operator questionnaire 3) borehole observation checklist 4) Water quality testing checklist 5) KII guide for BRRT 6) KII guide for county department officials 7) KII guide for private sector 8) FGD guide for water management committees 9) In-depth KII guide for MWA program team. Finally, the household survey tool and the borehole operator questionnaire were then coded on the mWater platform (figure 5) and subjected to pre-tests to check on the relevance of the questions and ensure the accuracy of skip patterns and logical flow.

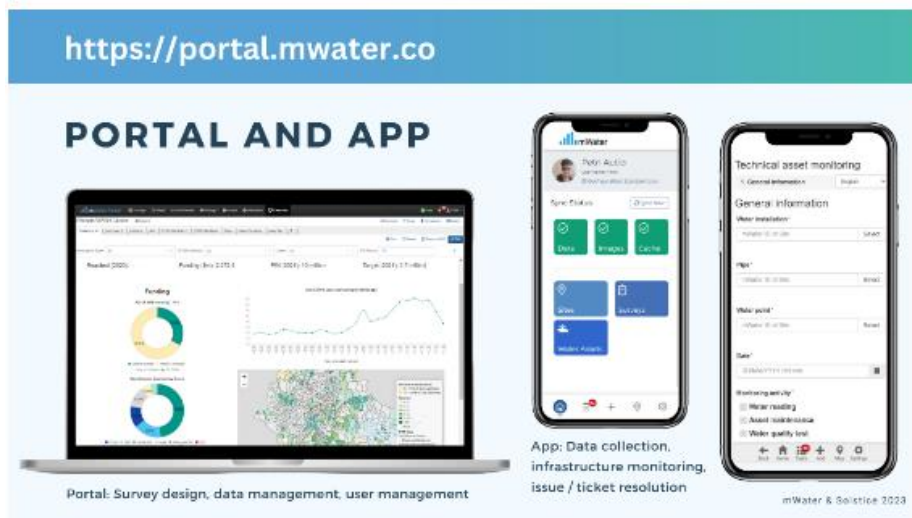


Figure 5 mWater portal and application interface: Source mWater.

Phase 2: Field Work/ Data collection Phase

In preparation for the field work, the team developed a detailed movement plan to guide data collection in the counties. This plan was developed collaboratively with the MWA team who took part in the enumerator training. In addition, locally selected enumerators from each county were recruited and trained on the data administering the Key Informant Interviews (KIIs) as well as conducting water quality tests. In each county team a water technician was recruited to undertake the water quality testing. The enumerators were also trained on ethical practices to be adhered to during data collection. After the enumerators training, practical session to test the household survey and water quality testing checklist were undertaken.

During data collection daily debriefs were held to identify any gaps and ensure that immediate corrective actions are taken if necessary. The main deliverable for this phase will include raw and cleaned data sets from the field work. The map with sites covered during data collection are provided in figure 6

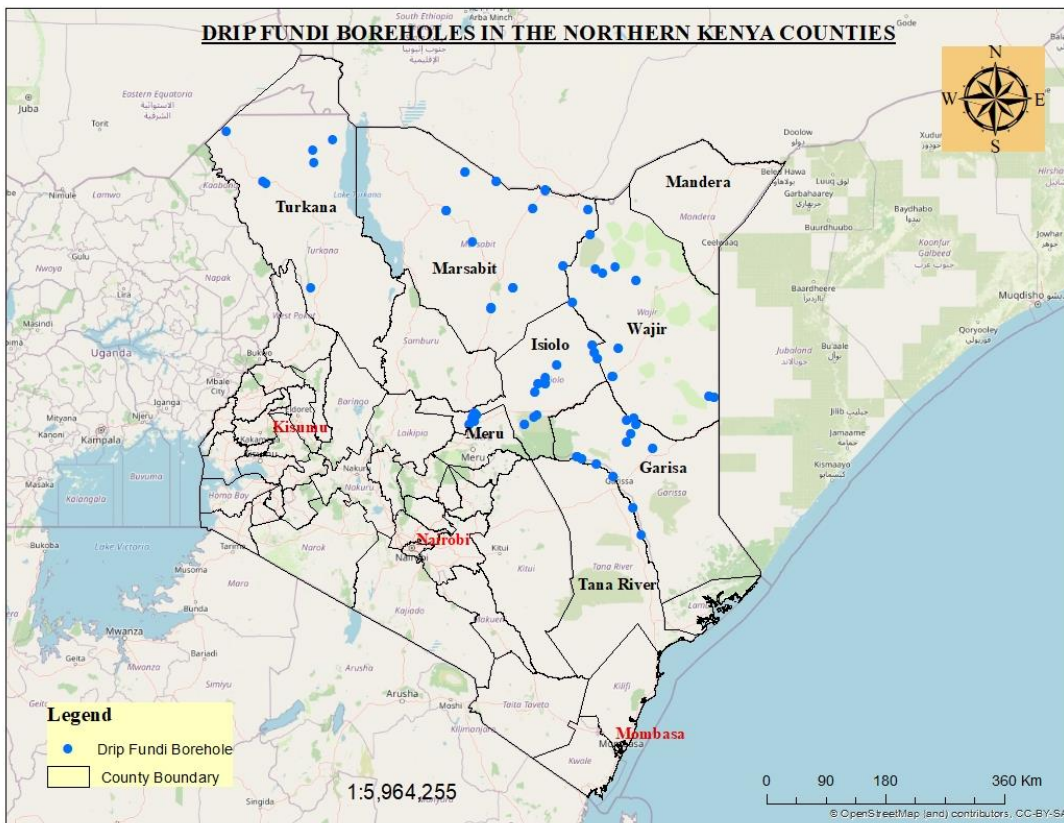


Figure 6 Map of boreholes visited in the EE

Phase 3: Data Analysis and Reporting

The collected data underwent a data cleansing process to any rectify errors in readiness for data analysis. Quantitative analysis was conducted using advanced excel techniques for analyzing and visualizing data while for the qualitative data a thematic analysis/ coding of the transcripts into relevant themes was undertaken. The endline report was developed and finalized based on the results from the analyzed field data. A presentation of findings to the MWA program team. As part of the report, the endline values for the Indicator Performance Tracking Table (IPTT) were provided in comparison with the baseline values. A detailed description of each data collection method with the sample is provided below.

2.2. DATA COLLECTION METHODS

2.2.1. OBSERVATION CHECKLIST

For a total of 57 boreholes (8 in Garissa, 12 in Isiolo, 10 in Marsabit, 14 in Turkana, and 13 in Wajir), an observation checklist was administered to collect data on the general functionality at the time of visit; the BH log with details on the design and construction; the power supply (solar, diesel generator, or hybrid system); and the general condition of the BH in terms of management. The observation checklist was also used to collect data on the available records at each borehole. The observation checklist was administered at all boreholes other than those in insecure, or flooded areas

In addition to the observation checklist for the purpose of the DRIP FUNDI activity which was to improve borehole uptime (the percentage of time when a borehole is operational within a year), the study team designed the framework in **Error! Reference source not found.**, as a guide to provide

borehole data for decision-making; and ensure timely repair and maintenance of the boreholes (uptime).

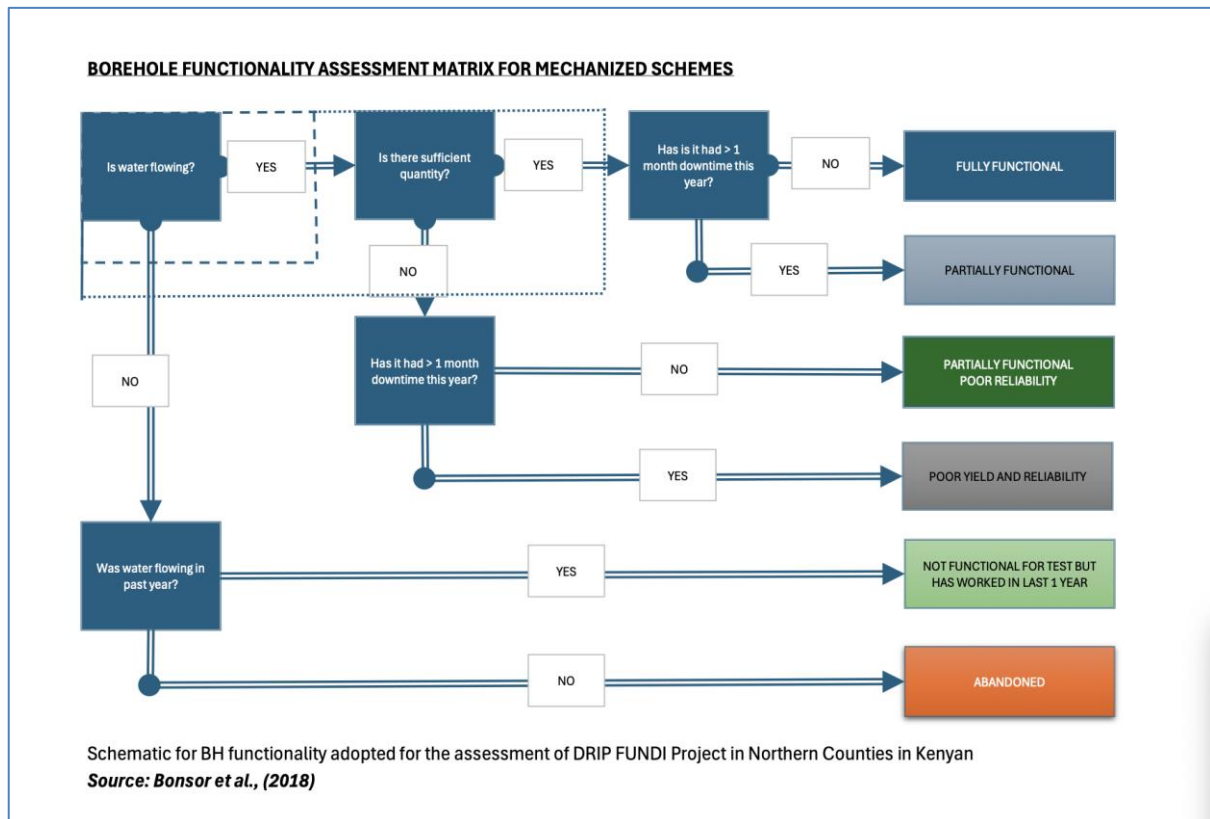


Figure 7 Overall Borehole Functionality Framework

2.2.2. HOUSEHOLD SURVEY

The team undertook rapid surveys from a sample of two (2) households served by the boreholes under the program near the targeted boreholes to assess water quality, changes in water access, reliability, and household water management practices. A total of 132 households were interviewed across 66 boreholes. Data for the household survey was collected on an electronic device using the mWater platform.

2.2.3. WATER QUALITY TESTING

At 65 boreholes, a biological water quality analysis was conducted by testing for E. coli and Total Coliform presence/absence through observing coloration of the water sample under UV light. Equally, for boreholes that have been installed with Klorman Inline Chlorinator, the amount of Free Residual Chlorine (FRC) and the pH were measured on site to determine if the right chlorine dosage had been achieved or if there could be point source contamination, which would require additional water treatment. A detailed protocol was observed for each water quality monitoring as detailed below.

2.2.3.1. E. COLI AND TOTAL COLIFORMS TESTING PROTOCOL

The tests were conducted using the Aquagenx® Water Test Kit, which deploys Presence/Absence (P/A) Testing. The test detects EC and TC in a 100 mL water sample. The biological water quality test was undertaken for all BHs sampled. First, the water quality team determined that the sample being drawn is from the target BH where DRIP FUNDI had undertaken interventions such as repair, installation of sensors, or installation with a Klorman Inline Chlorination unit. Upon identification of the BH, a sample was drawn from the respective point (BH, kiosk, tap or household jerrican) and by use of the Aquagenx®, respective samples were prepared, properly marked and labelled and incubated for 24 – 36 hours to allow for growth of the EC and the TC bacteria colonies. The temperature across the five counties ranged from 30–36-degree Celsius which then informed the incubation period of between 24 and 36 hours. The samples were then read in low light for best use of the Infrared light to detect P/A of the respective bacteria (EC or TC) and recorded.

2.2.3.2. FRC AND PH TESTING PROTOCOL

The FRC was carried out on-site and recorded together with a pH test of the same water sample. Before undertaking the FRC and pH, the water quality team established that the water system had a Klorman Inline Chlorinator installed and was operational (checked if the valves were open and connected). Water samples were collected from kiosks, taps, and household jerricans supplied by target BHs equipped with Klorman Inline Chlorinators. Free Residual Chlorine (FRC) and pH levels were tested using a Comparator, with DPD Chlorine Reagent used for FRC and Phenol Red Reagent used for pH.

2.2.4. KEY INFORMANT INTERVIEWS

In-depth interviews were conducted with key informants, including the borehole operators, County BRRTs, county WASH representatives, as well as the private sector representatives and MWA program team. The KIIs provided information on the effectiveness of the program's interventions in improving operations, repair, and maintenance, as well as recommendations for program improvement and sustainability. The interviews followed a structured format, allowing for follow up questions and probing. The interviewer took detailed notes from each interview and later transcribed for analysis. The anonymized KII list is provided in Annex C.

2.2.5. FOCUS GROUP DISCUSSIONS

In each county, FGDs were held with the Water Management Committees to garner stakeholder insights about the program, information on the effectiveness of the program's interventions in improving operations, repair and maintenance, as well as provide recommendations for program improvement and sustainability. The FGDs had between 6-8 members of the committee. As per the committee constitution, both male and female genders were represented in the FGDs. In each FGD, a moderator and a note taker from the evaluation team were present. The moderator facilitated the FGDs in the local language, while the note taker took detailed notes of the conversation. The evaluation team analyzed data from the FGDs and KIIs using content analysis techniques, in which text was coded according to key themes of interest across the interviewees and discussion participants.

2.3. DATA COLLECTION SUMMARY

Based on the methodology described above, Table 1 provides the total number of respondents interviewed for each category.

Table 1: Summary of data collection

Tool	Data Collection Method	Target	Actual	Deviation (+-) with reason
1	Household Surveys	172	132	We undertook 2 household interviews for each borehole visited. The visited boreholes were 66 which brings the total households interviewed to 132.
2	KII with Borehole operators	25	57	While the total number of visited boreholes was 66, in 9 of the boreholes the operators were not available for interviews thus a total of 57 operators were interviewed.
3	Borehole observation checklist	86	57	The initial target boreholes were 86, however, this had 4 duplicates. Further 16 BHs were dropped due to insecurity and accessibility challenges. Out of the remaining 66 visited BHs, in 9 of them, the operators were not available for interviews thus a total of 57 BHs were observed.
4	Water quality testing checklist	86	65	The initial target boreholes were 86, however, this had 4 duplicates. Further 16 BHs were dropped due to insecurity and accessibility challenges. Out of the remaining 66 visited BHs, one was broken and therefore water quality was not undertaken bringing the number to 65.
5	KII with BRRT	10	6	The initial target was to interview 2 per county; however, for some counties only the lead/ technician was available as most were out in the field. For each county at least one BRRT representative was interviewed
6	KII with County officials	10	6	The initial target was to interview both the county WASH directors as well as County Chief officer/ CEC Member for Water. In 4 counties only one of the county staff was available for interviews.
7	KII with Private sector	3	5	Solargen, Virridy and Epicenter representatives were interviewed from the Nairobi offices and select county offices
8	FGD with Water Management Committees	5	5	One FGD with the committees was conducted in each county.
9	KII with MWA program team	4	4	A preliminary discussion was held with current and former MWA staff on the program.

2.4. LIMITATIONS AND CHALLENGES

During the evaluation, the team encountered a number of limitations that could have led to lack of certain data sets. However, every effort was made to ensure that this was mitigated as discussed under.

1. Insecurity/ poor infrastructure: This limited the movement to some sampled sites and necessitated change of movement plans or site replacement based on advice from the ground teams. The evaluation happened during the rainy season thus some sub-counties were not accessible.
2. Some stakeholders especially in government were not available for the interviews, despite numerous follow ups. Where possible, this was resolved by replacing them with other key informants within the same departments who were equally informed about the project.
3. In three of the boreholes visited, despite these boreholes being installed with inline chlorinator the borehole operators had closed the valve passing water through the chlorinator for treatment after complaints from water users thus the team had to wait for at least 30 minutes for water to pass through the chlorinator before they could conduct the FRC test. This caused delay and disruption of the movement plan.

3.0. SOCIO-DEMOGRAPHIC FINDINGS

The section below provides information on the socio demographic characteristics of the households

3.1. AGE AND GENDER OF RESPONDENTS

The data revealed that 50.8 % (n=67) of the household respondents were aged between 18-35 years. 39.4 % (n=52) were aged between 36-64 years and 9.8% (n=13) were 65 years and above. The findings also show that 78.9% (n=45) of borehole water operators were aged between 36-64 years. This could indicate that this age group dominates the water operators in the five counties. 15.8% (n=9) were represented by the 18-35 age group which signifies low involvement of youth in the water system management.

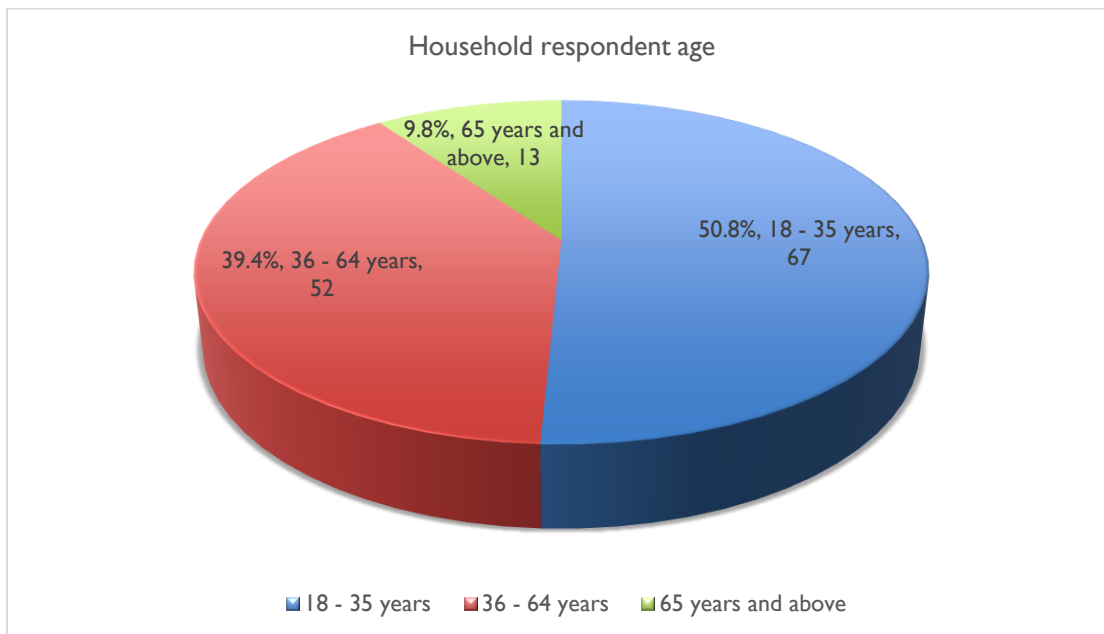


Figure 8 Household respondent's age

While the overall percentage of women household respondents was higher than men (54.5% compared to 45.5%), Garissa and Wajir counties had a higher number of male respondents in comparison to women. This finding aligns with the results from the DRIP FUNDI Baseline report where the proportion of female respondents in these two counties was notably lower, attributed to cultural norms that restrict interactions between females and male enumerators. As a result, male household members often undertook the responsibility of answering the Key Informant Interviews (KIIs). In Marsabit county, none of the respondents interviewed was male as they were not available at the household/ water point. Additionally, 96.5% (n=55) of the borehole operators were male signifying that while females predominantly manage water-related tasks at the household level they have a low participation in the water system management.

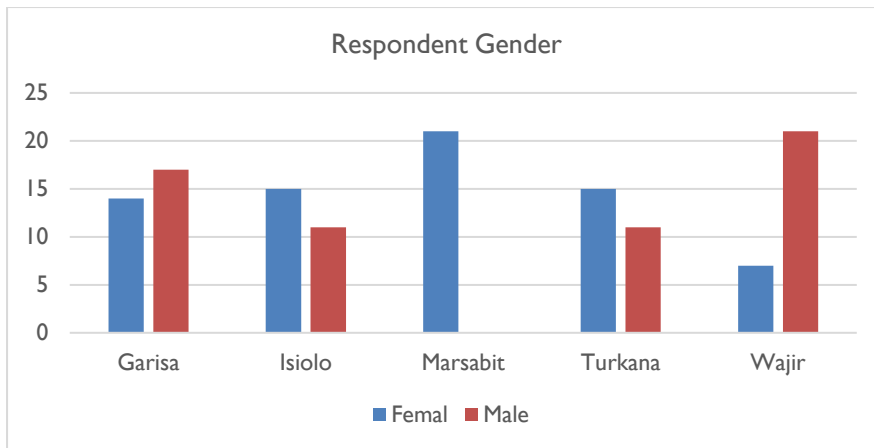


Figure 9 Household respondent's gender

3.2. HOUSEHOLD SIZE

In the endline evaluation, the average family size was 8.3 members: with an average of 4.0 for male and 4.3 for female. It was observed that the average household sizes across all the counties exceeded those reported in the 2019 Kenya National Bureau of Statistics census. This could be attributed to the purposive sampling used in selection of households near the water points as compared to representative sampling used during national census.

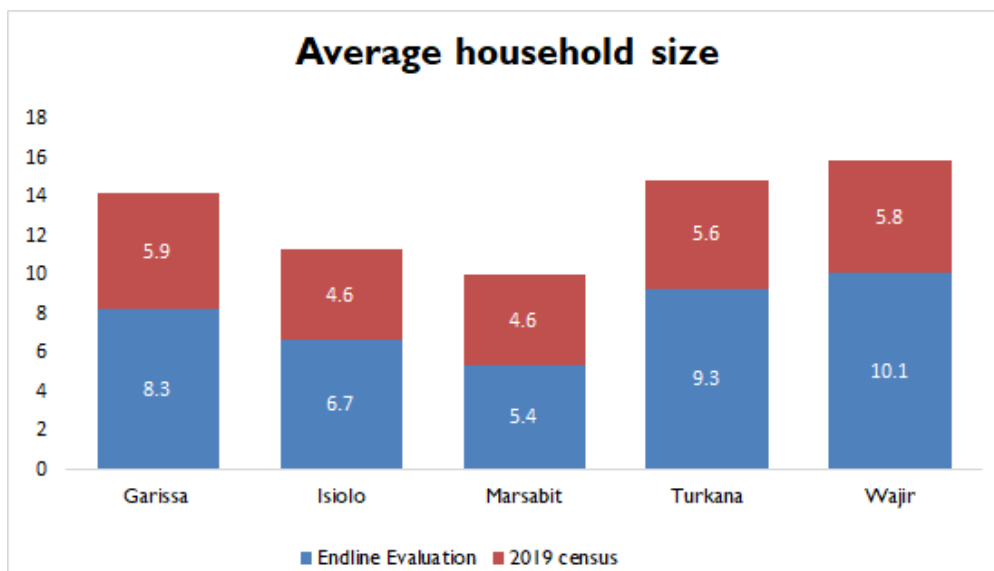


Figure 10: Average Household Size

3.3. INTERVENTION TYPE

Secondary data (from the list provided by MWA) suggested that 42 of the visited boreholes were repaired while 24 were treated with chlorinator. This data matched that provided by the borehole operators during the evaluation on the intervention type. For the 57 boreholes, the operators noted that over 34,053 households are served by the boreholes.

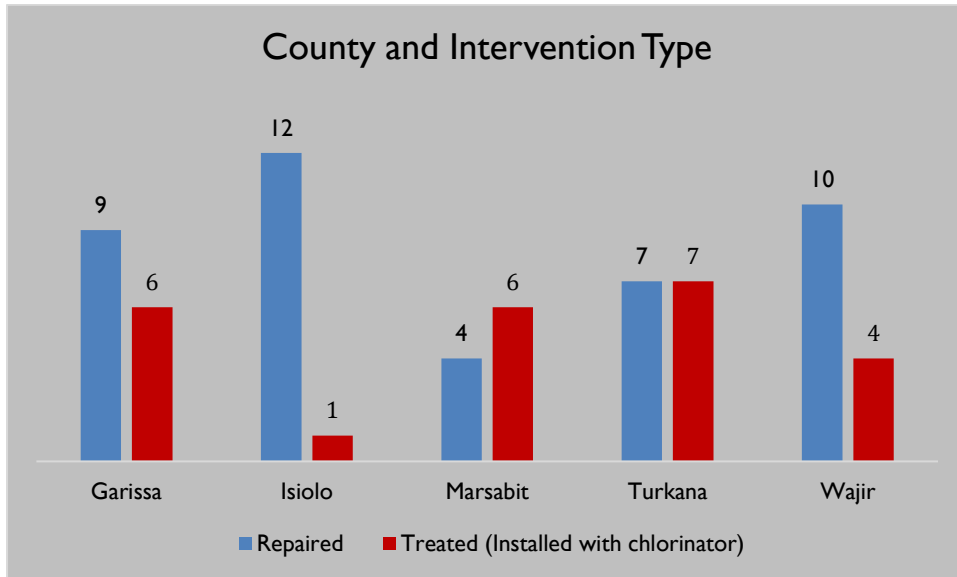


Figure 11: County and Intervention Type

3.4. BOREHOLE OWNERSHIP

Household data revealed that the majority of the boreholes were community owned (57.6%: n=38), county government (40.9%: n=27) and private/ individually owned (1.5%: n=1). The private owned borehole was in Garissa County. The model of borehole water user management was 47.4% water management committee, 33.3% village committee, 17.5% county government. This was confirmed by the county officials stating that water schemes are managed by water committees formed and elected by community representatives. These committees oversee the operations and maintenance of the schemes.

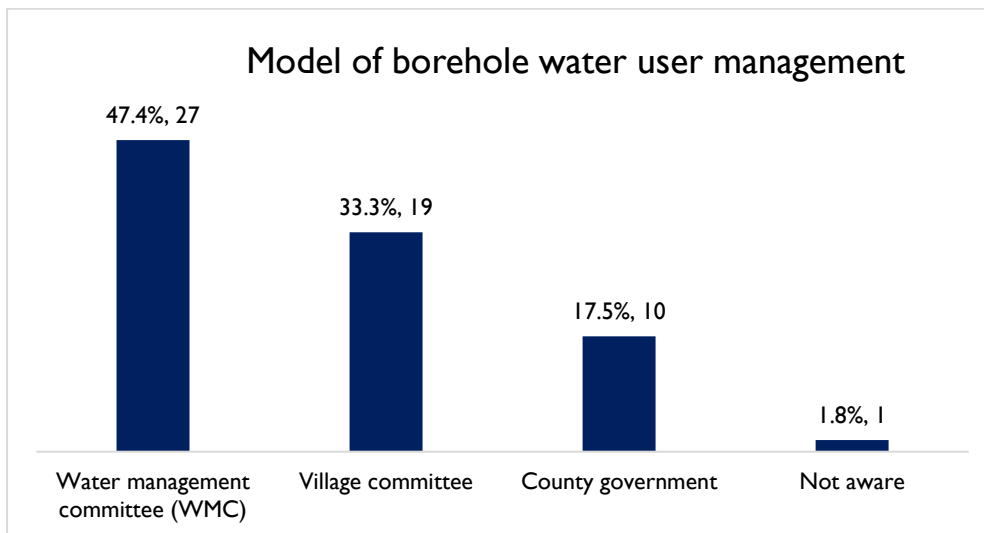


Figure 12: Model of borehole water user management

4.0. WATER ACCESS FINDINGS

The section below provides information on the water access parameters.

4.1. ACCESS TO PRIMARY WATER SOURCES

The endline household data indicates that piped to household (26%) and tube/ borehole (26%) were the main source of drinking water in the household; while piped to household (32.1%) and water kiosk (25.1%) were the main sources for cooking and washing.

Data from the borehole operators suggests that communal/public standpipes (42.1%) at the community is the main household water source

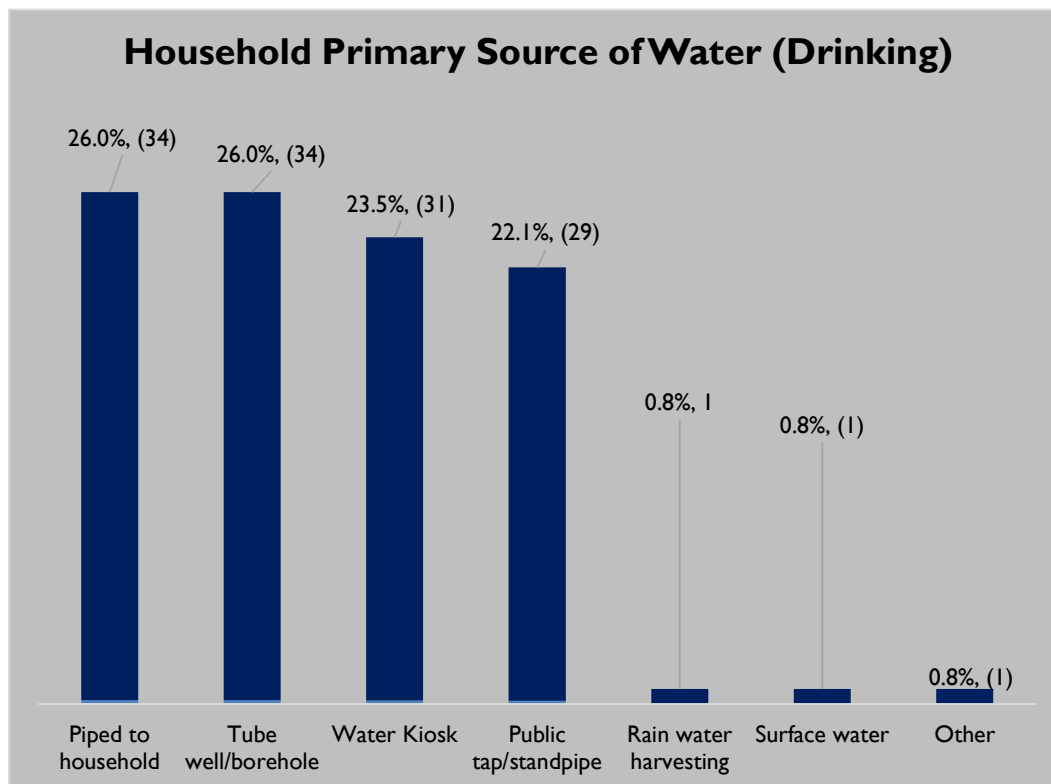


Figure 13: Household source of drinking water

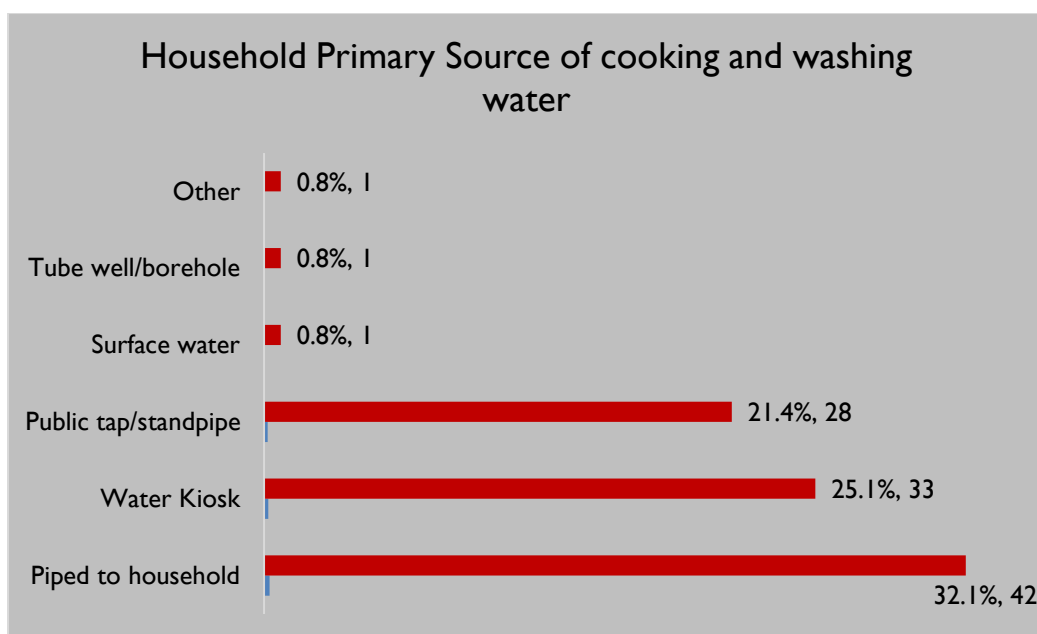


Figure 14: Household Primary Water Source for Cooking and Washing

4.2. DISTANCE TO WATER SOURCES

Data collected indicates that for households where water is not piped to household, majority (42.2%) take 0-15 minutes to and from the water point including queueing. For the secondary sources the majority (42.0) use more than one hour to arrive at the water point, which signifies a longer distance to the secondary source.

Distance	Primary water source: Time taken to and from the water point including queueing	Secondary water source: Time taken to and from the water point including queueing
0 - 15 minutes	42.2% (n=38)	17.6% (n=23)
16 - 30 minutes	23.3% (n=21)	18.3 (n=24)
31 - 60 minutes	15.6% (n=14)	21.4 (n=28)
More than one hour	18.9% (n=17)	42.0 (n=55)

Table 2: Distance to and from the water source

87.8% (n=79) of household members who collect water walk to the source, 8.9% (n=8) use animal transport (camel or donkey) and 1.5% (n=2) use a motor bike. All the households noted the use of a 20 liter jerrican to fetch water.

4.3. VISITS TO THE WATER POINT

In Garissa and Isiolo counties, the majority of the households indicated that they visit the water points once a day; compared to Marsabit and Turkana households whose majority visit twice a day. In Wajir a similar number of households visit the water point twice and three times a day

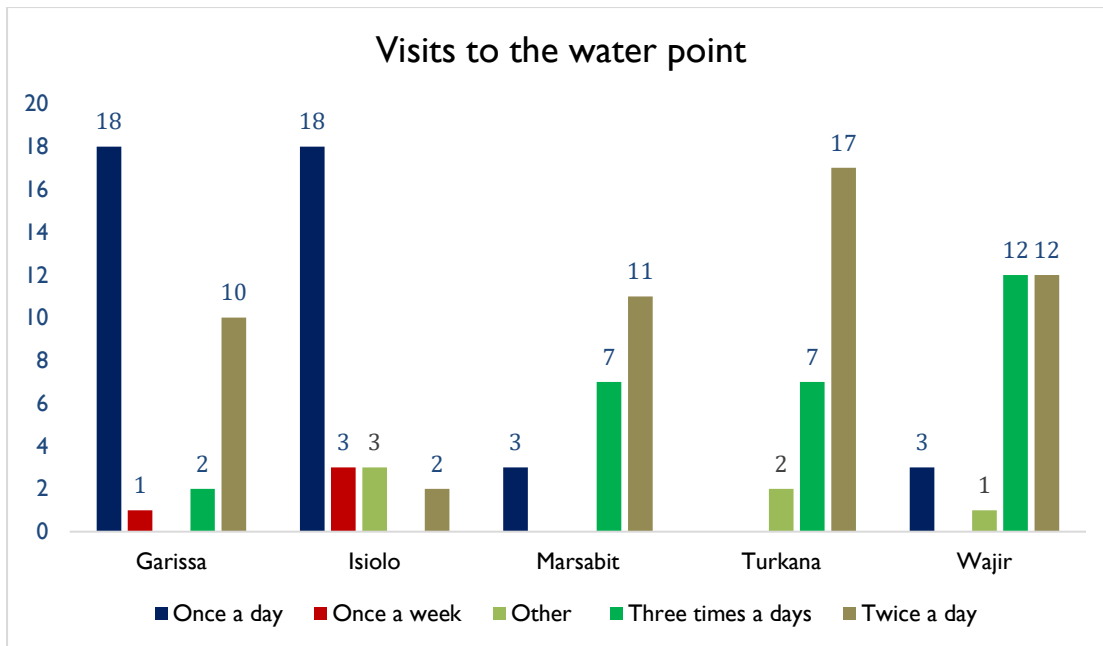


Figure 15: Frequency of water fetching

4.4. CONSUMPTION

On average, each household uses 15 liters of water for cooking and 20 liters for drinking. 63 percent of the households noted the quantity of water from the water source is enough for all your household water needs. Empirical evidence⁴ suggests that a 20 litre per day is often sufficient for drinking, cooking, food hygiene purposes.

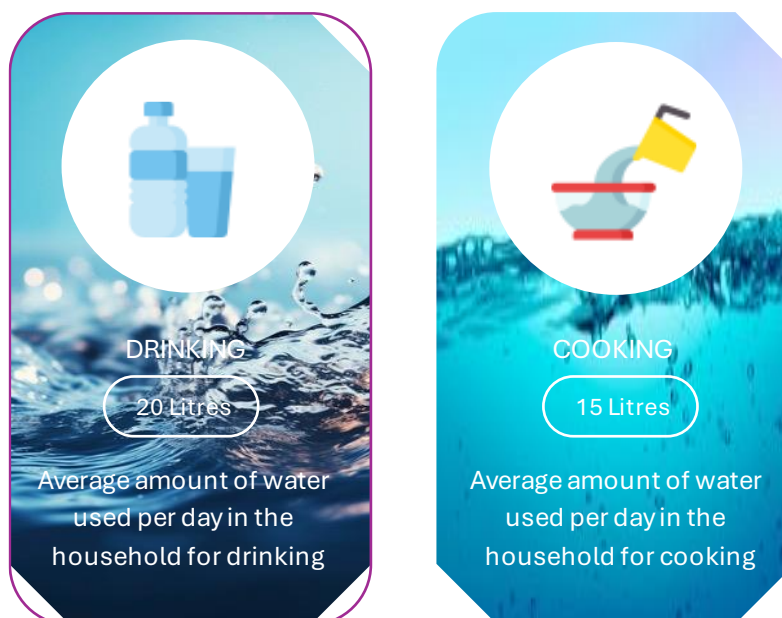


Figure 16: Average water consumption per household

⁴ <https://iris.who.int/bitstream/handle/10665/338044/9789240015241-eng.pdf>

4.5. ALTERNATIVE WATER SOURCE

Seasonal rivers accounted for the highest percentage of alternative water source when the primary water source is not available, implying that households resort to unprotected sources of water which are not safe to drink unless it is treated.

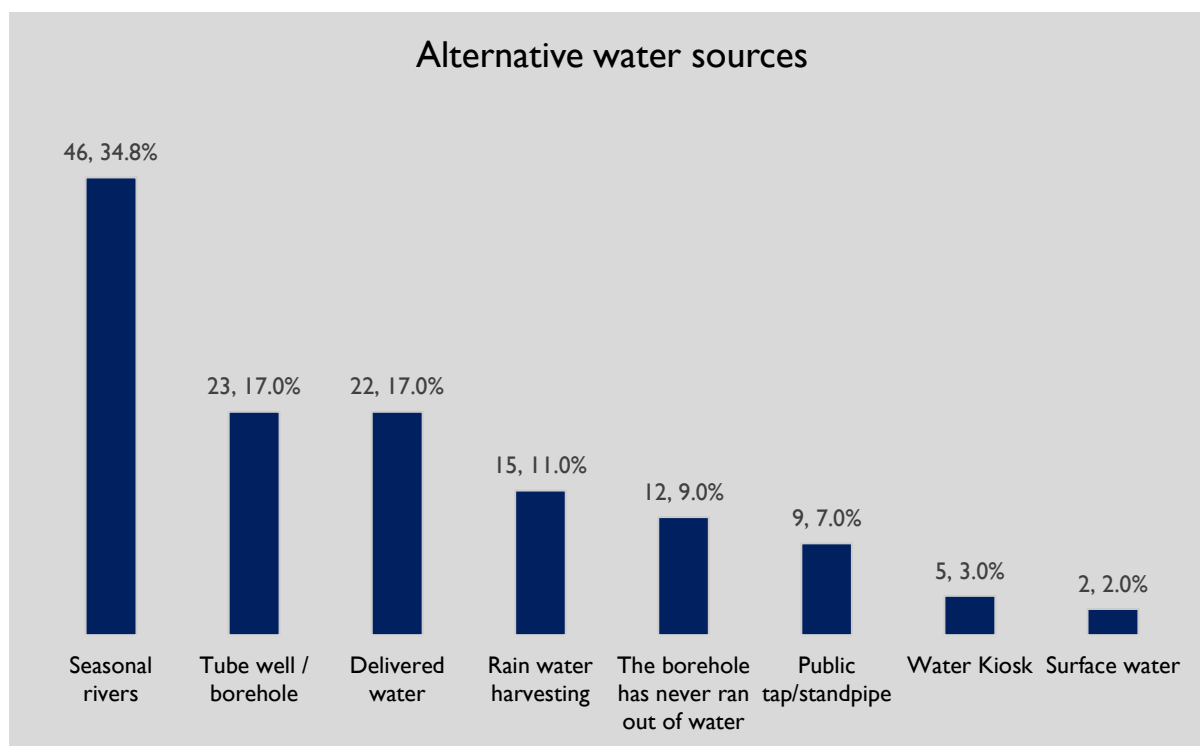


Figure 17: Alternative sources of water

4.6. WILLINGNESS AND ABILITY TO PAY FOR WATER

81.1% (n=107) of the households stated that they paid a fee to fetch water from the borehole. The payment was normally paid to the water user committees either on a weekly or monthly basis.

Where is payment made	Number
Water user committee	68.2% (n= 73)
Kiosk Attendant	12.1% (n=13)
Borehole operator	11.2% (n=12)
Other- Watchman/ guard	5.6% (n=6)
County Government	1.9% (n=2)
Water utility	0.9% (n=1)

Table 3: Water payment recipients

The households noted that during the wet season the cost for a 20-liter jerrican ranged between 5-20 KES, while in the dry season it ranged between 5-25 KES. Half of the household respondents (50.5% n=54) noted that they had not received prior information regarding these payments/fees. For those who had received information they noted that the payment was for general borehole maintenance.

It was noted that in Turkana (67.1%) and Wajir (68.1%) of households were not willing to continue paying for water services. In Marsabit (85%) and Isiolo (83%) were willing to continue paying for water

services. 50% of the Garissa households were willing to continue paying for water services. The borehole operators noted that the payments are done on a monthly basis. The WMC noted that these funds collected are for borehole repair and maintenance.

4.7. WATER USES

The household uses of the water is for drinking, cooking and washing. 90.9% of the respondents noted that they feel comfortable using the water for drinking, 90.6% for cooking and 98.5% for cleaning

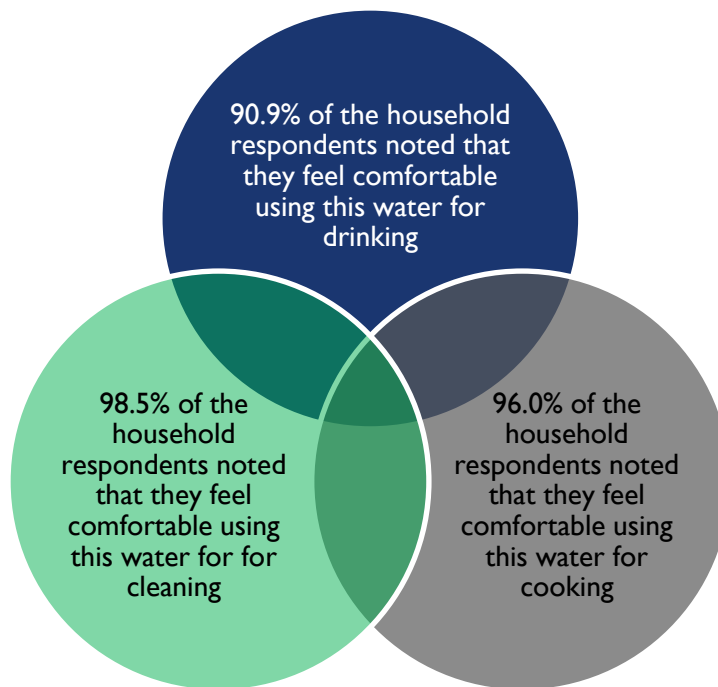


Figure 18: Water uses

5.0. INTERMEDIATE OUTCOME I: BOREHOLE DATA FOR DECISION-MAKING AVAILED

5.1. OVERVIEW

It was anticipated that, if remote borehole monitoring data was collected for timely decision-making for repair and maintenance, then the repair teams could, in a timely manner respond to borehole breakdown for improved functionality. Therefore, it was important to have full information about the design and development of the borehole including the available assets (both surface and below ground).

This outcome also aimed at collecting county specific systematic data on barriers and solutions for timely borehole repairs, and to develop a borehole asset inventory including a list of fast-moving spare parts to aid quick decision- making on reported breakdowns for the targeted boreholes.

5.2. BOREHOLE INVENTORY

A borehole asset inventory and a list of fast-moving spare parts for the boreholes was also to be developed to facilitate rapid decision-making on the spare parts needed for borehole repairs. DRIP FUNDI engaged two private sector firms (Solargen Technologies Limited and Epicenter Africa Limited) to supply spare parts, and to support the repair and maintenance of boreholes. Solargen Technologies Limited was contracted to work in Isiolo, Marsabit, and Wajir counties, and Epicenter Africa Limited was contracted in Garissa and Turkana counties.

During the asset inventory development, it was realized that it was easier and cheaper to register the assets above the ground. However, for below ground assets, it required complete removal of the pump and related accessories for the program to get a full list of assets. This proved operationally expensive because of the costs associated with removal of pumps, test-pumping and complications related to borehole collapse. It was only when a borehole completely broke down, that the program was able to develop a full list of assets (both surface and below ground).

During observation of the boreholes, the team sought to collect information on clear identification of the BH, the various levels of BH functionality, availability of the BH Logs, the type of Power Supply, whether the BH was treated with an installation of the Klorman Inline Chlorinator, and the general conditions of the BH. With a total of 57 BHs (8 in Garissa, 12 in Isiolo, 10 in Marsabit, 14 in Turkana, and 13 in Wajir), Table 4 provides a summary of the findings.

Table 4: Borehole Observation Checklist Summary

Main category	Sub-category	Garissa	Isiolo	Marsabit	Turkana	Wajir
BH Identification	Number visited	8	12 BHs	10 BHs	14 BHs	13 BHs
Functionality at time of visit	Functional	8	12	10	12	13
	Not functional	0	0	0	2**	0
BH Log	All log available			1	3	9
	Some logs missing	8	12	9	10	4
Power Supply	Only solar	5	5	1	12	3
	Hybrid with gen. set	3	7	9	1	10
	Hybrid with elec. grid		1			

Klorman Chlorinator	Klorman Connected	4	2	5	6	5
	In use	2		2	6	
	Not in use	3	1	3		5
	Removed	1				
	No Klorman	3	9	5	7	8
General Conditions	Yield more than 15 M3/h	2		1	2	1
	Yield less than 15 M3/h	0			2	12
	Yield Unknown	5	12	9	9	
	Single use	5	6		11	2
	Multi-use potable and animal	3	6	5		11
	Multi-use potable and irrigation			1	2	
	Multi-use (potable, animal, & irrigation)			4		
	Well managed, surrounding	4	11	7	5	4
	Not well managed	3	1	3	8	9

Other borehole information required for decision-making like the number of people accessing water at the specific source, the borehole logs, the yield of the borehole, were either missing or was not easy to obtain from the borehole operator given their low levels of competence. For instance, only 12.3% (n= 7) of borehole operators interviewed, confirmed keeping updated borehole data records. According to the observation data at the boreholes, only 13 boreholes had logs available. 57.9% of the operators stated that they had not been trained on management of this borehole which could have contributed to lack of record keeping for the boreholes. KII data from the BRRTs and county officials further stipulates that county teams lack updated borehole asset inventories which would be helpful for identifying compatible components and avoiding incorrect orders.

5.3. SPARE PARTS INVENTORY

In order to address specific barriers preventing the rapid repair of non-functional boreholes in each county, the program set out to host a startup workshop for the assessment of county specific barriers and solutions for timely borehole repair; develop and regularly update a borehole asset inventory in each county and develop a list of fast-moving borehole spare parts. In order to kick off this process, MWA convened the program start-up workshop in Nairobi on 7th November 2023 which brought together selected officials from the county water departments, the county BRRT leads, representatives from the county water utilities, private sector entities, other development partners with experience in the operation and maintenance of boreholes, and representatives from the USAID-BHA Kenya office; to discuss the unique, county-specific challenges hindering the rapid repair of borehole systems and potential solutions to these issues. Some of the cross-cutting challenges identified include inadequate financial resources, inadequately skilled technicians to conduct repairs, lack of rapid access to spare parts, lack of a borehole inventory to efficiently ascertain the specification of the needed spare parts, vastness of the counties in comparison to the available human and technical resources and insecurity.

However, whereas the private sector partners maintained spare parts inventory, their county counterparts had not established the inventory which would come a long way in speeding up response to maintenance needs and minimizing borehole downtime. This meant that the county teams relied on the private sector or other external sources for the parts.

The BRRTs noted that spare parts were provided by the private sector firms. Some of the reported challenges in acquiring the spare parts from the private sector included long lead times; as spare parts are not readily/ locally available, high cost of purchase thus resulting to purchasing low quality parts; inconsistent quality of parts from the private sector and tedious procurement county processes. These issues need to be addressed for speedy acquisition of the spare parts.

5.4. APPLICATION OF DATA FOR DECISION-MAKING

The private sector noted that because they were maintaining the repository of the borehole assets and fast-moving parts, they were also able to analyze the parts which were mostly in demand and therefore reposition them for faster repair of the broken boreholes. With data from the sensors, the BRRTs and private sector were also able to monitor the pump performance and anticipate repairs based on number of pumping hours as well as discharge volumes.

5.5. BARRIERS AND SOLUTIONS

It was reported that, there was general scarcity of borehole repair parts in the counties. This was the case for those spare parts for below ground assets which at the time of borehole breakdown, were not known and required undertaking more thorough diagnosis which significantly delayed the repair time. Since the parts were not known, they were not locally available, and this required importing some of them to the country. The BRRTs mentioned that, importing experienced long lead times hence leading to major delays in fixing the borehole once broken.

The private sector stated that, there was low technical know-how on the part of the BRRTs and borehole operators and also lack of tools, meant that accurate information was not provided during borehole breakdown diagnosis. In some instances, this led to procure and deliver a wrong spare part or asset which meant high logistical costs associated double travel to and from the borehole.

Logistical hiccups associated with distance to the boreholes from the County Headquarters, access related to security in some counties, and lack of vehicles for transport were other key barriers limiting timely repairs. Addressing the above challenges would enhance the rapid repair of the non-functional boreholes.

BRRTs felt that one of the solutions to improve repair response times, was for the County Governments to buy borehole repair equipment together with the standard spare parts. The other recommendation is for the County Governments to encourage the several private sectors to establish local spare parts shops and supply chains even in remote areas. Equally, training and capacity-building of local technicians and borehole management teams in remote rural areas for better operation and maintenance while the engagement of Rural Water Management Companies in operation and maintenance like in the repair of remote boreholes could provide a localized solution to this challenge.

6.0. INTERMEDIATE OUTCOME 2: BROKEN BOREHOLES ARE REPAIRED WITHIN 96 HRS

6.1. OVERVIEW

This outcome aimed to **utilize data from borehole sensors to inform response to breakdowns** coupled with supporting timely access to borehole spare parts and supporting BRRTs to procure tools and logistics.

According to the DRIP FUNDI Program, an uptime of 96 hours (4 days) was determined as a period within which water user's dependent on the borehole did not resort to accessing unsafe sources of water which would otherwise lead to an environmentally unfriendly response of boiling water as a form of treatment. Borehole breakdown or non-functionality refers to a situation where the borehole system is unable to pump water from the borehole to a suitable water point for users to fetch water. At the time of the endline evaluation data collection, 96.5% (55 of the 57) boreholes were functional and were operational each day of the week.

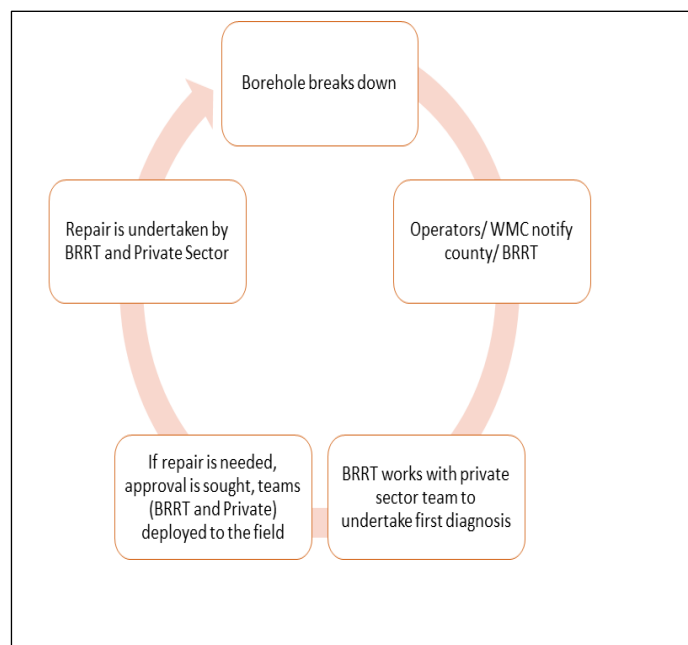


Figure 19 : Feedback Loop for Reporting and Response to Borehole Breakdowns

6.2. BOREHOLE BREAKDOWN REPORTING AND RESPONSE MECHANISM

The DRIP FUNDI program set up a Feedback Complaints and Response Mechanism (FCRM) to facilitate reporting borehole breakdowns for repairs and maintenance. Specifically, the system consisted of a set of procedures and tools formally established and linked to other monitoring processes and was intended to:

- Enable BRRT teams to respond to issues raised by users making complaints in a timely and cost-effective way and
- Boost public confidence in our repairs and maintenance process,
- Provide information that could be used by us to deliver quality improvements in our products, services,

The full mechanism included setting up a toll-free and Short Message Service (SMS) line - +254757852918; Email: feedback@mwawater.org and stakeholder meetings. Reporting processes of the borehole breakdown was however also complemented by the data from the sensors from select boreholes which had these installed.

The complaints system had 5 critical steps, and all complaints received were managed in accordance with this system.

- Receive/Report – reporting of breakdown
- Acknowledge – notification of BRRT
- Asses/Investigate – partnership with private sector for diagnosis
- Respond – deployment of repair team
- Close complaint – completion of repair and closure of complaint

A Microsoft Excel database was developed to track feedback and complaints, categorizing them as sensitive or non-sensitive. Communities were encouraged to report issues such as prolonged borehole downtime, chlorination concerns, service quality, exploitation, abuse or fraud. The process of procuring banners and stickers displaying the complaints and feedback was undertaken to disseminate the FCRM toll-free number and email to project stakeholders.

The BRRTs were responsible for borehole repair and maintenance. They noted that they monitor boreholes within the country through real time monitoring using dashboard applications, scheduled site visits and community reporting through mobile phone. The monitoring was scheduled in a monthly basis; however, this largely depends on the availability of facilitation for site visits.

During the evaluation, 64.4% of the households reported they were aware of the feedback or complaints channel, with the main reporting mechanism being, the “in-person with the operator” at 96.5% in the program; those who reported through in-person with the county government were 25.9%, phone calls with county and private sector were 7.1% and 1.2% respectively. None of the household respondents (0%) noted using the toll-free line for feedback or complains.

Only 17.4% of the household respondents noted having used the feedback/complaints with the major complains related to Borehole breakdown, shortage of water and saltiness of the water.

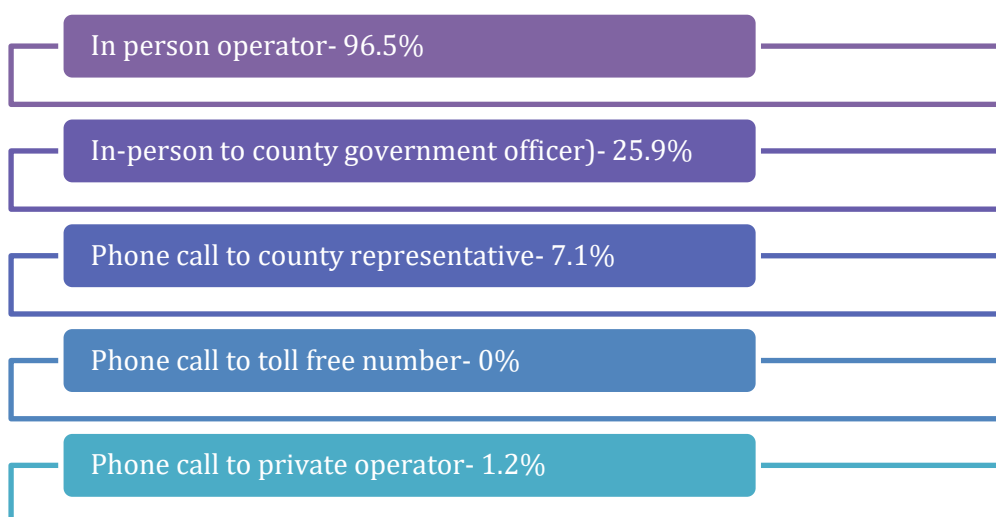


Figure 20: Feedback and Complaint Mechanism

The WMCs however were not aware of the MWA Feedback and Response Mechanism. The Wajir WMC noted that the channel for the borehole breakdowns was through the water committee to the county office via phone calls; while the Garissa team said that they didn't know where or how to submit complaints or suggestions. They further said that they reported the issues informally to the technician or local chief. When asked about the Feedback and Response Mechanism was effective, the WMCs said that it was moderately effective, as the county teams were quick to repair minor issues but slow for major breakdowns. They also noted that more follow-up and feedback is needed after repairs. While phone call is the main means of communication, the WMC said that they preferred face to face communication.

"We trust face-to-face the most because we can explain the problem fully and see the person's reaction. It also builds accountability."- Garissa

The BRRTs noted that they receive feedback through the committees or borehole operators; these same channels were used to inform communities about the status of borehole repairs.

According to the Water Management Committees, the number of breakdowns differed across the counties depending on water demand and season. The BRRTs noted that breakdowns normally happen during the dry season when the water demand is higher with borehole operators stating that the boreholes they manage have broken down. Data from the KIIs and FGDs indicates that motor issues, pump system failures and solar system breakages were the main causes of borehole failure. In Turkana County, it was noted that breakdowns are sometimes also caused by conflicts or vandalism by children.

Borehole breakdowns were reported using various mechanisms. According to the interviewed borehole operators, "Calling the county water department" is the preferred reporting mechanism (84.2% n=48) likely because the operators are conversant with the Borehole Rapid Response Teams (BRRTs). Phone calls to the county water department was also noted as the preferred reporting and response mechanism by the borehole operators The feedback loop is provided in **Error! Reference source not found.**

One BRRT said "All the community boreholes have committees who manage the borehole at the village level. They are the ones who inform and communicate to the BRRT team on the status of the repairs or any other activities" We normally use the borehole operator to disseminate the status of borehole repair to communities'

6.3. BOREHOLE REPAIR RESPONSE TIME

On turnaround of borehole repair, mWater data indicates only 2.4% (n=1) of the boreholes were repaired within 4 days; 63.4% (n=26) within 5-30 days, 4.9% (n=2) between 31-60 days, 14.6% (6) between 61-120 days, and 14.6% took more than 121 days to be repaired. Based on the analysis, an uptime of 85.7% was attained at the endline showing some improvement from the baseline value of 84.7%

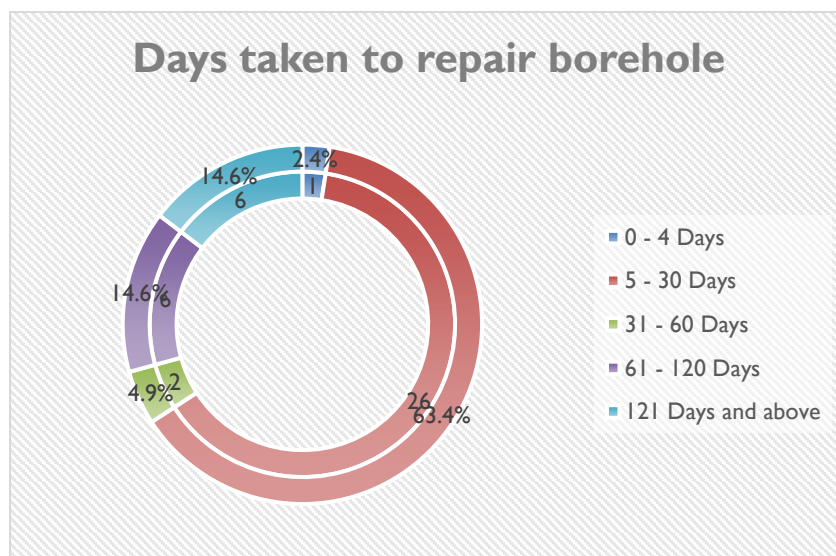


Figure 21: Borehole repair times

On average, the BRRTs noted that the breakdown notification time varies between 1-30 days; and the average response time is 2 days- 2 weeks. Response might not necessarily translate to repair as there are other processes of diagnosis, procurement of spare parts and final repair.

An analysis of the repair times for counties as presented in Figure 22 , showed that most of the boreholes repaired within 5-30 days were in Wajir.

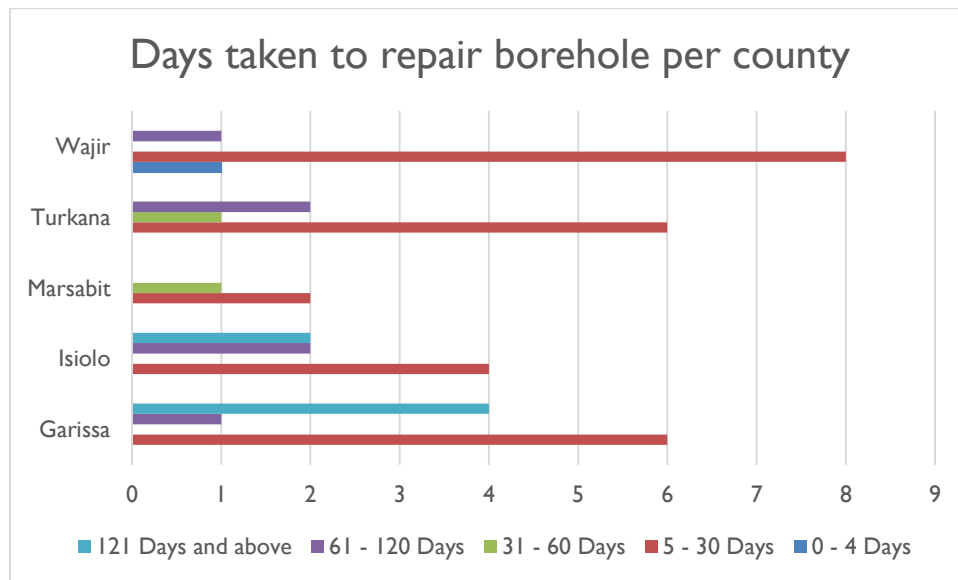


Figure 22: Borehole repair times per county

The summary of response time and challenges affecting response time are provided in Table 5.

Table 5: Response time and uptime challenges

County	Average notification time of a breakdown	Average response time	Challenge affecting response time
Garissa	1-2 days	2 weeks	<ul style="list-style-type: none"> • Security concerns • Hard-to-reach locations, • Limited parts • Occasional vandalism
Isiolo	6-30 days	2-3 weeks	<ul style="list-style-type: none"> • Logistical challenges • Long time in procuring boreholes spares.
Marsabit	2 weeks	2-3 weeks	<ul style="list-style-type: none"> • Logistical challenges • Few skilled human resource personnel • Logistical challenges
Turkana	1-2 days	1-3 weeks	<ul style="list-style-type: none"> • Accessing spare parts, • Lack of transportation to remote areas,

			<ul style="list-style-type: none"> • Security concerns in certain areas and poor road conditions
Wajir	1-2 days	1 week	<ul style="list-style-type: none"> • Logistical challenges • Few human resource personnel

For the private sector the average response time is 96 hours. The delay in response was normally occasioned by contextual issues related to un-availability of BRRTs.

An analysis of the broken boreholes and those repaired at the time of the endline evaluation indicated that it was only in Wajir where all the broken boreholes were repaired.

Table 6: Broken verses repaired boreholes

County	Percent Borehole broken down	Percent Repaired
Garissa	81%	65%
Isiolo	77%	73%
Marsabit	86%	76%
Turkana	69%	54%
Wajir	89%	89%

The BRRT's stated that they undertake daily monitoring and data collection for the boreholes. The Isiolo and Turkana BRRTs however stated that they had reduced the frequency due to facilitation challenges. The Turkana BRRT stated *"For monitoring purposes, I regularly use the "Overseer Orux Map" application, which has become an essential tool in my daily work. While I conduct monitoring activities every day, I've had to discontinue the monthly measurement routines due to operational constraints. I also collaborate closely with local village administrations to enhance our monitoring capabilities"*

6.4. CAPACITY OF REPAIR TEAMS

Technical, Human and Financial capacity of BRRT Teams were noted as the main challenges in obtaining uptime.

Technical: The BRRTs noted that while they had received training on the use of data platforms, there was also needed to have a training on advanced borehole technical aspects like pump diagnostics, and solar repair. The WMC noted that the technical capacity at the county is better than at the community level. They noted that they had to depend on local technicians and county government Borehole Repair and Rehabilitation Team (BRRT) members for even small repairs like replacing pipes due to limited tools and lack of advanced skill. They further noted that access to services from the county teams was hard to get, regular supervision and technical support are limited and lack of follow-ups after repairs. 57.9% of the borehole operators reported that they had not been trained on borehole management. This challenges at the community level made it difficult to diagnose faults, undertake minor repairs and or preventive maintenance further delays the repair and maintenance timelines.

According to the private sector, to further enhance system resilience and sustainability, ongoing refresher training for community-based operators, especially on preventive maintenance and basic troubleshooting, would have been beneficial to ensure that minor issues are addressed early.

Human Resource: The BRRTs expressed that there were few skilled human skilled teams and thus they were overwhelmed. According to the county officials, Wajir had a total number of 25 BRRT, Turkana 20 BRRT, Garissa 15 BRRT, Marsabit 5 and Isiolo 15 which is relatively low in comparison to the number of boreholes in each county.

The county officials stated that while BRRT staffing was “right” it was not adequate and the BRRT was not well resourced with the BRRT annual budgets ranging between KES. 6-10 million (USD.50,000-70,000). “The BRRT is resourced through government funding, but there is no exact budget allocated.

“Yes, we have a Borehole Rapid Response Team (BRRT). The staffing may be adequate in numbers, but the capacity is limited due to funding and resource shortages. For example, some sub-counties lack an electrician, which hampers repair efforts. (Turkana County official)”

“We have the right teams but some lack technical expertise. Most of them have learnt on the job training and have not gone for a professional training/ course. (Wajir County official).

The delay is also occasioned by limited BRRTs in relation to the number of sites requiring repairs. For example, the WMC in Marsabit said *the county used to help in case of any repairs and maintenance, but lately they are not as present as before. They further noted, when the borehole broke down and report was made to the county, they said it will take time since the technician was held up somewhere”*

Financial capacity: A major limiting factor is the lack of financial resources available for purchase of spare parts and transport logistics to the boreholes. The long and cumbersome government procurement processes lengthen the delay in repairing the boreholes. The WMC and Borehole operators noted lack of funds for preventive maintenance as this is dependent on the willingness and ability of households to pay for water services.

Contextual issues also come to play in delay of the repairs. For example, one private sector provider noted *“Last year we had a case where we were asked to demobilize the repair due to a disagreement between the county and community”* This was corroborated with feedback from the county officials who noted that sometimes they have a standoff with the community due to non- accountability of the borehole operators. In some counties, instances of non-availability of the BRRT to support the private sector teams was reported thus resulting in a delay. Political interference was also noted as a challenge.

Another private sector firm noted *“one challenge we have with one of the counties where they delayed providing BRRTs to accompany us to the site. The community kept calling us and on arrival at the site we were notified by the county team that no work can be done without the BRRTs. The repair was delayed by 1.5 weeks.”.*

This was also echoed by the WMC who reported that poor coordination between the county and community committees is one of the challenges hindering operations and maintenance of boreholes. Other challenges include intercommunal conflicts during dry seasons, sharing of water sources by host and external users, conflicts over ownership or control over the water resource.

“More people and animals are coming here from neighboring villages like (jarirot) because their boreholes failed. This puts pressure on our borehole and sometimes leads to conflict- Garissa FGD.

6.5. DETERMINANTS OF SUCCESS

Private sector engagement: Overall, in all five counties, the BRRT reported that the involvement of private sector players improved the turnaround time for repair, operation, and maintenance of boreholes. The Isiolo BRRT noted that *‘They provide materials and spares, hence improve the turnaround time for repairs’*. Their Marsabit counterpart noted *“They provide all the resources required on time and want regular updates on maintenance and repair status.”* The Turkana one stated *“ Yes, private sector involvement helps in pressing common issues and improving efficiency. For example, their support has reduced delays in repairs’*.

Policy and regulatory framework: Policy and regulations provide a framework for sustainable management and financing of water resources; As noted by the county officials, none of the counties has a formal policy for borehole operations and maintenance. This leads to challenges in planning, organizing, prioritizing, and executing repairs effectively. The Wajir officials noted *‘we do not have a policy to guide prioritizing the repairs’*. *We are sometimes overwhelmed in the repairs and maintenance. For example, our county has over 400 boreholes. Sometimes we just do firefighting’*. Additionally, none of the counties had a data and information management system for water services, they were fully dependent on the sensor data for decision making. Additionally, 61.4% of the borehole operators noted that the county does not have any guidelines, manuals, or SOPs for operations, repairs or maintenance of boreholes which would be a guiding document for borehole repair and maintenance.

7.0. INTERMEDIATE OUTCOME 3: BOREHOLE FUNCTIONALITY MONITORING EFFORTS STRENGTHENED

7.1. OVERVIEW

This outcome aimed to increase knowledge of borehole response planning and monitoring. Key activities included.

- Developing and strengthening capacities of Borehole Rapid Response Teams (BRRT) and private sector partners in accessing and interpreting borehole sensor dashboards, as well as utilizing mobile phone-based data collection tools for continuous monitoring
- Sensitization of communities and stakeholders on the DRIP FUNDI model.

To tackle the issue of borehole functionality, the DRIP FUNDI program facilitated installation of sensors in the boreholes. The sensors systematically gather and transmit data daily via satellite, detailing each borehole's functionality and pumping hours. The data was displayed on a dashboard (on the mWater platform) providing the county Borehole Rapid Response Teams (BRRTs) with immediate access to the vital information.

7.2. ACCESS AND USE OF MONITORING DATA

As per the DRIP FUNDI program design, installation of sensors in the boreholes was aimed to making borehole data available and accessible for decision making. These could sensors enable continuous monitoring of borehole functionality, providing valuable data for responsive repairs and preventative maintenance. During the endline evaluation it was found that, 96.5% (n=55) of the boreholes visited had sensors.

The BRRTs noted using mWater app, sweet sense dashboard and Virridy to receive, record and manage their repairs and maintenance operations. They noted that these platforms provided useful data, such as the number of breakdowns and repair statuses, which helped in decision-making. All the BRRTs interviewed noted that they had been trained on using these applications.

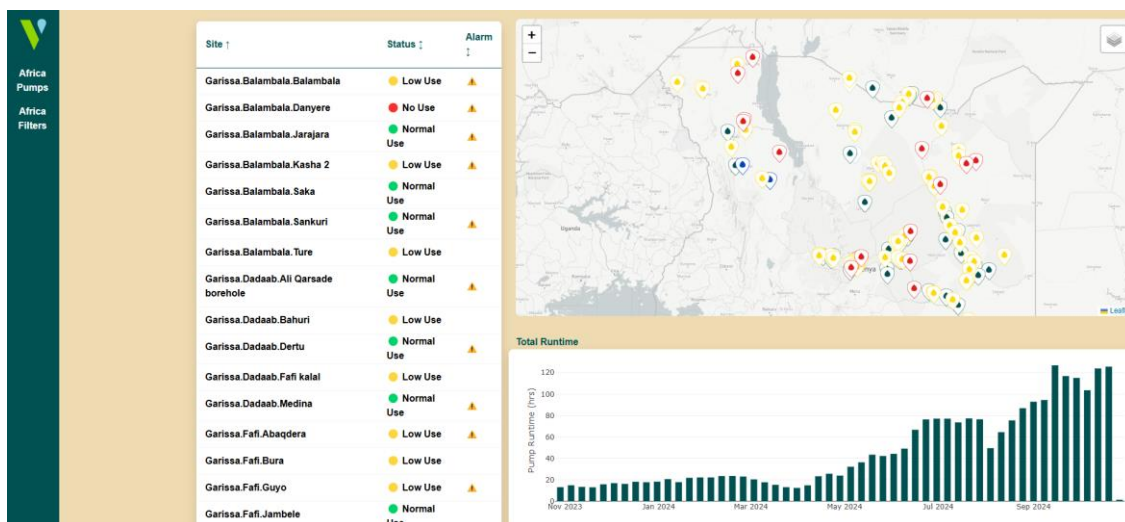


Figure 23 A snapshot of the Virridy borehole sensor dashboard.

Table 7 shows the use and experience of the BRRTs and Private Sector on the mWater and Virridy applications.

Table 7: : Use and Experience of mWater and Sensors

County	Application	Experience	Example of use	Challenges
Isiolo	mWater	It improves the data collections, monitoring and sharing of information	We act on time when the problem is not more technical and needs little financial needs. Like motor short circuit.	Improve data entry and enhancing data accuracy and reliability.
	Virridy	When the system stops relaying information, it alerts the BRRT team that there is a problem with the borehole.	It relays information when the system stops working, hence alerting the BRRT team.	
Turkana	mWater	To monitor borehole statuses and manage repairs. I was trained only on the mWater platform.	My experience with mWater has been mixed. It would be easier if the interface were more user-friendly and if there were fewer delays in data updates	Delays in data updates and occasional technical hitches.
	Virridy	The dashboard is helpful, but it could be improved by making it more accessible and intuitive for all users	Yes, these platforms provided useful data, such as the number of breakdowns and repair statuses, which helped in decision-making.	It could be improved by making it more accessible and intuitive for all users. It would also be helpful to add details such as water table levels and borehole depth.
Garissa	mWater	The mWater platform is reliable for standardizing data entry and tracking repair history.	We use sensor data to prioritize high-risk boreholes. In one case, declining water levels helped us pre-position replacement parts in advance of expected failure.	However, it needs better offline support and simplified reporting formats.
	Virridy	The dashboard is helpful for remote monitoring. It gives real-time alerts on borehole status.	For example, when the Virridy dashboard showed a gradual drop in output in our borehole, we scheduled preventive maintenance and avoided total failure.	Network outages, device compatibility issues, and occasional user errors due to limited technical literacy among new staff.
Marsabit	mWater	It has made my work easier	We use sensor to record voltage, frequency of temperature from machine to generator	None
	Virridy	Use of the application has made my work easier	Sensor use various symbols to show water temperature, oil pressure, when to change water coolant and oil	None
Wajir	mWater	Yes we use this application as a department to alert us on breakdowns	It helps us know when a borehole is broken.	The sensor system needs to be updated, to provide real time and accurate information.

	Virridy	It provides information on the borehole breakdowns	Notify us when there is a problem	There is also a need to improve the software and dashboard to ensure the sensors' effectiveness is monitored continuously.
Private Sector	mWater	We were trained on how to use it.	Good experience using the app; it's a very easy tool to use.	Needs to be improved to give reports in real time and not 12 hours after they occur.
	Virridy	The sensor data helps them track the pump performance and anticipate repairs thus reducing the turn-around time for repair.	Yes, the use of real time and historical data has significantly enhanced our decision –making processes, enabling faster more targeted, and efficient response to borehole breakdown and maintenance need	None

Overall, the dashboard and sensor were reported to provide information to help make decisions other than in a few instances where the sensors report a borehole needing repair whilst that is not the case or vice versa (sensor does not report a broken borehole but repair is needed). The Virridy dashboard and mWater platforms have provided important information to the teams to make decisions.

- Yes. For example, when the Virridy dashboard showed a gradual drop in output in our borehole, we scheduled preventive maintenance and avoided total failure. We use sensor data to prioritize high-risk boreholes. In one case, declining water levels helped us pre-position replacement parts in advance of expected failure. (BRRT Garissa)
- The sensor has really helped us. Before, we would wait weeks or even months for someone to come and check the borehole when there was a problem. Now, the technicians arrive quickly because they already know something is wrong. We have fewer water shortages, and our children no longer have to walk long distances to find water. We thank DRIP FUNDI for bringing this technology to our community. (Garissa FGD)

7.3. COMMUNITY AND STAKEHOLDER SENSITIZATION

In community and stakeholder sensitization, the BRRT reported that they receive information from NDMA. The BRRTs further reported that they used this information to prepare for dry spells by conducting preventive maintenance, ensuring water storage is functional, stocking spare parts and prepare for potential droughts, floods, or other weather events that could impact water infrastructure.

As reported by the WMC, some of the contextual issues in the past year that have changed the water situation include:

- Water availability improved during rainy seasons, but dry spells due to frequent breakdowns and long queues
- Increased demand due to population growth
- Occasional contamination after floods.

- More people and animals are coming here from neighboring villages like (jaricot) because their boreholes failed. This puts pressure on our borehole and sometimes leads to conflict.

The private sector noted that they used the climate change information to develop borehole-specific contingency measures based on predicted risks; for example, during drought season they pre-position spares in readiness for repairs, in drought season they elevate storage tanks and ensure drainage systems are open. They further noted that due to climate change some sites we impacted by the floods and infrastructure destroyed.

One key element for this objective is the sensitization of communities and stakeholders on the DRIP FUNDI model. 52.3% (n=69) of the households were not aware of the DRIP FUNDI program and its model.

- 63.6% (n=84) of the household respondents were aware of the County Borehole Rapid Response Teams (BRRTs) responsible for repair and maintenance of boreholes.
- Of those who were aware 85.7% (n=72) reported that BRRTs provide timely and necessary operations/maintenance of the borehole (effective)?
- A similar percentage 85.7% (n=72) noted that the BRRTs are responsive to the needs of the community
- 75% (n=63) noted that they are easily reachable by community members.

The county teams were appreciative of the support and model from DRIP FUNDI. The noted areas of improvement were to improve on the timeliness of the approvals to improve efficiency. One respondent said “ *Sometimes approvals for diagnosis and spare parts replacement could take time. This needs to be improved*”

The private sector also noted that though short, they have had a good experience with the DRIP FUNDI project and model with MWA maintaining a good relationship with them. If possible, it was recommended to engage the private sector at the initial program design stages. That said, specific challenges exist that could be improved in future programs which could further improve the borehole uptime. These include:

- Ensuring that there was clarity on the agreement on the roles and responsibilities of each player. There were reported conflicts between the private sector and government BRRT teams. This was due to lack of understanding on the roles and mandates of each player. This conflicts further complicated the work relationship between the players and delayed the borehole uptime
- Instances of delayed approval of purchase of spare parts. This delay strained the relationship between the private sector/ BRRT and communities, who blamed the private sector teams for delays in repair and maintenance
- There is need to consider the cash flow issue of the private companies which makes it difficult for them to stock the required spare parts.

In general, the KIIs and FGD data, notes that the repairs and maintenance model can be improved through training more technicians, streamlining the payment process, and supporting the development of clear policies and guidelines for borehole management.

8.0. WATER QUALITY AND TREATMENT

8.1. PERCEPTION OF HOUSEHOLDS ON WATER QUALITY

When the households were asked to describe the water from the borehole, in terms of color of water, 97% (n=128) of households describes the color of the water to be clear, 91.7% (121) of households described the smell of water to be odorless, while 5.3% (7) noted that the water had a chlorine smell. In terms of taste the households reported the following: Saline 51.5% (n=68), Tasteless 43.9% (n=58), Salty 2.3% (n=3) and Chlorine 1.5% (n=2).

8.2. WATER TREATMENT

The endline data indicates that: 23.5 % (n=12/51) of the household respondents from the treated sites boreholes treat water before using it for drinking/cooking while 14.8% (n=12/81) of the respondents from the repaired boreholes treat water before using it for drinking/cooking. Across both treated and repaired sites, boiling was the main method of treating water.

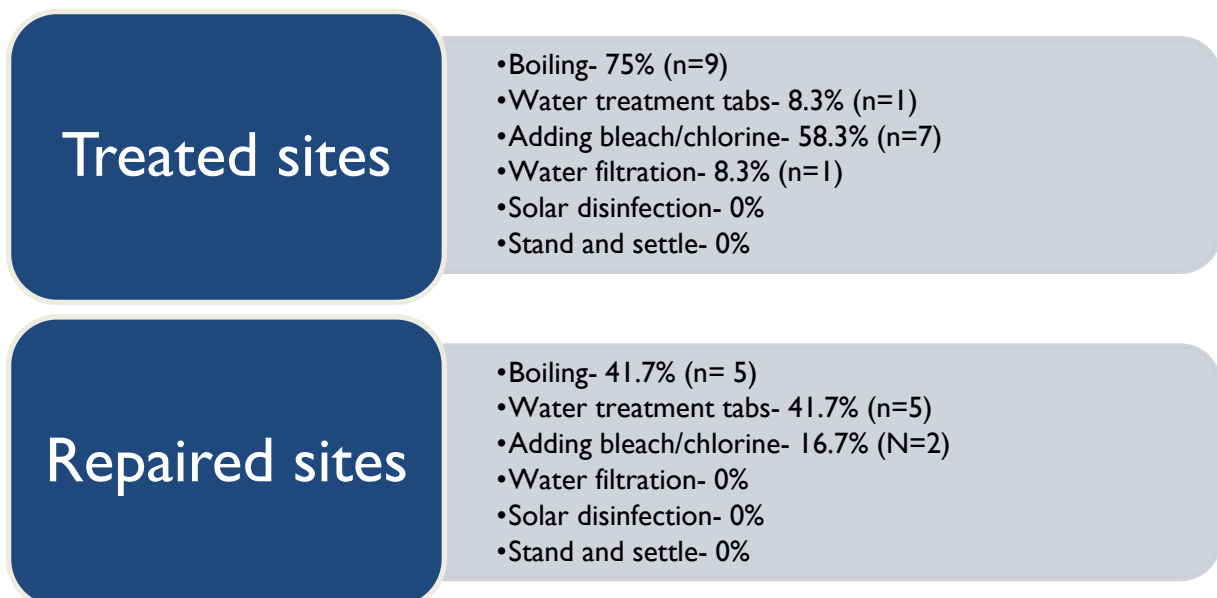


Figure 24: Water treatment methods at the household

For the treated sites, 66.7% (n=33) of the households are aware that water is treated at source. For the repaired sites, 14.8% (n=12) of the household respondents are aware that water is treated at source with the water management committee being the source of this information.

For both the treated and repaired sites, there were common reasons for not treating the water. This included the assumption that water is treated at source and is safe, no interest in treating water, lack of treatment tabs or materials and lack of awareness on importance of treating water. This was corroborated with feedback from the borehole operators who noted that the community assumes the water is healthy to drink and cook.

For the treatment sites, the borehole operators noted that community feedback regarding the treatment units was on complains on the taste and odour complaint due to high chlorine presence, need for regular monitoring of the treatment units and community sensitization on chlorination signifying a need for community sensitization on the treatment units. The borehole operators also

noted a need for training on how to operate the system. The household interviewed noted that the saltiness of water should be regulated.

In Turkana ‘The treatment units were effective, but community feedback highlighted the need for better education on their use’. Behaviour change interventions were necessary, and these could be improved through more community engagement. The treatment units are particularly challenging to maintain because they require specialized knowledge.

The private sector noted that

- The Klorman units showed reliable chlorination performance across most sites. water tests confirmed the presence of free residual chlorine at safe levels, indicating effective disinfection.
- Community members were generally receptive. Some noted a slight change in taste but accepted it once it was explained that it indicated effective chlorination. The water committee appreciated the cartridge spares and basic training.
- Behavior change efforts were necessary, especially in areas where untreated water use was still common.
- Capacity building for a few community members; especially youth or water committee reps as water ambassadors to promote safe practices was necessary

8.3. WATER QUALITY ANALYSIS

Water quality treatment was done in 65 boreholes. The test was focused on biological water quality analysis testing the E. coli and Total Coliform presence/absence by observing the coloration of the water sample under UV light. Equally, for boreholes that have been installed with Klorman Inline Chlorinator, the amount of Free Residual Chlorine (FRC) and the pH were measured on site to determine if the right amounts of chlorine dosage have been done or if there could be point source pollution which will require proper water treatment.

Table 8: Summary of Water Points Sampled for Water Quality

County	Number of water points visited	Water points testing E.Coli Presence	Water points testing Total Coliforms presence	Number with functional Klorman Chlorinator
Garissa	13	6	6	2
Isiolo	13	0	10	1
Marsabit	12	9	9	7
Turkana	12	9	9	6
Wajir	15	6	10	5
Total	65	30	44	21

Biological water quality testing - E.Coli and Total Coliforms: A total of 65 boreholes (BHs) were tested for both E. Coli (EC) and Total Coliforms (TC). Samples were drawn from various points - 12 (18 percent) directly from the BH, 15 (23 percent) from household jerricans, 11 (17 percent) from water kiosks, and 27 (42 percent) from water taps. Out of the 65 BHs, 31 tested presence of EC while 44 tested presence of TC.

Further breakdown in terms of draw point and biological water quality indicated that 4 samples from BH tested presence of EC while 6 samples tested presence of TC. 6 samples from household jerricans

tested presence of EC while 11 samples tested presence of TC. For the water kiosk it was 6 with EC and 8 with TC, water tap had 15 with EC and 19 with TC.

The results show evidence of possible secondary contamination of water during transportation (either through pipes or containers). Therefore, further investigation is required to determine the possible point sources of contamination by taking samples from the borehole source, along the pipeline, kiosk and finally at the household jerricans.

Free Residual Chlorine (FRC) testing: A total of 21 water points were tested for FRC and pH (Refer to Annex G). Samples for these tests were taken from Water Tap 11 (52 percent), Household Jerrican 5 (24 percent), Water Kiosk 4 (19 percent), and direct at the BH source 1 (5 percent).

Out of the 21 water points observed, 6 BHs did not have the Klorman Inline Chlorinator connected though it was installed; 6 BHs had FRC levels at 0 mg/L tested; 1 BH had FRC at 0.1 mg/L; while the rest (14 BHs) had between 0.2 mg/L to 4 mg/L; 3 BHs had very high and unacceptable levels of FRC of 2, 3, and 4 mg/L.

Turkana County had a majority (4 out of 5) of the BHs installed with Klorman Inline Chlorinators that were not connected; while all BHs in Marsabit (6 out of 7), had 0 mg/L of FRC tested.

For all the 21 BHs, the pH levels were within a range of 7.03 to 8.2; which was within the acceptable WHO limit of 6.5 to 8.5 which is required for chlorine efficiency.

The results show that the water quality is a major concern across the project area but more so in Turkana County where, despite the installed Klorman inline chlorinator, the treatment system was not working since it was disconnected. This could be as a result of awareness of the water users exposing them to preventable waterborne diseases.



Figure 25: Photo of FRC and pH results from Hargaal Borehole in Garissa County.

9.0. FINDINGS ON PROGRAM DESIGN AND IMPLEMENTATION MODALITIES

9.1. Collaboration and Partnerships

The DRIP FUNDI program recognized the importance of several other programs which were being implemented by other humanitarian and development actors in the DRIP FUNDI target counties. These included activities by US agencies such as the United States Agency for International Development (USAID) and the Bureau for Humanitarian Assistance (BHA), UN agencies such as UNICEF, the United Nations High Commissioner for Refugees (UNHCR), the International Organization for Migration (IOM) and the World Food Program (WFP), the World Bank, the Swiss Agency for Development and Cooperation (SDC) and a multiplicity of other multilateral, bilateral donors and numerous international and local Non-Governmental Organizations (NGOs). The local county governments and their affiliate institutions such as the Frontier Counties Development Council (FCDC) as well as national government institutions such as the National Drought Management Authority (NDMA) have also been at the forefront of mitigating the harmful effects of the drought.

During the implementation period, MWA continuously fostered collaboration with these key water sector stakeholders, such as the respective county water departments and other development partners working in the target counties. These included the RAPID+ program implemented by MWA in across the DRIP FUNDI target counties through its member organizations including World Vision in Wajir, CARE International in Garissa, Catholic Relief Services (CRS) in Turkana and Isiolo, and Food for the Hungry (FH) in Marsabit.

DRIP FUNDI also worked with RAPID+ to identify target boreholes and to support installation and maintenance of borehole sensors. Other partners who were involved in sourcing of the initial list of target boreholes included USAID Nawiri, Oxfam and Save the Children. Oxfam participated in the program kick off meeting and were part of a panel discussion where they shared insights from a recent operation and maintenance program targeting Turkana County. Coordination with USAID Mashinani and USAID STAWI identified key areas of synergy for the two programs and strategized on avoiding duplication of interventions.

These collaborative efforts were solidified through active participation in coordination forums such as county steering group (CSG) meetings, county WASH forums, and other key partner meetings. DRIP FUNDI was represented in the Partnership for Resilience and Growth (PREG) meetings in Isiolo County on March 1st, 2024, Garissa County on April 30th, 2024, and Wajir County on 16th May 2024. The program also participated in the PREG pause and reflect meeting organized by USAID Resilience Learning Activity (RLA) in Garissa on 12th September 2024. Additionally, DRIP FUNDI participated in County WASH forums held on March 18th, 2024, in Isiolo County, and August 27th, 2024, in Marsabit County. The program also participated in the County Steering Group (CSG) meeting and the World Water Day commemoration in Isiolo County on March 28th, and on March 22nd, 2024, consecutively. During these forums, partners introduced their programs, shared experiences, and exchanged key lessons.

Stakeholder feedback gathered through County Steering Group (CSG) meetings complemented field reports and played a vital role in adapting the program's strategies. For instance, insights from county officials in Turkana and Marsabit regarding logistical challenges and community preferences influenced decisions on repair schedules and chlorination practices. The MEL team used this feedback to refine implementation plans, ensuring that interventions remained relevant and responsive to local needs.

9.2. Private Sector Engagement (PSE) Approach

The PSE approach remained central to the execution of DRIP FUNDI and safeguarding its sustainability after the proposed project implementation period. The success of the intervention was particularly contingent on the rapid delivery of spare parts to facilitate borehole repair within 96

hours. Consequently, leveraging the efficiency and expertise of the private sector to ensure this happened was key.

During implementation, MWA signed agreements with two private sector partners to supply spare parts, and to support repair, and maintenance of boreholes. Solargen technologies limited was assigned Isiolo, Marsabit and Wajir counties and Epicenter Africa limited was assigned Garissa and Turkana Counties. The agreements were signed in July 2024. Additionally, program implementation agreements were signed with Wajir, Garissa, Isiolo and Marsabit Counties in September 2024. The agreements stipulated roles and responsibilities of Counties, private sector partners and MWA to ensure a cohesive approach to boreholes repair and maintenance.

9.3. Learning and Adaptive Management

The program originally proposed installing treatment systems on ten boreholes, on the assumption that boreholes rarely get contaminated. However, results of the baseline survey indicated that 53% of the targeted boreholes had traces of E. coli contamination (106 boreholes out of the targeted 200). This was most likely due to runoff water contaminating the boreholes. There is a need to allocate more funds to disinfect the borehole storage and reticulation systems and to install more chlorination units to ensure water safety. As a result of this finding, treatment systems were installed in a total of 86 boreholes during the project implementation period and the evaluation team was able to collect data from a total of 65 of these boreholes.

10.0. CONCLUSIONS AND RECOMMENDATIONS

10.1. CONCLUSION

Improving water service delivery is a challenge that draws support from county and private sector teams. DRIP FUNDI's intervention introduced an innovative technological solution of using sensors to help solve the challenge of timely borehole repairs. Whilst this has improved the timeliness of the borehole repairs, a lot more needs to be done to fully realize the required uptime period for reliable water supply to the communities these boreholes serve.

In outcome 1, the program did indeed avail data for decision-making for timely borehole repairs. Development and updating of the asset inventory and spare parts was a collaborative effort between the county BRRTs and private sector. However, the major was that the inventory was only for above-ground assets. It was difficult to undertake the below-ground asset register because that required removal of pumps etc making boreholes non-functional for a long period.

In outcome 2, the program target was to improve borehole uptime from 84.4% to 90% by providing support for timely borehole repairs. To actualize this, DRIP FUNDI signed a tripartite borehole repair agreement with county administration and private sector partners. At the endline, an uptime of 85.7% was attained showing some improvement (1.3%). One of the main reasons for untimely repair was sighted as the internal procurement system which was not adapted to align with this target. This meant that procurement time was far much longer making it hard to repair boreholes within the 96 hours target. Equally, there was also a cash-flow issue for the private sector making it difficult to stock the required spare parts.

In outcome 3, the program focus was to undertake two main activities: develop and strengthen capacities of BRRTs and the private sector partners in accessing and interpreting borehole sensor dashboards; and sensitization of communities and stakeholders on the DRIP FUNDI model. The endline evaluation found that both the BRRTs and the private sector had access and were making use of the dashboards in receiving data relating to number of breakdowns for repositioning of fast-moving parts. Equally, by consolidating the dashboard data and secondary data from NDMA, the evaluation confirmed that, the BRRTs and the private sector developed contingency plans for all the five counties based on predicted risks for management of boreholes. On sensitization of communities and stakeholders on DRIP FUNDI model, the evaluation results show that, 52.3% of the households didn't know about the program, while 63.6% were more aware of the BRRTs. This could have shown popularity on the part of the BRRTs, a positive indication for implied sustainability of the program.

10.2. RECOMMENDATIONS FOR PROGRAM IMPROVEMENT AND SUSTAINABILITY

Based on our experience and findings, the evaluation team offers the following recommendations for future programmatic decisions:

1. **Include sensitization on chlorine treatment and Social Behavior Change Communication (SBCC) through hygiene education on water safety to create demand for safe water:** The program did not create demand for safe water which meant that, a number of boreholes had the Klorman Inline Chlorinator disconnected either because of improper installation or a malfunction. It might be important to undertake hygiene promotion

with specific focus on water safety at household level. This will lead to demand for safe water making the borehole operator and other partners to ensure water is treated before it reaches the users or customers.

2. **Establish a Modified Procurement Process:** There was a noted delay in procurement process affecting both the physical diagnosis, purchase of spare parts and actual repair of boreholes. It might be necessary for DRIP FUNDI to either establish a Modified Procurement Process (MPP) to accommodate the quicker responses required in diagnosis, purchase of spare parts and repair of the borehole
3. **Establish workshops for repair of mechanical parts of boreholes:** Very high costs incurred in repair of boreholes through either replacing motors, pumps and solar. It might be beneficial or cost-effective to establish repair workshops in each of the counties where the BRRTs and other electromechanical technicians can undertake repairs of pumps, motors and other mechanical parts instead of procuring new ones which are very expensive.
4. **Capacity building or professionalize the borehole operation:** Very low capacity of borehole operators was noted across all the counties, with most of them not even knowing basic information about the borehole they were operating. It might be necessary to professionalize the borehole operation by ensuring that the counties employed a professional operator or even train the ones that have some skills. This will enable them to undertake the normal daily operations serving as preventive maintenance.
5. **Allow for multi-Use Water system based on competing water uses:** The program did not factor a water allocation formula for boreholes that served a multi-Use Systems (potable, animal watering and irrigation) with treatment/chlorination done for all the water. It might be good for DRIP FUNDI to consider a better design in the placement/location of the Chlorinator to only serve potable water points.
6. **Map the water supply system for each borehole:** During water quality analysis, it was found that some of the water systems had treatment/chlorination and yet they tested positive for E.Coli which meant that there was contamination either along the pipeline or through handling during collection and transportation of water. Mapping could help establish point sources of contamination to enable development of a remedy to contamination.
7. **Feedback to manufacturers of specific high-value assets:** The asset inventory could include information on manufacturers and if possible, contact information (email and telephone). This could provide an opportunity to establish a feedback mechanism of sharing information on the performance of say, a pump or motor. Well-intended feedback might lead to technical support from the manufactures since their products might be at risk if a lot of negative feedback comes from many customers.
8. **Explore and include other funding streams for service sustainability:** So far, DRIP FUNDI has relied on the donor funds and are exploring the carbo credit for sustainable financing of water services. It might be important to also explore other traditional mechanisms such as user fee with a focus on improving collection efficiency. Equally, improving advocacy at county level to improve budget allocation for both the development of new sources, capital expenditure

(CAPEX) and funds for maintaining the existing sources, operational expenditure (OPEX).

9. **Develop clear protocols on WQ and O+M:** The evaluation found that there were no clear standard operating procedures (SOPs) for water quality (WQ) and operation and Maintenance (O+M) procedures laid down. These SOPs could help the BH operators, the BRRTs and private sector to ensure proper installation of the Klorman Inline Chlorinator, proper checks on regular basis as well as frequent O+M of the BH assets and the fast-moving parts. The program over relied on the sensor without a human interaction which meant that, they could only apply O+M procedures when a malfunction happened. This watered down the very objective of preventive maintenance the project was meant to uphold.

10. **Institutional support and policy on county budget allocation for WASH:** While counties may have instituted WASH policies, their implementation especially on budget allocation to O+M might be weak. It might be important for DRIP FUNDI to support counties in the budget-making and budget-monitoring process through the County Integrated Development Plan (CIDP) process. This will ensure ring-fencing of water funds making them available for both CAPEX and OPEX.

8.0. ANNEXES TO THE REPORT

ANNEX A: EVALUATION TOR

ANNEX B: FINAL DATA COLLECTION TOOLS

ANNEX C: ANONYMIZED LIST OF RESPONDENTS

ANNEX D: RAW AND CLEANED DATA SETS/ BOREHOLE LIST

ANNEX E: UPDATED IPTT TABLE BASED ON AVAILABLE SOURCE DATA RECORDS

No	Indicator	Result Measured by indicator	Type of Indicator	Data Source	Unit of Measure	Baseline value	Target	Endline value	Explanation
1	Number of individuals utilizing improved water services provided by BHA funding	Utilization of the improved water services	Performance	Population based endline survey	Number	0	120,000	272,424+	Number of HHs utilizing water from the 57 boreholes
2	Percent of target boreholes reporting 90% uptime	Uptime improvement of the boreholes	Performance	Dashboard analytics	Percentage	84%	100%	64.3%	Based on 42 boreholes (mWater)
3	Number of reported breakdowns that are responded to as a result of available technical data	Responsiveness to breakdowns of the boreholes	Performance	Outcome monitoring and participant-based sample survey	Number	0	TBD	42	Based on data from 42 boreholes (mWater)
4	Number of borehole assets inventory/ repository developed at the county level by BRRTs and Private Sector	Availability of the crucial info on the borehole	Performance	Routine monitoring	Number	0	1	5	
5	Number of spare parts data repository developed and updated by BRRT and Private sector	Availability of the fast-moving list of spare parts	Performance	Routine monitoring	Number	0	1	5	
6	Number of boreholes repaired within 4 days of breakdown	Timeliness of the repairs	Performance	Outcome monitoring and participant-Based sample survey	Number	0	200	1	As per mWater data
7	Number of people using climate information or implementing risk-reducing actions to improve resilience to climate change as supported by USG assistance (RiA)	Utilization of climate Information to combat Climate risks	Performance	Outcome monitoring and participant-Based sample survey	Number	0	TBD	N/A	
8	Number of reported breakdowns that are responded to in a timely manner by the BRRT and Private Sector	Responsiveness of the Repairs team	Performance	Routine monitoring	Number	0	TBD	1	As per mWater data
9	Percentage of persons reporting increased usage of remote borehole functionality monitoring approaches as a result of DRIP FUNDI	Improved borehole functionality	Performance	Participant Based survey	Percentage	0	60%	N/A	
10	Number of participants trained in the application of the proposed monitoring approaches reporting increased knowledge	Increased knowledge of the participants	Performance	Pre and Post survey	Number	0	100	N/A	
11	Percent of water points developed, repaired, or rehabilitated with 0 fecal coliforms per 100 ml sample	Improved water quality	Performance	Census of all water points repaired	Percentage	0	200	53.8%	
12	Percent of water points developed, repaired, or rehabilitated with free residual chlorine (FRC) \geq 0.2 mg/L	Improved water quality	Performance	Census Of all water Points repaired	Percentage	0	200	38.1%	

ANNEX F: FINAL INCEPTION REPORT

ANNEX G: FINDINGS ON WATER QUALITY

	County	Sub-county	Name of the Ward	Name of the village	Borehole Name	Population served	Sample collection point	Date	E. Coli (A/P)	Total Coliform (A/P)	FRC	pH
1	Isiolo	Isiolo	Ngare mara	Kona village	Kona BH	106	From Tap	04/04/2025	Absent	Present	0.2	7.6
2	Marsabit	Laisamis	Logologo	Lokilelen	Lesitima BH	140	From household jerrican	09/04/2025	Present	Present	0	7.4
3	Wajir	Eldas	Basir/la koleey	Masalale	Masalale BH	350	From household jerrican	03/04/2025	Absent	Present		8.2
4	Wajir	Tarbaj	Tarbaj ward	Hargaal	Hargaal BH	50	From Kiosk	07/04/2025	Present	Present	0.2	7.2
5	Marsabit	Laisamis	Loglogo	Lokilelen	Lesitima BH	140	From Tap	10/04/2025	Present	Present	0	7.4
6	Marsabit	Moyale	Uran	Rawana	Rawana BH	150	From Tap	10/04/2025	Present	Present	0	7.2
7	Marsabit	Moyale	Golbo	Missa	Missa BH	3000	From Kiosk	10/04/2025	Absent	Absent	0	7.6
8	Garissa	Balambala	Balambala	Balambala	Blambala BH	500	From Tap	06/04/2025	Absent	Absent	0.4	7.2
9	Garissa	Balambala	Sankuri	Sankuri	Sankuri BH	600	From borehole	09/04/2025	Present	Present	0.4	7.2
10	Turkana	Turkana South	Katilu	Katilu Center	Katilu Center BH	3000	From Tap	09/04/2025	Present	Present	0.1	7.03
11	Turkana	Turkana West	Kakuma	Nakoyo	Nakoyo BH	5000	From Tap	08/04/2025	Present	Present		7.64
12	Turkana	Turkana North	Kaeris	Kanakurudio	Kanakurudio BH	200	From Tap	07/04/2025	Present	Present		7.95
13	Turkana	Turkana North	Kaeris	Kaeris Center	Kaeris Center BH	240	From Tap	07/04/2025	Present	Present		8.05
14	Turkana	Turkana North	Kaeris	Mlima Tatu	Mlima Tatu BH	219	From Tap	07/04/2025	Present	Present		7.95
15	Turkana	Loima	Lobei/Kotaru k	Kekuto	Kekuto BH	2000	From Tap	05/04/2025	Absent	Absent	3	7.89

16	Wajir	Wajir West	Arbajahan	Arbajahan	Arbajahan BH	800	From household jerrican	09/04/2025	Absent	Present		7.6
17	Wajir	Eldas	Basir/lakoleey	Masalale	Masalale BH	350	From household jerrican	03/04/2025	Present	Absent	4	8.2
18	Wajir	Wajir North	Buna	Nyatta	Nyatta BH	360	From household jerrican	08/04/2025	Absent	Present	2	7.4
19	Marsabit	North Horr	Maikona	Elgade	Elgade BH	600	From Kiosk	11/04/2025	Absent	Absent	0	7.6
20	Marsabit	North Horr	Maikona	Boji	Boji BH	500	From Kiosk	11/04/2025	Present	Present	0	7.6
21	Marsabit	Saku	Sagantejaldesa	Dololo dokatu	Dololo Dokatu BH	215	From Tap	11/04/2025	Absent	Absent	0.4	8.01

ANNEX H: PHOTOS

