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EVALUATION REPORT

MILLENNIUM WATER AND SANITATION PROGRAM (PEPAM/USAID) EX-POST EVALUATION

WASH Ex-Post Evaluation Series—Water Communications and Knowledge Management (CKM) Project

July 2019

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The Water CKM project team, comprised of ECODIT LLC and Social Impact Inc., prepared this report under the leadership of Holly Dentz, M&E Specialist, and Kari Nelson, Senior Technical Advisor.

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ACRONYMS

ACIEHA	Integrated Community-Based Approach for Water, Hygiene, and Sanitation
ASUFOR	Associations of Water Users, Association d'Usagers de Forage
CFA	West African Communauté Financière Africaine Franc
CKM	Communications and Knowledge Management
CG	Village Management Committee, *comité de gestion*
CLTS	Community-Led Total Sanitation
CLTS-WI	CLTS with a Water Incentive
DHS	Demographic and Health Surveys
DVL	Double Vault Latrine
E. coli	*Escherichia coli*
ET	Evaluation Team
GoS	Government of Senegal
HH	Household
IP	Implementing Partner
JMP	Joint Monitoring Programme
MPN	Most Probable Number
NGO	Non-Governmental Organizations
NL	Natural Leader
OD	Open Defecation
ODF	Open Defecation Free
OFOR	Office of Rural Borehole Management
O&M	Operations and Maintenance
PEPAM/ USAID	The Millennium Water and Sanitation Program/USAID
PHAST	Participatory Hygiene and Sanitation Transformation
PLHA	Local Water Supply and Sanitation Plan
RTI	Research Triangle Institute
RWSN	Rural Water Supply Network
SARAR	Self-Esteem, Associative Strengths, Resourcefulness, Action Planning and Responsibility
SI	Social Impact Inc.
SNAR	National Sanitation Strategy
USAID	United States Agency for International Development
USAID/E3	USAID Bureau for Economic Growth, Education and Environment
USD	United States Dollar
VIP	Ventilated Improved Pit
WADA	Water and Development Alliance
WASH	Water, Sanitation, and Hygiene
WP	Water Point
WatSan	Water and Sanitation
WUA	Water Users Association

EXECUTIVE SUMMARY

PURPOSE AND OVERVIEW

Rural water and sanitation service challenges in developing countries are well known. As of 2015, only 63 percent of rural populations in Senegal had access to basic drinking water, 13 percent had access to basic sanitation, and 24 percent had access to a handwashing facility.[1] Donors, implementers, and governments continue to debate the effectiveness of applying subsidies to expand rural water and sanitation infrastructure.[2, 3] In recent years, that debate has grown with the popularization of the community-led total sanitation (CLTS) approach, which in its "pure" form does not allow subsidies. With great interest over the last several years, stakeholders in the water, sanitation, and hygiene (WASH) sector have tried to combine or debated the value of combining the two approaches.

This report presents findings from the fifth in a series of six ex-post evaluations designed to provide evidence of the factors impacting sustainability of USAID–funded WASH activities. A consortium of partners with Research Triangle Institute (RTI) in the lead implemented the subject of this evaluation—the Millennium Water and Sanitation Program (*Programme d'Eau Potable et d'Assainissement du Millénaire au Sénégal*, PEPAM/USAID)—from 2009–2014 with a budget of $21 million, and aimed to improve sustainable access to WASH in four regions of Senegal. USAID and other stakeholders will use the evaluation to improve the design, effectiveness, and sustainability of future WASH activities.

PEPAM/USAID applied three different approaches to deliver water services, sanitation services, or both: CLTS with a water incentive (CLTS-WI), subsidy for water and sanitation services, and a hybrid of CLTS-subsidy. Within these approaches, the RTI consortium aimed to improve local water and sanitation services through several interventions. Specifically, PEPAM/USAID trained and supported local water entrepreneurs (drilling operations, metal artisans) to facilitate the construction, rehabilitation, and maintenance of water points (WPs), installed different pump types and set up supply chains for them, and established or strengthened water management committees. The activity also trained local sanitation masons to construct PEPAM/USAID–promoted designs, provided latrine construction and pit emptying manuals, and established or strengthened sanitation committees. In addition, the activity promoted handwashing at critical times and tippy tap construction. A wide array of behavior change interventions accompanied these activities using both the participatory, hygiene and sanitation transformation (PHAST) and self-esteem, associative strengths, resourcefulness, action planning and responsibility (SARAR) approaches.

SCOPE

The evaluation addressed seven key questions**:**

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1 Joint Monitoring Program (JMP), WHO, and UNICEF. washdata.org/data/household#!/sen.
2 Evans, B., C. van der Voorden, & A. Peal, 2009. Public Funding for Sanitation: The Many Faces of Sanitation Subsidies. Water Supply & Sanitation Collaborative Council. Geneva: Switzerland
3 Le Blanc, D. 2007. Providing Water to the Urban Poor in Developing Countries: The Role of Tariffs and Subsidies. United Nations.

Table 1. Evaluation Questions

Water	1. What is the level of service of PEPAM/USAID WPs? 2. Which factors influenced sustainability of water services? 3. Are women actively engaged in management and governance structures?
Sanitation	4. Are households (HH) using and replacing their latrines? 5. What factors, including choice of approach, contributed to sustainability?
Handwashing	6. What is the status of handwashing stations and practices today? 7. Which factors influenced sustainability of handwashing behaviors?

DESIGN

The evaluation team (ET) conducted data collection in November and December of 2018 in Kolda, Sédhiou, Ziguinchor, and Tambacounda regions using a mixed-methods design:

Surveys

- **514** Water users
- **617** Sanitation HHs

Water Quality Tests

- **105** *Escherichia coli (e. coli)*
- **105** Iron
- **64** Fluoride

Structured Observations

- **169** Water points
- **551** Latrines
- **291** Handwashing stations

Key Informant Interviews

- **56** interviews with former implementers, local water entrepreneurs, government officials, water management committees, community leaders, and members.

For the quantitative component of the study, the ET randomly selected villages to provide a representative sample. The ET purposively selected the qualitative sample to provide a wide range of perspectives and opinions. The ET analyzed the quantitative data using Stata and the qualitative data using MAXQDA. The ET triangulated the quantitative and qualitative data to validate findings, conclusions, and recommendations.

KEY FINDINGS

WATER POINTS

CURRENT STATUS

- **While a majority (63 percent) of the water points remained functional,** the performance varied significantly based on technology used. Of the different technologies, the Erobon rope pumps performed poorly (27 percent functional), while the India Mark (74 percent functional) and mechanized pumps (70 percent functional) performed the

best. These findings are in line with the broader literature, which show similar functionality rates.[4]

- **A majority (84 percent) of water users reported being satisfied or very satisfied with the quantity of water** produced at their primary water source. The India Mark 2 pumps performed best in terms of flow rates as well as stroke rates. Across manual pump technologies, however, some users complained about the strenuous effort required to meet their water needs.
- **Respondents generally believed the activity WPs provided safe water**; water quality testing results largely supported this sentiment. **Only 7 percent of WPs tested positive for *E. coli,*** and fluoride and iron testing revealed similarly low levels.
- **Most users (83 percent) spent less than 30 minutes round trip to get water**. However, most users had to make multiple trips to meet their households' water needs, spending 53 minutes per day on average to collect water.
- **Most respondents (82 percent) reported their WP functioned year-round**, with the Vergnet pumps reported to have the most issues.

USE

Sixty-one percent of respondents reported using multiple WPs to meet their water needs, and most secondary water sources used were unprotected. In communities with functioning PEPAM/USAID WPs respondents reported these typically served as their primary source for water and most frequently used for drinking and cooking purposes. For animal and agriculture purposes, HHs relied more heavily upon secondary sources for water. Only 27 percent of respondents reported using an effective form of water treatment such as Aquatabs or chlorine.

FACTORS AFFECTING SUSTAINABILITY

Most WPs had an active water management committee, but few appeared to be following management best practices such as holding monthly meetings, writing and distributing meeting minutes, etc. Only 33 percent of respondents said they paid water fees, and these fees, more often than not, were insufficient to cover the necessary operation and maintenance costs. The ET found a statistically significant and positive correlation between fee collection and functionality. PEPAM/USAID–trained local entrepreneurs could still be found and hired if a person or water committee had the means to pay for their service. However, none of the local entrepreneurs sustained active contracts with water committees.

SANITATION

CURRENT STATUS

HH in PEPAM/USAID villages surveyed reported high rates of sanitation access (92 percent) across all approaches and sharing latrines as a common practice. While HHs in CLTS-WI villages reported the highest access to any latrines, subsidy and hybrid communities typically

[4] Banks, B. & S. Furey. 2016. What's Working, Where, and for How Long: A 2016 Water Point Update. Poster session presented at the 7th RWSN Forum, Abidjan, Cote d'Ivoire. https://www.rural-water-supply.net/_ressources/documents/default/1-787-2-1502962732.pdf

built latrines of higher quality. Among all approaches, only 47 percent of respondents qualified as having basic sanitation access, with those in hybrid villages performing best (56 percent).

USE

The ET found fairly high levels of latrine use—both self-reported (89 percent) and observed (86 percent). Ninety-four percent of latrines in CLTS-WI villages and 89 percent of subsidy village latrines appeared to be in use; the hybrid approach performed relatively poorly in comparison (with 77 percent in use). Reports of open defection varied by approach. Overall, 68 percent of respondents stated that no one in their community defecates in the open.

FACTORS AFFECTING SUSTAINABILITY

Overall, 49 percent of respondents indicated they had repaired their latrine when it had an issue, with those in hybrid villages reporting the highest rate of repair/replacement. Reported barriers to access and repair/replacement included insufficient access to financial and material resources. Some of the poorest households appeared to be in a cycle of building poor quality latrines that required frequent repairs or replacement, which had an impact on sustainability.

A trade off appeared to occur between latrine quality and use. While the CLTS-WI approach appeared most effective at encouraging use, the poor quality of the latrines in these communities did not meet the requirements for basic sanitation service. In subsidy and hybrid communities, more respondents qualified as having basic sanitation service and more frequently reported repairing or replacing their latrine, yet actual use appeared lower.

HANDWASHING

CURRENT STATUS

Very few HH had a fixed handwashing station (6 percent). The ET did not find any activity-supported tippy taps still in use. Only 31 percent of households had access to both soap and water for handwashing.

USE

Despite the low rates of observed handwashing stations, soap, and water, 85 percent of respondents said they regularly washed their hands with soap and water. Only 38 percent of handwashing stations across the intervention approaches showed signs of use, indicating that handwashing promotion did not become normative.

FACTORS AFFECTING SUSTAINABILITY

The PHAST/SARAR approaches used for behavior change messaging are now known to have several weaknesses.[5] People reported washing their hands most before eating (81 percent), after toileting (73 percent), and before cooking (53 percent). At other critical times, less than 50 percent of respondents reported washing their hands. Respondents pointed to the need for

5 IRC International Water and Sanitation Centre & NETWAS International. 2009. Report of the Evaluation of the PHAST Tool for the Promotion Hygiene & Sanitation in the GOK/UNICEF Programme of Cooperation. UNICEF. https://www.unicef.org/evaldatabase/files/Kenya_2009-008_-_PHAST_Evaluation_Report_final-.pdf

sustained behavioral interventions and promoter presence to enable HHs to change habits and shift norms.

The implementation of additional WASH programming in the community appeared to influence handwashing (but not sanitation or water outcomes). HHs in these communities appeared to be more likely to have both soap and water as well as observable signs of handwashing.

CONCLUSIONS

Overall 63 percent of PEPAM/USAID WPs still functioned and served as high-quality, reliable primary drinking water sources. The PEPAM/USAID WP failure rate, while on a par with other studies, indicated a lack of sustainability. Several factors appeared to influence the status and use of the PEPAM/USAID WPs. Despite training, many of the water management committees struggled to implement best practices, and most did not to collect water fees that would ensure sufficient funds to pay for WP operations and maintenance. Activity-trained local entrepreneurs continued to engage in construction and repair of WPs, but only for those with financial resources could afford to hire them. These findings are consistent with other studies in this series as well as studies of rural WP management more broadly.[6] As long as these issues remain, rural water service will struggle to consistently function and be maintained.

Achieving a balance between quality infrastructure and high rates of use can be difficult. Latrine use and norm creation are dependent on a host of factors, but chief among them is access. In PEPAM/USAID villages, the ET noted a trade-off between quality and use. CLTS-WI communities had the highest evidence of use, but the lowest quality latrines, while subsidy and hybrid communities had lower evidence of use, but better-quality latrines that more frequently met basic service standards. A hybrid approach also has the potential to address sanitation service for economically disadvantaged households that reported limited financial, material, and physical resources. The approach could affect outcomes in multiple ways. For example, the CLTS-WI approach used open defecation free certification as an incentive for a subsidized water point, whereas the hybrid approach did not. It is of critical importance for future WASH activities to further explore the impact of differences between the implementation approaches and how they motivated behavior change around latrine use and open defecation practices.

As far as the sanitation subsidy vs. CLTS debate goes, in this context the data indicate a trade-off between the approaches. However, in aggregate, the data suggest that the hybrid approach strikes a balance and may be able to deliver more basic sanitation service to HHs and better establish norms.[7] However, more research needs to be done to understand the factors that drove high latrine use in CLTS-WI villages and comparatively poor use in hybrid villages; this analysis is beyond the scope of this evaluation given available information on PEPAM/USAID implementation.

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6 Foster, T. 2013. "Predictors of Sustainability for Community-Managed Handpumps in Sub-Saharan Africa: Evidence from Liberia, Sierra Leone, and Uganda." *Environmental Science & Technology* 47.21: 12037-12046. And Foster, T. and R. Hope. 2017. "Evaluating Waterpoint Sustainability and Access Implications of Revenue Collection Approaches in Rural Kenya." *Water Resources Research* 53.2: 1473-1490.

7 USAID. 2018. An Examination of CLTS's Contributions Toward Universal Sanitation. Washington, DC.: USAID Water, Sanitation, and Hygiene Partnerships and Sustainability (WASHPaLS) Project.

Encouraging handwashing is also difficult, though repeated messaging over time may be helpful. Based on the interviews and direct observations, it became evident that the handwashing stations PEPAM/USAID promoted no longer exist and replacement has been limited. With less than half of all observed HHs possessing any materials or facilities to wash hands and in spite of self-assertions regarding handwashing practices, the behavior change strategy did not appear sufficient to change handwashing behavior long-term.

RECOMMENDATIONS

1. **Consider building on the hybrid (combined CLTS and subsidy) approach for future rural sanitation service programming.** Attention should be paid to improving promotion of quality latrine facilities and determining the appropriate subsidy.
2. **Consider alternative models for small-scale WP management and governance**. Ensure that these models include linkages and consistent interactions with larger WASH governance and support structures.
3. **Incorporate human-centered design of handwashing stations into future projects**. Consider improving access to fixed handwashing stations beyond the tippy tap as well as supply chains for quality materials. Also develop guidelines on handwashing station material quality.
4. **Continue to engage in private-sector partnerships that foster local capacity building and entrepreneurship training.** Ensure that specific plans are in place to transition financial systems (bank accounts/guarantee of payment) for WASH services when a project ends. Simultaneously, ensure that supply chain systems are sustainable after the project concludes.
5. **Support system strengthening for sustained championing of WASH behavioral norms.** Promote the journey to self-reliance through work with host governments to strengthen systems that support community health workers or community WASH champions to provide longstanding and consistent behavior change activities. Changing behavior and shifting norms around water, sanitation, and handwashing with soap and water will require sustained presence.
6. **Conduct a cost-benefit analysis of WP pumps, well borehole options, and the three sanitation implementation approaches.** Combine existing cost documents with benefit data as an aid in decision-making for future programming.
7. **Support adaptive management recommendations in midterm evaluation reports and follow up to ensure that implementers have the flexibility to make course corrections.** Based on the data, it appears that implementing partners did not modify all implementation approaches in accordance with independent midterm evaluation findings regarding threats to sustainability.

INTRODUCTION

Water and sanitation service challenges in developing countries are well known. The 2016 Water Point Update from the Rural Water Supply Network (RWSN) showed that an average of 22 percent of water points (WPs) were nonfunctional across 11 countries.[8] In a study of four sub-Saharan African countries, an average of 13 percent of villages previously declared to be open defecation free (ODF) slipped back into open defecation (OD) status.[9] Debates about the effectiveness and application of subsidies for rural water and sanitation infrastructure have taken place for many years.[10, 11] In recent years, the debate has only grown with the popularization of the community-led total sanitation (CLTS) approach that does not include subsidies. As an outcome of this debate, a number of stakeholders have tried or considered the value of combining CLTS with targeted subsidies, which is of great interest to the water, sanitation, and hygiene (WASH) sector.

This report presents findings from the fifth in a series of six ex-post evaluations designed to understand the factors impacting sustainability based on the evaluation of completed USAID–funded WASH activities three to ten years after their conclusion.[12] The subject of this evaluation—the Millennium Water and Sanitation Program (*Programme d'Eau Potable et d'Assainissement du Millénaire au Sénégal*, PEPAM/USAID)—provides an opportunity to learn about the long-term outcomes related to rural water point construction and rehabilitation, management of those water points, participatory sanitation and hygiene education activities, and the comparative long-term outcomes of three approaches to achieving sanitation adoption: CLTS with a water incentive (CLTS-WI), subsidy for water and sanitation services, and a hybrid subsidy-CLTS approach. As of 2015, Senegal had met the Millennium Development Goals (MDGs) in urban water and sanitation. However, more than 2 million rural Senegalese lagged behind. Only 63 percent of rural populations had access to basic drinking water, 13 percent had access to basic sanitation (use of improved facilities that are not shared with other households), and 24 percent had access to a handwashing facility.[13] The aim of this evaluation is to provide evidence for USAID and other stakeholders and inform the design of sustainable future rural WASH activities in Senegal.

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[8] Banks, B. & S. Furey. 2016. What's Working, Where, and for How Long: A 2016 Water Point Update. Poster session presented at the 7th RWSN Forum, Abidjan, Cote d'Ivoire. https://www.rural-water-supply.net/_ressources/documents/default/1-787-2-1502962732.pdf

[9] Tyndale-Biscoe, P. et al. 2013. ODF Sustainability Study. Plan International. http://www.communityledtotalsanitation.org/sites/communityledtotalsanitation.org/files/Plan_International_ODF_Sustainability_Study.pdf.

[10] Evans, B., C. van der Voorden, & A. Peal. 2009. Public Funding for Sanitation: The Many Faces of Sanitation Subsidies. Water Supply & Sanitation Collaborative Council. Geneva, Switzerland.

[11] Le Blanc, D. 2007. Providing Water to the Urban Poor in Developing Countries: The Role of Tariffs and Subsidies. United Nations.

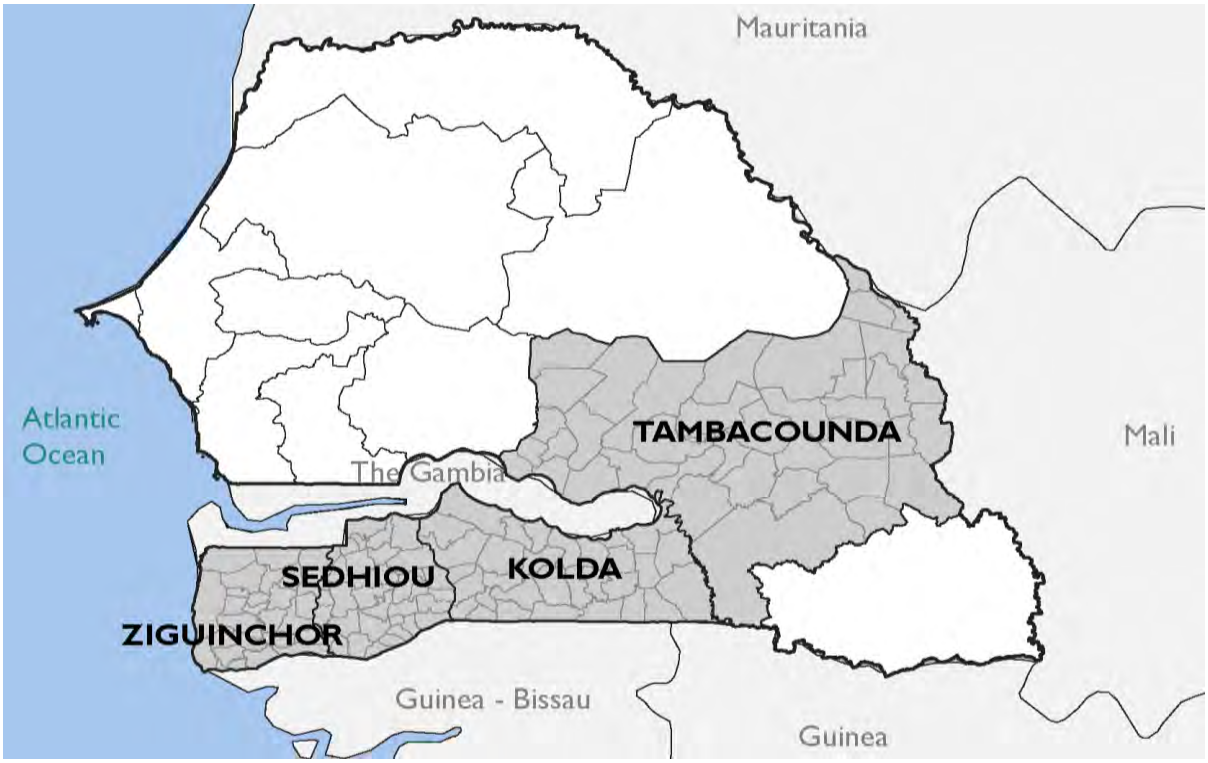
[12] The first four evaluations have been completed in Madagascar, Indonesia, Ethiopia, and India. The ex-post series is a task under the Water CKM activity, which is implementing knowledge management and communication services in support of the USAID Water and Development Plan. The project supports USAID's E3 Water Office and its partners in increasing water program knowledge and data capture; enhancing knowledge creation and knowledge sharing internally and among a wide range of external water sector stakeholders working in the water sector; and improving communication and outreach through diverse stakeholder engagement.

[13] Joint Monitoring Program (JMP), WHO, and UNICEF. washdata.org/data/household#!/sen.

OVERVIEW OF ACTIVITY AND BUDGET

In 2005, the Government of Senegal (GoS) launched PEPAM, a unified framework geared toward meeting Millennium Development Goal targets for water and sanitation, specifically to "provide drinking water to an additional 2.3 million people, increase rural households (HHs') access to drinking water from 64% in 2004 to 82% in 2015;[14] and expand sanitation provision to 355,000 rural HHs, increasing the rate of access to sanitation in rural areas from 17% in 2004 to 59% in 2015."[15] In addition to its own PEPAM interventions, the GoS also partnered with a number of international donors (e.g., PEPAM/European Union, PEPAM/African Development Bank, etc.[16]), including USAID. Even with progress from GoS inputs, by 2008, Senegal's rural areas, particularly in southern Casamance and Tambacounda (**Figure 1**), remained behind in terms of access to water and sanitation.[17] Poverty and ongoing low-level conflict in Casamance since the 1980s exacerbated the discrepancy in coverage.[18]

Figure 1. Map of Senegal Regions with PEPAM/USAID Activities Highlighted in Gray



[14] PEPAM's Final Report specifies that the indicator used to measure rural household access to drinking water follows the USAID definition for improved drinking water

[15] PEPAM. "Vue d'ensemble." http://www.pepam.gouv.sn/ensemble/index.php?rubr=vue.

[16] See Inception Report in Annex A for more details on PEPAM's partners.

[17] PEPAM documented these conditions in a 2010 Coordination Unit study, which found that "the Casamance region in Senegal ranks at the bottom of the list for access to potable water (i.e., Kolda's rate is 36.8%). Access to sanitation facilities is even lower, with the rate in Ziguinchor at 29%, and the rate in Sédhiou and Kolda both at a very low 8.1%." Swerdlin, D. & M. Seck. 2013. Final Report–Senegal WADA I & II Activities Community Led Total Sanitation Infrastructure Planning and Construction (Water Wells and Latrines) in the Regions of Ziguinchor, Sédhiou, and Kolda.

[18] CIA World Factbook. "Senegal Country Profile." https://www.cia.gov/library/publications/the-world-factbook/geos/sg.html.

To address these challenges USAID, in partnership with the GoS, selected Research Triangle Institute (RTI) to lead a consortium to manage and implement the $21-million PEPAM/USAID activity from September 2009 to December 2014. RTI worked with the GoS, other implementing partners (IPs), approximately 20 local NGOs, local entrepreneurs,[19] and other stakeholders to implement PEPAM/USAID in the Casamance region (Kolda, Sédhiou, and Ziguinchor) and Tambacounda. The primary objective was to: "Improve sustainable access to water supply and sanitation (WSS) and to promote better hygiene in targeted rural, small town, and peri-urban areas of Senegal" (**Annex F: USAID/PEPAM Results Framework**).[20]

CROSS-CUTTING IMPLEMENTATION

The RTI consortium aimed to achieve its objectives through a number of water and sanitation service-strengthening activities. This included training and supporting local water entrepreneurs to facilitate the construction, rehabilitation, and maintenance of WPs, including setting up drilling operations and supply chains. PEPAM/USAID also provided manuals on latrine construction, pit latrine emptying, and handwashing station construction and trained local entrepreneurs (sanitation masons) to construct and maintain sanitation infrastructure in their communities. The activity strengthened existing or established new Water Users' Associations (WUAs), *Association d'Usagers de Forage* (ASUFORs), and Village Management Committees (*comité de gestion*—CGs)[21], which oversaw the construction and maintenance of water and institutional sanitation infrastructure, as well as the promotion of good WASH practices.

Additionally, the activity provided Regional Hygiene Offices with water quality measuring equipment to facilitate local water quality testing[22] and promoted the development of local water and sanitation plans.[23,24] Program technicians and regional technical service units used these water and sanitation plans to support village selection.[25] Across all villages and approaches (described below) PEPAM/USAID used a wide array of behavior change interventions informed by the participatory, hygiene, and sanitation transformation (PHAST) and self-esteem, associative strengths, resourcefulness, action planning and responsibility (SARAR) approaches. In addition, PEPAM/USAID promoted community management practices and capacity building, and worked to empower local leaders to mobilize their communities around household water treatment with Aquatabs, handwashing practices at critical times, and tippy tap construction. Community members participated in all the interventions on a voluntary basis.

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[19] Private-sector local entrepreneurs were capacitated and provided inputs to provide a range of products and services along the WASH value chain e.g., WP drilling, pump installation, WP slab placement, and operations and maintenance contracts.
[20] RTI International. 2014. PEPAM/USAID Senegal Final Project Report.
[21] WUAs and ASUFORs typically served larger water systems with mechanized pumps while the CGs typically manage manual pumps.
[22] PEPAM/USAID documents do not specify the frequency at which water quality testing was supposed to occur.
[23] SEMIS. 2013. Mid-Term Evaluation of the PEPAM/USAID Water and Sanitation Project. USAID.
[24] RTI International. 2011. USAID/Millennium Water and Sanitation Program Annual Report No. 2. USAID.
[25] Site selection was ultimately approved by the national department. PEPAM Year 1 Assessment Report.

INTERVENTION APPROACH

Over the course of implementation, PEPAM/USAID used three different approaches to WASH programming: CLTS with a water incentive (CLTS-WI), subsidy, and hybrid. Each is discussed in turn below (see **Annex G: Summary of USAID/PEPAM Approaches**).[26]

The first approach, **CLTS with a water incentive,** focused primarily on sanitation (encouraging at least one latrine per HH) and handwashing promotion. PEPAM/USAID offered no subsidies or funding for household latrines, following the traditional CLTS approach (e.g., triggering.), however, the activity provided sanitation manuals to guide latrine construction and maintenance and referrals to trained masons.[27] In addition, PEPAM/USAID incentivized villages with a subsidized water point upon achieving ODF certification (the village paid a 10 percent cost-share for new WP and 50 percent to 100 percent for any major rehabilitations).[28] Only a subset of the total ODF certified villages opted for a subsidized WP. In addition to sharing the cost of building/rehabilitating WPs and setting up a maintenance fund with a minimum 50,000 West African Communauté Financière Africaine Franc (CFA) contribution, communities provided sand, gravel, and other construction materials.[29] The activity also encouraged community members to treat their water with Aquatabs,[30] build handwashing stations, and wash their hands at critical times. PEPAM/USAID implemented this approach Kolda, Sédhiou, and Ziguinchor.

Table 2. CLTS Villages

APPROACH	#
Sanitation & Hygiene Only (ODF Verified)	36
Water, Sanitation, & Hygiene (ODF Verified)	72

[26] The approaches were rolled out in a phased process and learning incorporated for each phase into the next. Starting with the subsidy approach in 2009, in 2010 CLTS pilots began, and after 2.5 years the hybrid (CLTS+subsidy) approach was introduced in Tambacounda according to: USAID. 2013. Diversification of Strategies to Improve Access to Sanitation in Rural Areas In Senegal Technical Note on USAID/PEPAM's Integrated Approach.

[27] RTI International Implementation Plan, WADA Project Development Process.

[28] Note, using a water point as an incentive alone diverges from traditional CLTS, which focuses on disgust and shame as the primary motivators to change behavior and reach open defecation free status.

[29] The Water and Development Alliance (WADA) subcomponent principally focused on this approach and drove efforts toward Development Result 5.

[30] The implementation documents do not provide specific details on how and where community members were encouraged to use Aquatabs.

The second approach**—subsidy—**combined demand creation through community meetings and promoters with a subsidy to finance water and/or sanitation infrastructure. This approach did not include traditional CLTS activities. Presidents of ASUFORs and CGs, heads of villages, or mayors could request financing support for desired water and/or sanitation infrastructure in their communities, and PEPAM/USAID financed the difference between what the community could contribute and the total cost of the water point, or in some rare cases, institutional latrines.[31,32] PEPAM/USAID made the subsidy available to any household in the community. Households that opted to participate in the sanitation subsidy component cost-shared a prespecified amount based on the latrine type selected (see **Table 6**). The community fundraised and cost-shared 10 percent of the project's capital expenses for WPs, and user fees were meant to cover ongoing operation expenses. In addition, the activity encouraged community members to treat their water with Aquatabs and to construct fixed handwashing stations to wash their hands at critical times. PEPAM/USAID implemented this approach in Kolda, Sédhiou, Tambacounda, and Ziguichor.

Table 3. Subsidy Villages

APPROACH	#
Water only	64
Sanitation & Hygiene only	57
Water, Sanitation, & Hygiene	112

The final approach—**hybrid**[33]—a combination of CLTS and subsidy implemented in parts of Tambacounda, promoted both water supply and /or sanitation infrastructure. IPs triggered communities with CLTS methods and approximately three months later revisited the communities to introduce the subsidy structure. PEPAM/USAID made the sanitation subsidy available to all households in the community, and those that chose to participate had to pay their portion of the cost-share. In villages that only participated in the water subsidy, IPs held demand-creation meetings, and the community fundraised their portion to obtain a subsidized WP. In addition, PEPAM/USAID encouraged community members to treat their water with Aquatabs, build handwashing stations, and wash their hands at critical times.

Table 4. Hybrid Villages

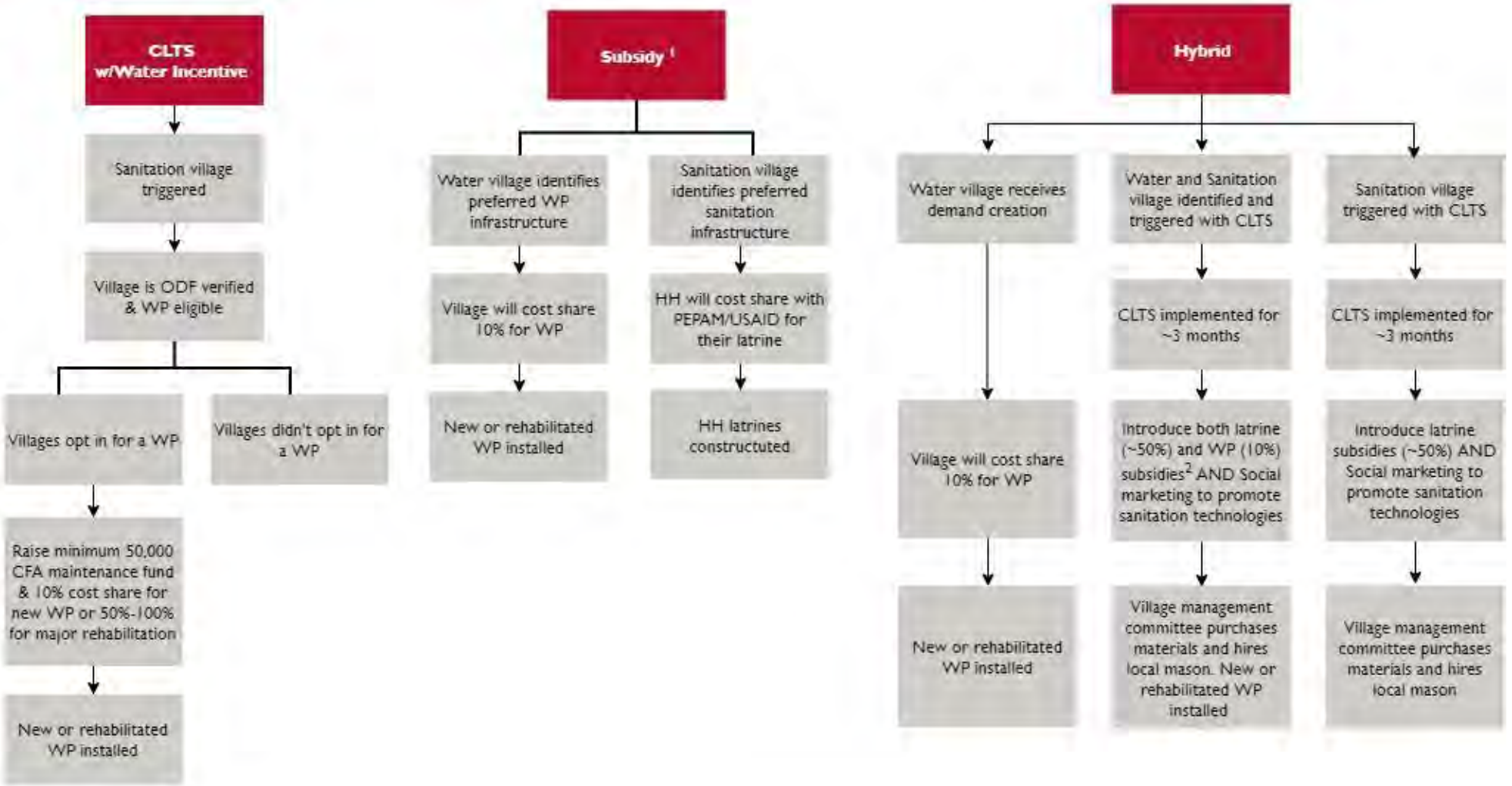
APPROACH	#
Water only	31
Sanitation & Hygiene only	9
Water, Sanitation, & Hygiene	34

[31] Public sanitation also referred to as institutional sanitation was only a part of the subsidy approach and included latrines at 10 schools and 39 clinics. PEPAM/USAID constructed sanitary blocks and boreholes to promote WASH in Schools in the Casamance and built institutional sanitary blocks at health centers and health posts in Tambacounda. This evaluation did not evaluate 147 improved toilets provided as part of the WASH in Schools or institutional sanitation activities.

[32] RTI International. 2011. USAID/Millennium Water and Sanitation Program Annual Report No. 3. USAID.

[33] The hybrid approach was termed the Integrated Community-Based Approach for Water, Hygiene, and Sanitation in PEPAM documents.

Figure 2. PEPAM/USAID Approaches



Notes
1. When both water and sanitation activities were implemented in the same village, the activities happened simultaneously.
2. In water and sanitation villages, the water and sanitation subsidies were introduced simultaneously.

WATER INTERVENTION

PEPAM/USAID developed the capacity of local entrepreneurs to install or rehabilitate several different water point types. The activity selected technologies based on a variety of factors, including: geology, site access for drilling rigs, population density, desired level of service, cost, familiarity of the communities with different pumps, and operations and maintenance (O&M) requirements. PEPAM/USAID installed mostly small, single-point water pumps. However, the activity also installed a limited number of water system extensions and larger, solar- or diesel-powered, multi-point submersible pumps. The smaller systems could serve up to 1,200 people in a community, whereas the latter could serve up to 15,000 people. In addition, the activity rehabilitated existing manual pumps in some villages. The specific pump classification and models of the rehabilitated pumps are not identified in project documents, however, all were manual pumps. **Table 5** summarizes the types of WPs that PEPAM/USAID installed.

Table 5. Water Pumps Installed by PEPAM/USAID

PUMP CLASSIFICATION	SPECIFIC PUMP NAMES	NOTES
Rope Pump 	Erobon	Problems noted in the midterm evaluation; no more constructed after 2013.
Deep-Well Diaphragm Pumps 	Vergnet 60	
	Vergnet	
	Vergnet 100	
Deep-Well Piston Pumps 	India Mark II Galvanized	Problems with corrosion. The project stopped using the galvanized version in favor of the stainless-steel version.
	India Mark II Stainless Steel	

Submersible Pumps 	Submersible Pumps[34]	Some installed with water towers.

SANITATION INTERVENTION

PEPAM/USAID promoted three improved household latrine designs that ranged in cost from $100 to $323 USD. PEPAM/USAID worked to create demand for any type of latrine, and to train local entrepreneurs (masons) to build activity-specific latrine types. Where applicable, the amount subsidized varied for each of the latrines by approach. Note that in the subsidy approach, the HH's cost-share was less than for HHs participating in the hybrid approach (**Table 6**).

Table 6. PEPAM/USAID Latrine Design and Cost

LATRINE DESIGN OPTION	FEATURES	APPROACH	SUBSIDY AMOUNT FROM PEPAM/ USAID	COST FOR HH	
SanPlat[35] 	A ventilated, round, brick-lined pit latrine; covered with a concrete, circular slab with drop hole cover (required). Total built: **2,707**[36]	**Subsidy**	42,943 CFA $75	20,527 CFA $35	63,470 CFA $110
		CLTS	0	28,707 CFA $50	28,707 CFA $50
		Hybrid	29,880 CFA $51	27,590 CFA $49	57,470 CFA $100
Double Vault Latrine (DVL) 	2 separate ventilated, (about 2 meters apart), round brick-lined latrines; covered with concrete circular slabs with drop hole covers (required). Removable superstructure made of	**Subsidy**	70,285 CFA $70	40,805 CFA $122	111,090 CFA $192
		CLTS	0	0	0
		Hybrid	29,880 CFA $51	81,210 CFA $140	111,090 CFA $192

[34] Specific brands of submersible pumps were not identified in PEPAM/USAID's documentation.
[35] The total costs are different for a SanPlat latrine in subsidy, CLTS, and Hybrid categories. This table is a modified version from the final report annexes. The ET was unable to understand why this difference existed. but were not able to.
[36] SanPlats built by region—Kolda 704, Sédhiou 312, Tambacounda 240, Ziguinchor 1,452.

	local materials (optional). Total built: **941**[37]				
Ventilated Improved Pit (VIP)[38] 	2 rectangular, ventilated pits separated by a partition wall but in the same superstructure; 2 concrete defecation slabs and 2 concrete drain tiles; footrests installed; brick superstructure with metal sheet roof and door (required). Total built: **323**[39]	**Subsidy**	76,977 CFA $133	119,565 CFA $207	196,542 CFA $323
		CLTS	0	0	0
		Hybrid	29,880 CFA $50	166,662 CFA $290	196,542 CFA $323

HANDWASHING

As noted above, PEPAM/USAID implemented handwashing interventions across all approaches using PHAST/SARAR methods. The activity focused on promoting handwashing at critical times (before preparing food, before eating, and after a defecation event). The activity promoted tippy taps and provided guidance on how to construct them.

PEPAM/USAID KEY RESULTS

According to the PEPAM/USAID final closeout report, the activity surpassed targeted levels of performance across indicators. Key achievements are shown in **Figure 3**.

Figure 3. PEPAM/USAID Select Key Achievements

Overall

- ✔ 742 organizations (WUAs, trade and business associations, etc.) received USAID assistance[40]
- ✔ 18,349 rural HHs directly benefitted from the program
- ✔ 10,245 home visits conducted on WASH across all of the approaches

[37] DVL built by region—Kolda 137, Sédhiou 247, Tambacounda 24, Ziguinchor 533.
[38] VIP latrines are typically built with one pit, however, the PEPAM/USAID manuals specified that promoted VIP latrines would have two pits.
[39] VIP built by region—Kolda 1, Sédhiou 29, Tambacounda 16, Ziguinchor 277.
[40] On the private-sector side specifically, 33 enterprises and 236 individuals were trained and/or equipped to provide private-sector construction and operations and maintenance to water and sanitation infrastructure in PEPAM/USAID activity villages.

Water

- ✔ 11,076 beneficiaries gained access to an improved drinking water source[41]
- ✔ 14 local drilling enterprises, 5 metal working shops, 60 local water infrastructure repairmen trained/strengthened

Sanitation

- ✔ 74,170 beneficiaries gained access to improved sanitation through the installation of 6,709 latrines. For CLTS-WI only: 28,300 beneficiaries in 108 CLTS-WI villages gained access through 2,405 new or rehabilitated latrines
- ✔ 176 masons trained to construct household latrines

Handwashing

- ✔ 4,925 handwashing units installed

GOVERNMENT OF SENEGAL POLICY CONTEXT

The GoS continues to take steps to enhance WASH access in rural Senegal. In 2014, the government passed a law to establish a new public corporation, the Office of Rural Borehole Management (OFOR), to own, manage, rehabilitate, and delegate rural water supply assets across Senegal. OFOR is responsible for asset management, infrastructure renewal and extension, and the control and monitoring of operations. Through delegated public service contracts (leases) from OFOR, private operators directly manage service delivery, oversee O&M, and collect tariffs. This legislation shifted the ASUFORs' role from overseeing operations to governing water services in the locality, representing consumers in policy and operational decisions, and advising the operator on issues relating to the community.[42] Of note, this policy only applies to ASUFORs (which typically manage larger multi-village systems) and does not apply to smaller community water points. In 2016, Senegal adopted its national sanitation strategy (SNAR), which aims to replace the subsidy approach with a market-based approach that will gradually shift responsibility for building sanitation facilities to households. The SNAR uses sanitation marketing techniques to reach the estimated 7.5 million unserved or underserved people who are capable and willing to pay for water services.

[41] 135,311 beneficiaries gained access to a drinking water source
[42] Diallo, O. 2015. Levers of Change in Senegal's Rural Water Sector. Word Bank Group.

EVALUATION QUESTIONS

This evaluation addressed seven questions as shown below:

WATER

1. What is the present level of service at WPs installed or rehabilitated by PEPAM/USAID four years after activity close in terms of functionality, water quantity, quality, accessibility, and reliability?
    a. To what degree are community members using activity-sponsored WPs relative to other water sources, for which purposes and why?
2. Which factors influenced sustainability of water services?
    a. How effective have governance and management activities been?
    b. To what extent have PEPAM's efforts to build private-sector (local entrepreneur) capacity for WP construction and maintenance influenced WP sustainability?
3. To what extent are women continuing to participate in management and governance structures put in place under PEPAM/USAID?

SANITATION

4. To what extent have HHs been using and replacing (as needed) their latrines in PEPAM/USAID communities?
5. What factors have contributed to use and maintenance of HH latrines?
    a. Which of the three implementation models (CLTS, subsidy, and hybrid) was the most sustainable?

HANDWASHING

6. In sanitation communities, to what extent are PEPAM/USAID–promoted handwashing stations, or other models, used today?
7. Which factors influenced sustainability of handwashing behaviors?

METHODOLOGY

OVERVIEW

This ex-post evaluation used a mixed-methods design to conduct data collection in November and December of 2018 in Kolda, Sédhiou, Ziguinchor, and Tambacounda regions (see **Figure 4** below). Prior to fieldwork, the evaluation team (ET) conducted a desk review of PEPAM/USAID activity documentation and researched other WASH activity in the regions, as well as other WASH literature. The ET developed all data collection instruments and updated them with input from data collection partner Atraxis Group. See **Annex A** for detailed methodological and data collection details, **Annex B** to review the data collection instruments (both in English and in French), **Annex C** to see the list of respondents, and **Annex D** for a list of documents reviewed.

Figure 4. Evaluation Data Collection Methods

Document Review

- +100 Project and background documents

Surveys

- 514 Water users
- 617 Sanitation households

Structured Observations

- 169 Water points
- 551 Latrines
- 291 Handwashing stations

Water Quality Tests

- 105 *E. coli*
- 105 Iron
- 64 Fluoride

Key Informant Interviews

- 56 interviews with former implementers (5), local water entrepreneurs (4), regional government officials (12), water management committees (11), community leaders (12), and members (12)

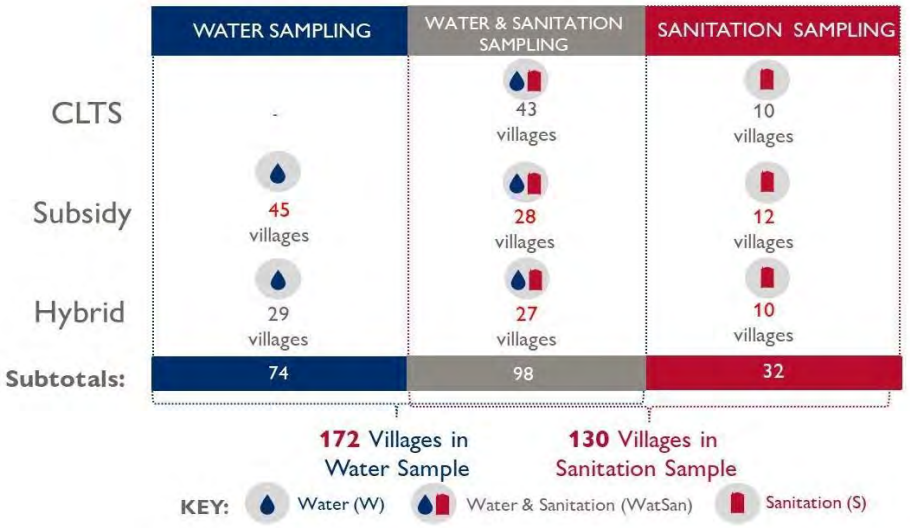
EVALUATION TEAM

Five people comprised the evaluation team: Team Leader Holly Dentz; Senior Technical Advisor Kari Nelson, Ph.D.; Senior WASH Consultant Alioune Watt; and Logistician Lyne Mendy. Project Director Leslie Hodel provided additional technical support and oversight. The Atraxis Group conducted data collection. The evaluation team and data collection firm brought significant expertise in WASH and evaluation methods, water point engineering, and knowledge of local languages and context.

SAMPLING

The ET derived the sampling frame of eligible villages from the approximately 500 villages mentioned in PEPAM/USAID documentation, which indicated key activity details such as intervention approach (CLTS-WI, subsidy, hybrid) and intervention village type (water, sanitation, or water and sanitation combined).[43] Once the team applied exclusion criteria, it drew a random sample of villages that received a water intervention, stratified by the type of approach in which it was embedded (CLTS-WI, subsidy, or hybrid) (see **Annex A: Inception Report, Table 5**). The final sample across type of intervention villages and approaches is summarized in **Figure 5.**

Figure 5. Final Quantitative Sample by Approach



The qualitative sample was purposively selected from the already sampled villages in the quantitative sampling frames. The ET selected from a combination of village types (water, sanitation, and water and sanitation combined) and implementation approaches (CLTS-WI, subsidy, and hybrid) to enable the representation of a variety of perspectives, approaches, and conditions.

Traditionally ex-post evaluations avoid data collection in locations that had subsequent activities similar to the intervention activities, known as sample contamination. The ET investigated the locations and content of WASH activities conducted by USAID, GoS, or other donors since PEPAM/USAID ended to the extent possible (see **Annex A: Inception Report Annex A, Assessment of Site Contamination**). In agreement with USAID, the ET attempted to select villages with limited or no additional WASH activities. In every data collection location, the ET also captured details of which activities, if any, took place and what those activities entailed. This allowed the ET to account for any impacts related to contamination during analysis.

[43] The USAID Mission provided the ET with a PEPAM/USAID activity WatSan by Activity implementation document that had details such as: village type, approach type, number an infrastructure installed, implementers, etc.

DATA COLLECTION METHODS

The ET conducted surveys with water users as they visited water points.[44] HH sanitation surveys focused primarily on sanitation and handwashing practices. The ET relied on structured observations of WPs, water quality testing, and key informant and group interviews with a variety of stakeholders to understand the current status, use, and factors that impacted the sustainability of PEPAM/USAID WASH activities.

QUALITATIVE INTERVIEWS

Key Informant or Group Interviews with IPs and Government Officials. The ET conducted key informant interviews or group interviews with IPs and regional government officials across regions to provide context for the overall evaluation (policy frameworks, monitoring, etc.) and gain a deeper understanding of the PEPAM/USAID activities' implementation challenges and successes, factors that may have impacted sustainability, lessons learned, and interactions with their offices. The ET also sought additional data and documentation but found it was rarely available.

Key Informant or Group Interviews with Community Members and Natural Leaders (NLs). The ET sought the perspectives of community members and NLs (e.g., village chief, health workers) on a wide range of topics: PEPAM/USAID activity implementation, the community's retention of WASH behaviors, WASH norms, and sustainability of water supply infrastructure and sanitation activities. In addition, the ET asked this group about the activity's village-level governance; local entrepreneur engagement; and other topics that emerged from interviews with USAID, implementers, and regional officials.

Table 7. Qualitative Interviews Completed

STAKEHOLDER	INTERVIEWS CONDUCTED
Former Implementers	6
National Government	1
Regional Government	11
Private Sector Water Entrepreneurs	4
Water Management Committees	11
Community Leaders	12
Community Members	12
Total	**56**

Group Interviews with Local Entrepreneurs. In each of the regions, the ET aimed to capture the perspectives of private-sector local water entrepreneurs (e.g., drillers, manufacturers, repair artisans) and sought their perspective on the impact of PEPAM/USAID training, program implementation, and sustainability of systems. During data collection, the ET identified some local water entrepreneurs who also had worked on the sanitation component of the activity. These local entrepreneurs shared their thoughts on both water and sanitation aspects.

[44] In some instances when no water point users were found collecting water after the observation period, the enumerators would seek out community members who reported collecting water to participate in the survey.

QUANTITATIVE DATA

Mixed-Methods Group Interviews with Water Committees. The ET conducted group interviews with two to four water committee (WUA and select ASUFOR) members and included female committee members, if available. The interview guides contained a mix of semi-structured and structured questions to elicit thoughts and perceptions related to who used the WPs, water quality, governance, operations, maintenance, financial stability, and engagement with local entrepreneurs.

Household Sanitation Survey. The ET completed 617 short sanitation and handwashing–focused household surveys with a female head of HH (where possible) to assess history of latrine installation, maintenance, replacement, user perception related to replacement/maintenance, local entrepreneurs' capacity to support replacement/maintenance, community open defecation, knowledge of critical times for handwashing, and use and maintenance of handwashing stations. Within sampled villages, the ET selected a nonprobability sample of HHs with respondents available.

Group Survey with Water Point Users. The ET identified 514 WP users (approximately three per WP) to participate in a brief survey to understand respondents' experiences and thoughts on service-level indicators such as functionality, quality, quantity, accessibility, reliability, source switching/mixing, challenges, and other related questions. When participants were available, the ET conducted one or more interviews at each WP. If the WP was not functioning at the time of its visit, the ET identified community members who collect water from other sources to participate.

Structured Observations. The ET conducted 169 one-hour structured observations at WPs. The observation tool captured function (e.g., if WPs dispense any water), flow rate, stroke rate, leakage tests, fill time, and observed risk of contamination. The ET also assessed WP infrastructure for factors that might affect sustained functionality, such as engineering aspects.

During the HH sanitation survey, the ET observed 551 latrines and 291 handwashing stations. The ET observed latrines to assess the facility's cleanliness, signs of usage, and its structure for safety, privacy, ventilation, and presence of a slab. Handwashing station observations took note of handwashing station type and assessed the presence of soap and water.

Water Quality Testing. The ET conducted water quality testing at functional water points. In line with USAID WASH indicator HL.8.1-2, the ET tested 105 WPs for *E. coli.* HL.8.1-2 specifies fecal coliforms as the indicator, however, the ET opted to test for *E. coli* as a more specific measure of contamination. The ET used the most probable number (MPN) method with the Aquagenx compartment bag test (Chapel Hill, North Carolina). The ET also tested 105 samples for iron and 64 samples for fluoride. Based on extensive research prior to the evaluation, the ET and USAID determined that no arsenic testing needed to take place in the regions and fluoride only needed to be tested in Kolda, Sédhiou, and Tambacounda.

QUALITY CHECKS

The ET employed a number of data quality checks throughout the data collection and cleaning process. During data collection, a supervisor conducted back check surveys and observations in 20 randomly selected villages in the overall sample. In addition, the ET made back check phone

calls to confirm enumerator visits. In cases where these measures raised quality concerns, the ET recollected the data. In addition, ET conducted frequent quality checks on the final dataset and resolved all noted issues prior to finalization.

Senior ET members reviewed all initial qualitative notes to ensure sufficiency of detail and clarity. They worked with data collectors to improve the quality where necessary, working with translators until notes attained quality standards.

ANALYSIS

The ET analyzed all quantitative data using Stata 15 software and calculated means and pairwise comparisons with 95 percent confidence intervals for WASH indicators. The team cleaned all data for errors (e.g., duplicates, missing values, etc.), and, where appropriate, disaggregated the data by region, approach, and/or pump type. For qualitative data, the ET developed a codebook based on the evaluation questions and refined it through practice coding and iterative discussions with coders before formal codebook application. Coders applied analytic codes using MAXQDA 12 software and tested for intercoder agreement. The team leader reviewed the results for consistency and addressed discrepancies. The team leader also recoded data as needed for consistent coding application. Two ET members used applied thematic analysis to deductively examine themes across the 56 qualitative interviews using complex coding queries and lexical searches. The ET triangulated the quantitative and qualitative data to ensure that the conclusions reflected the diversity of stakeholder perspectives from all groups, village types, and implementation approaches. The data analysis methods and triangulation process allowed the ET to validate findings, conclusions, and recommendations.

LIMITATIONS

As with any evaluation design, limitations and risks need to be considered. The ET identified the following challenges and devised mitigation strategies during the evaluation:

Contamination. Despite the ET's best efforts to avoid sites where another donor or group had completed a similar intervention since the end of PEPAM (i.e., sample contamination), the ET encountered contamination not detected during the desk review in 29 percent of villages. The level of contamination varied substantially region to region—Kolda had the lowest level (12 percent) and Ziguinchor the highest (61 percent). Sédhiou (25 percent) and Tambacounda (19 percent) had relatively low contamination. The ET analyzed the data to determine if the contamination affected key outcomes (e.g., WP functionality, WP payment indicators, basic sanitation access, observed soap and water, etc.). The team found no significant correlations between contamination and water and sanitation indicators. However, the ET identified a significant and positive correlation between contamination and two handwashing indicators (having soap and water available ($r=.18; P<.001$) and signs of handwashing ($r=.13; P=.03$). Thus, the presence (or not) of contamination appeared to relate only to handwashing, but not to water or sanitation outcomes. Due to fieldwork timing and interview schedules, it was difficult to gather information on contamination from government officials prior to village-level data collection. In most cases, when asked, government officials did not have village-level data readily available.

Lack of Comparison to an Endline Survey. This evaluation cannot directly measure the sustainability of sanitation and handwashing infrastructure and behavior because PEPAM/USAID did not conduct an endline survey at the activity's conclusion to which ex-post evaluation findings can be compared. While the ET cannot estimate precise slippage, it is possible to discuss implicit trends.

Use of PEPAM/USAID Water Points. Both the water user survey and the HH sanitation survey asked respondents how they used the water gathered from their primary and secondary WPs. Not all enumerators followed the survey protocols, however, and in some cases, the primary WP was not always the PEPAM/USAID WP. Without a verification question asking which (or if either) WP was the PEPAM/USAID WP, this identification had to be estimated using other variables collected in the HH sanitation survey.

Selection Bias and Sample Size. Random selection of villages for WP observations should limit bias for WP functionality observations. While the ET selected sanitation villages at random, due to the purposive nature of respondent recruitment for some aspects of the evaluation (water user survey, HH sanitation survey, qualitative data collection), the ET did not have a fully random and representative sample for measuring WASH behaviors. The ET also restricted WP or latrine observation to one day at each site with no revisits in light of resource and time constraints, which may have also affected generalizability of results.

Due to resource constraints, the sample size did not provide sufficient statistical power to measure precise and generalizable results. This could reduce the likelihood that the statistically significant results reflect a true effect.[45] The ET presents the results with this caveat and shares inferences based on results.

Other Biases. Biases such as self-selection, recall, and positive response may have occurred. Participants may have chosen to participate or not based on their interest in the topic and feelings about it. This has the potential to provide a skewed picture of WASH in their community. Because PEPAM/USAID spanned from 2009 to 2014, some villages may not have engaged with the activity in more than nine years, and respondents may not have been familiar with or able to recall details to adequately answer the ET's questions. Respondents may have also wanted to provide a "correct or expected" answer because of social norms in their community, which would lead to positive response bias. To guard against the biases listed above, the ET triangulated findings among several sources and data types and included observations, where feasible, to complement self-reported behaviors.

Implementation Complexities. PEPAM/USAID had several objectives, more than 18 IPs, and a complicated implementation that spanned different interventions, village types, and approaches. Exactly how each implementing partner carried out its activities is unknown, as are the details on which specific HHs took up interventions. This limits what can be said about how the implementation affected sustainability. However, the ET still made inferences based on triangulation of data sources.

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[45] Button, K. et. al. 2013. Power Failure: Why Small Sample Size Undermines the Reliability of Neuroscience. Nature Reviews. https://brain.mpg.de/fileadmin/user_upload/images/IMPRS/Master_Reading_List/small_samples_Nature_Reviews.pdf

FINDINGS AND CONCLUSIONS

WATER POINTS

FINDINGS

CURRENT STATUS

This section discusses the current status of PEPAM/USAID–supported water infrastructure in villages that experienced water and combined water and sanitation interventions. In most cases, outcomes of interest are disaggregated by the type of water pump installed, as technology may influence key outcomes such as functionality, quantity of water produced, life cycle costs, etc. Where relevant, the ET also disaggregated data by region. However, the types of pumps installed varied somewhat across regions, which could conflate any potential regional/geographic differences.

In addition to discussing observed values, the report also makes comparisons to Joint Monitoring Programme (JMP) and Demographic and Health Surveys (DHS) water access standards. This includes comparisons to the JMP ladder for water service, which classifies "basic" water service as being provided from an improved source and taking less than 30 minutes round trip to collect.

Water Point Functionality. The PEPAM/USAID activity supported installation of several different types of WPs based on a variety of factors: well depth to groundwater, population served, and other technical factors. Overall, functioning WPs accounted for 63 percent of the 169 visited, but the functionality rate varied by technology (**Error! Reference source not found.**). The type of well or borehole used (hand drilled, small rig, or large rig) showed no significant differences in functionality.

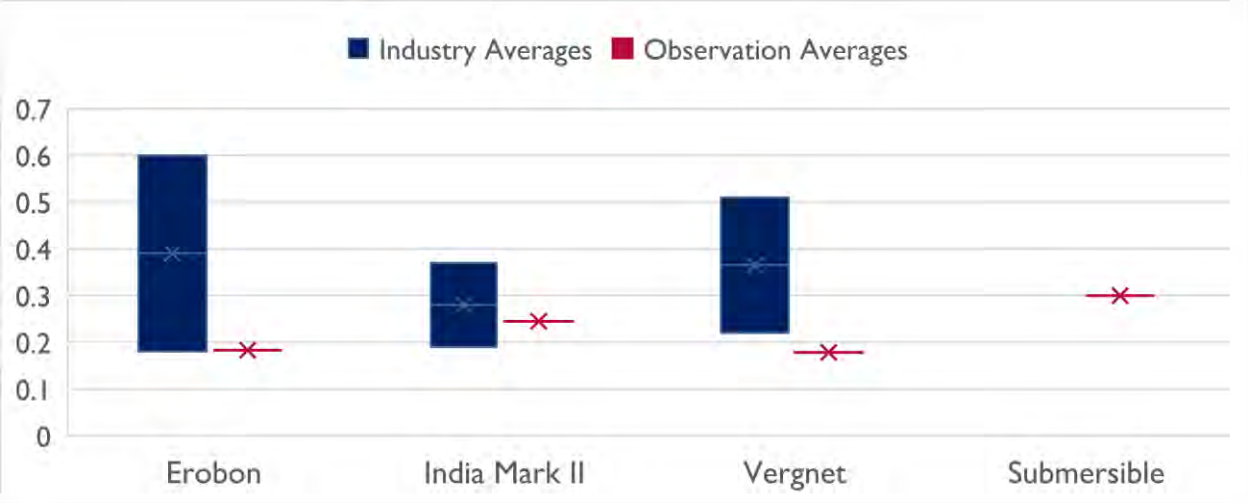
The activity's midterm evaluation highlighted problems with Erobon rope pumps,[46] which had the lowest functionality rate during the evaluation's observations (27 percent). This performance differed significantly from all other groups except the rehabilitated WPs (33 percent). PEPAM stopped installing the Erobon rope pumps in 2013, though documentation doesn't specify why this change happened.[47]

[46] SEMIS. 2013.

[47] The team heard anecdotally that the change was in response to feedback from the GoS rather than because of the midterm report, however, no documentation is available to confirm the full circumstances.

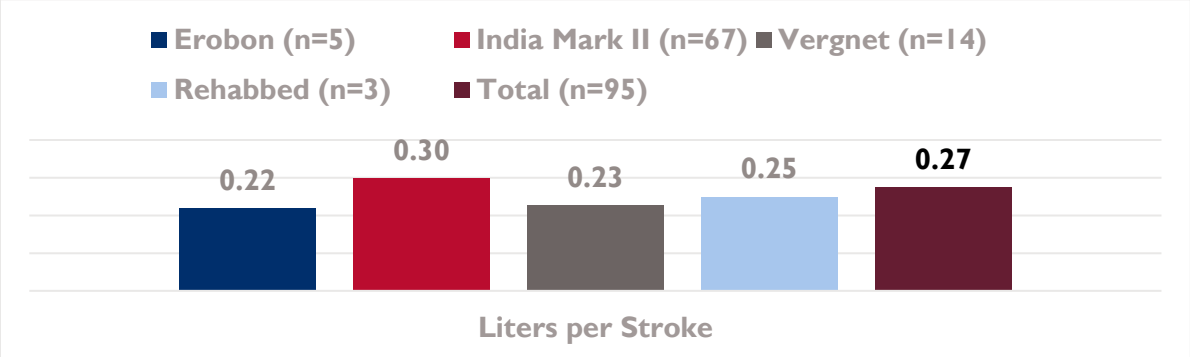
Water Quantity. The majority (84 percent) of water users reported being satisfied or very satisfied with the quantity of water produced at their primary water source. However, at observation, pumps appeared to be performing at the lower end of (if not below) the expected range for the type of pump **(Figure 6)**. Expected flow rates can vary significantly depending on borehole depth and, for manual pumps, can also vary depending on the user and the physical exertion applied. For submersible pumps, flow rates can also vary depending on the specific model and horsepower of the pump, as well as by the amount of energy put into the system. Project documents did not make these details available and thus a likely flow range cannot be estimated.

Figure 6. Expected vs. Observed Flow Rates by Type of Pump, in Liters per Second (Water Point Observations)[48]



Stroke rate is another important measure of flow specific to manual pumps **(Figure 7)**. The less water produced per stroke, the more strokes required to fill a bucket, and the more time and physical exertion it takes a person to collect water.

Figure 7. Manual Pump Stroke Rates by Type of Pump (Water Point Observations)



[48] Brikké, F. & M. Bredero. 2003. Linking Technology Choice with Operation and Maintenance in the Context of Community Water Supply and Sanitation. A Reference Document for Planners and Project Staff. WHO and IRC Water and Sanitation Centre. https://www.who.int/water_sanitation_health/hygiene/om/wsh9241562153.pdf.

Each type of pump had a similar mean stroke rate, with the exception of the India Mark II, which had a significantly better stroke rate when compared to either the Erobon pumps *(P=.01)* or the Vergnet pumps *(P<.001)*. In the qualitative interviews, water users occasionally complained about the high amount of effort needed to operate the pumps. As one water user said, "We all use the water from the pump, but it is difficult to get water because to pump the water we put a lot of effort into it, and we often have chest pains. This can discourage people and push them to look for water in the well."

Water Quality. Overall, water users described themselves as satisfied with the water quality from their primary WPs, with 87 percent of respondents giving either a satisfied or very satisfied rating for water quality. The water quality tests supported this broadly positive view, finding that very few WPs had significant water quality concerns.

When tested for iron, only 21 out of 105 WPs tested above 0 mg/l, and only one tested above the Senegal national standard of .5 mg/l.[49] Fluoride tests indicated that only five of 64 WPs tested over the national standard of .8 ppm, and only three tested above the World Health Organization standard of 1.5 ppm. *E. coli* testing revealed contamination of seven of 105 WPs. These findings only occurred in the Ziguinchor and Tambacounda regions. Though a precise diarrhea risk level is not known to correspond to a measured level of *E. coli* contamination, a general risk assessment indicates that three of the seven contaminated WPs would be considered unsafe (MPN of 100), while another three would be considered an intermediate risk (MPNs between 1.5 and 5.8), and the last would be considered high risk and probably unsafe (MPN of 48.5).

Qualitative interviews also reflected this positive view of water quality, where interviewees often commented on the purity of the water from the PEPAM/USAID WPs and how they have contributed to positive health outcomes in the communities.

> "In this village, no one doubts the good quality of the water. It is the people themselves who come to tell us that water is safe to drink because, since they have had access to water from the borehole, many of the diseases found in children and in the population in general have disappeared."
>
> *– Water Committee Member Marassoum*

Water Accessibility. USAID indicator HL.8.1-1 and JMP access indicators require that water collection must take 30 minutes or less round trip. Though direct observations of the WPs revealed only a small number of WPs where people had to wait 30 minutes or more (15 percent), these observations did not include travel time. The time of day at which enumerators conducted their observations could make a difference in total collection time, as lines are longest during peak times (typically early morning or late afternoon). Though the data collection attempted to conduct observations at peak times, this was not always feasible.

[49] Though 169 WPs were observed, only 105 were sampled for iron and *E. Coli* because some WPs were not functioning and, therefore, could not be tested. Fluoride testing was not conducted in Ziguinchor based on feedback from local stakeholders.

When asked in the survey, only 17 percent of users reported needing 30 minutes or more for a single trip to collect water. However, most users reported needing multiple trips per day, and thus respondents reported an overall average of 53 minutes per day required to meet their water needs. The qualitative interviews echoed these findings. While largely happy with the PEPAM/USAID WPs, interviewees commented that they still had trouble meeting all of their water needs in a timely fashion, either because they had to travel long distances or because they had to wait in line.

> "The population has access to drinking water, but this water is not sufficient because there are sometimes traffic jams, and the other water point of PEPAM is far from us, because it is in the other district 2 km from us.… So we can't do these trips to get water. The water from this one pump in our neighborhood is not enough for us. That is why we are sometimes forced to fetch water from the well."
>
> *– Community Member*

The ET recorded regional variations in time spent collecting water (**Figure 8)**. Tambacounda had the highest number of respondents (26 percent) reporting they spent more than 30 minutes per trip (a statistically significant difference compared to other regions at $P<.01$ in each comparison). However, the total time spent collecting water in Tambacounda is on par with the overall average, suggesting that each trip is taking longer, but they are taking fewer trips. For total time spent collecting water, Kolda recorded the lowest average, with only 36 percent of respondents reporting they needed more than 30 minutes per day to collect water (a statistically significant average compared to each of the other three regions at $P<.02$ in all comparisons).

Figure 8. Percent of Respondents Requiring >30 Minutes Per Trip and Per Day to Collect Water (Water User Survey)

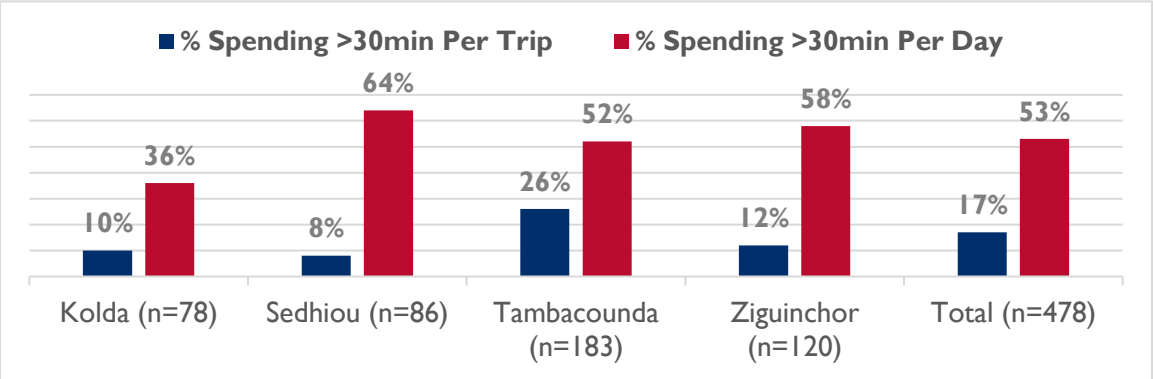
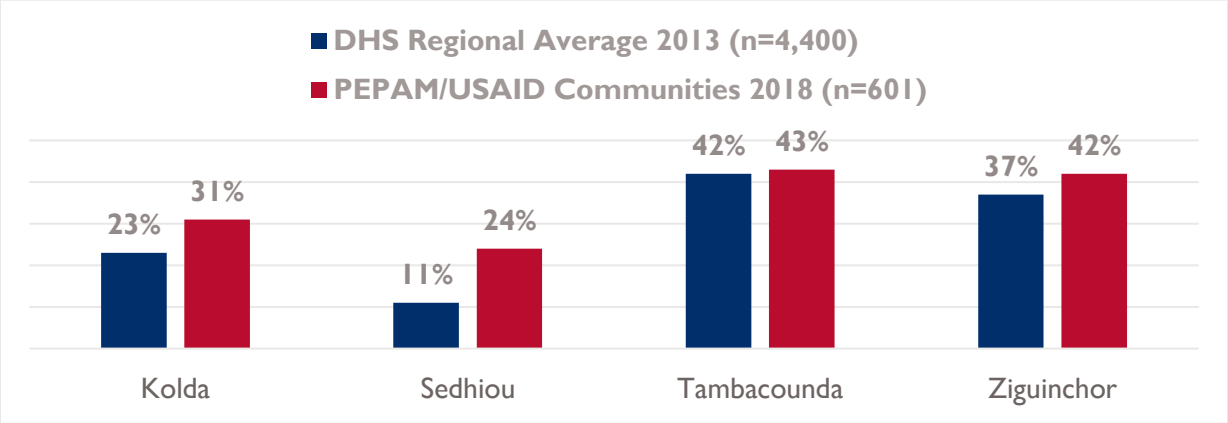


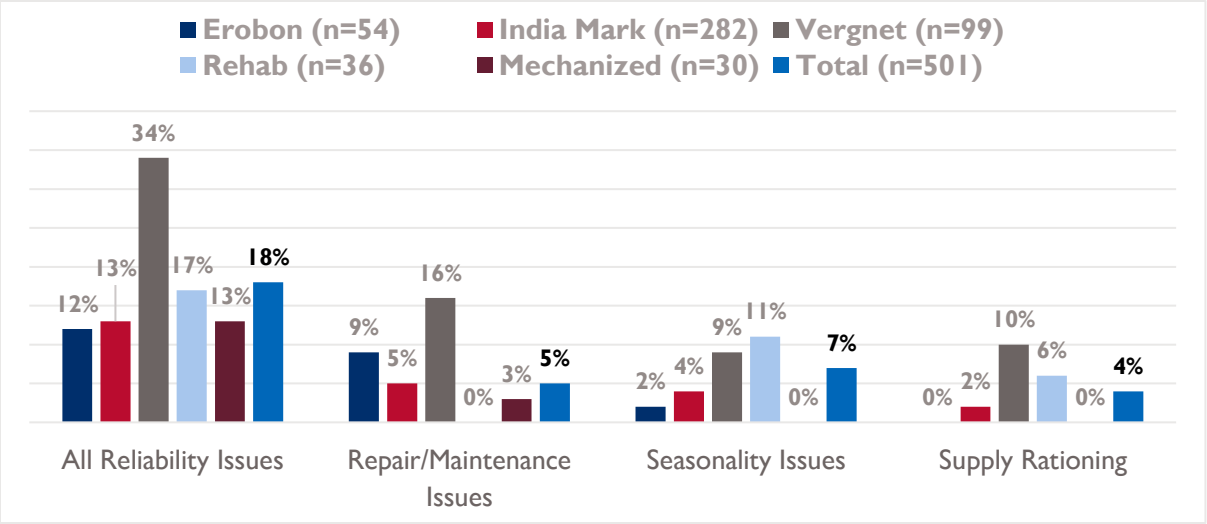
Figure 9 summarizes access to basic water service in PEPAM/USAID communities in 2018 compared to the 2013 DHS average in each region. PEPAM/USAID communities appeared to be close to or above the historic regional averages.

Figure 9. DHS Average of Basic Water Service by Region Compared with PEPAM/USAID Communities (Household Sanitation Survey)



Reliability. The ET found that respondents considered their WPs to be largely reliable throughout the year, with only 18 percent reporting concerns. Among the 92 respondents who reported reliability concerns, 40 percent reported repair and maintenance issues, 34 percent reported seasonality issues, and 21 percent reported issues regarding supply rationing. Though low overall, the specific reliability concerns varied notably by pump type and region, as seen below in **Figure 10** and **Figure 11**.

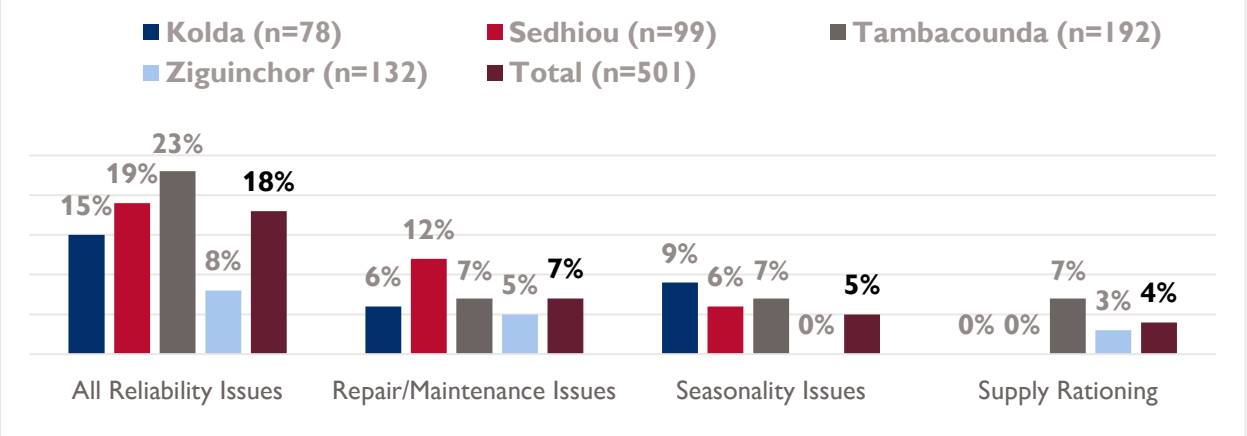
Figure 10. Reliability Issues by Pump Type (Water User Survey)



Vergnet pump users reported the most reliability issues. This higher rate of reported issues was statistically significant compared to all other groups *(P<.02* in all cases) except with regard to repair and maintenance issues, where Vergnet performance was not measurably different than the Erobon rope pump. The differences between pump types related to seasonality issues were shown to be statistically insignificant, suggesting that seasonality issues were not highly linked to the type of pump.

Examining the frequency of reliability issues by region is also informative (**Figure 11**).

Figure 11. Reliability Issues by Region (Water User Survey)



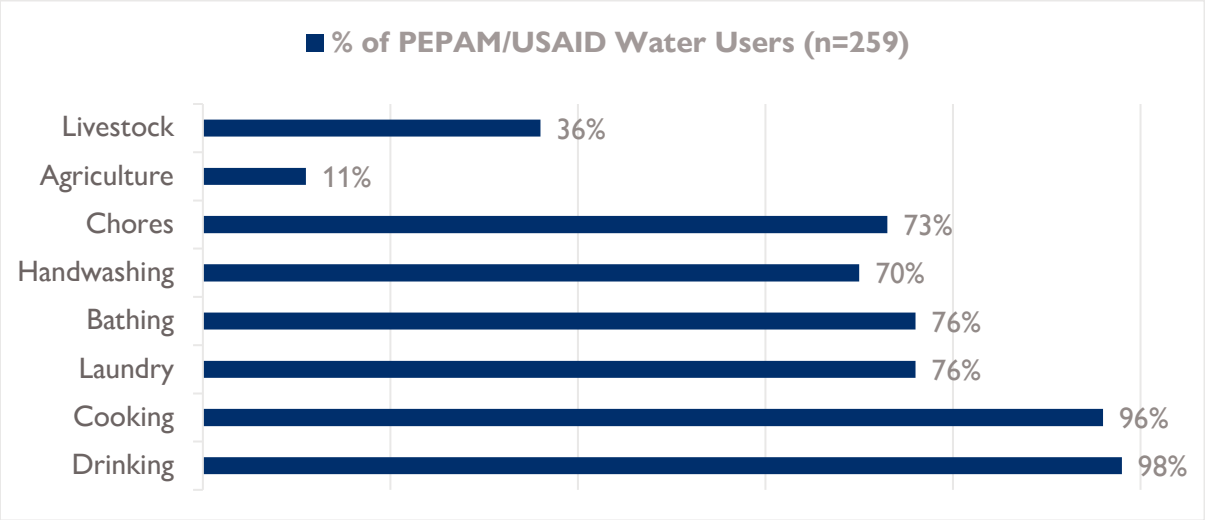
The ET reported no statistically significant regional differences in the occurrence of repair and maintenance issues. Ziguinchor experienced the fewest seasonality issues (no responses recorded)—a statistically significant difference compared to all other regions. Differences in seasonality issues between other regions were statistically insignificant. The low incidence of seasonality issues in Ziguinchor is likely related to its location near the ocean and delta regions of the Casamance River where the water table is likely higher.

Supply rationing occurred most often in Tambacounda, a statistically significant difference compared to each of the other regions *(P<.05* for each comparison). It is not clear from the data why supply rationing would be higher in Tambacounda. A possibility is that the water table depth and geology prevents quick recharging, which could affect the use of the pump.

USE

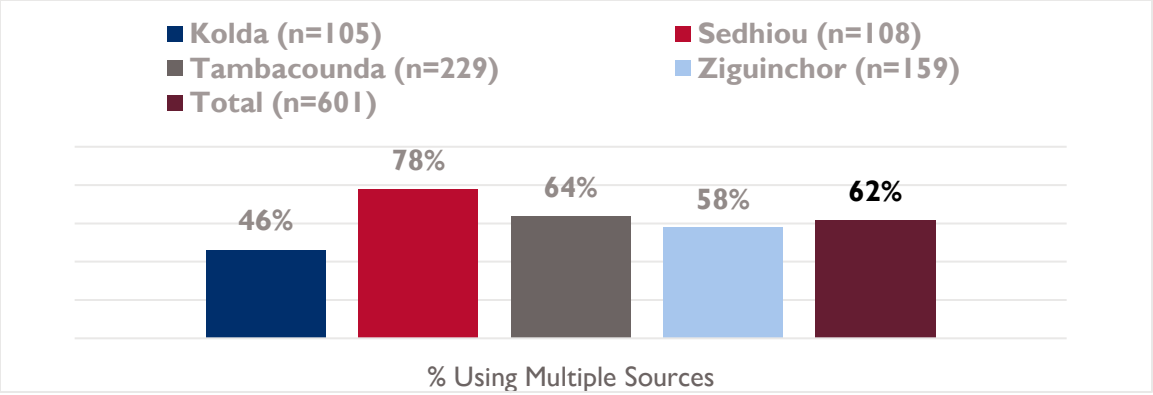
Water Use Patterns. Respondents used PEPAM/USAID WPs for a variety of purposes **(Figure 12)**. They reported drinking and cooking water as the dominant uses, however, a small number of respondents use these WPs for their livestock or for agriculture/gardening purposes.

Figure 12. Uses of PEPAM/USAID Water Points (n=259)



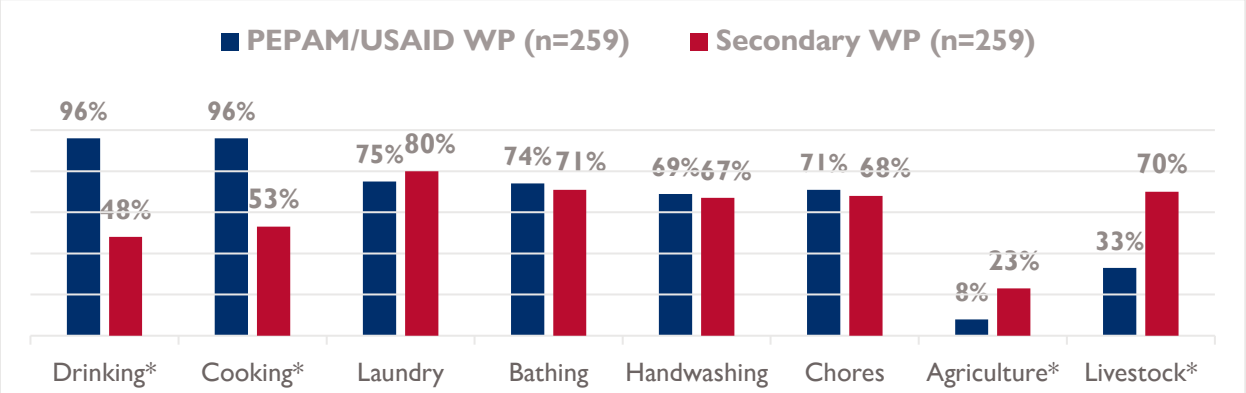
Sixty-two percent of respondents reported using multiple WPs to meet their water needs, though this number varies by region (**Figure 13**). In communities with functioning PEPAM/USAID WPs, interviewees reported that people typically use those WPs as their primary source of water. Many HHs in the activity regions also had their own (typically unprotected) wells, which interviewees indicated they used as backups to their primary sources and/or for water needs where water quality is of lesser concern (for example, doing laundry).

Figure 13. Percentage of Respondents Using Multiple Sources by Region (Household Sanitation Survey)



Of those reporting that they relied upon multiple water sources, 54 percent used unprotected wells, which mirrors interviewee comments in the qualitative interviews. **Figure 14** summarizes how multiple WP users utilize the PEPAM/USAID WPs compared to other WPs.

Figure 14. Uses of Primary and Secondary Water Sources (Household Sanitation Survey)



*Difference is statistically significant

Thus, while users appeared fairly ambivalent regarding whether they use the PEPAM/USAID WP or another WP for laundry, bathing, handwashing, and chores, responses differed significantly about what WP they preferred for domestic versus productive uses. Based on qualitative interviews, users appreciated the PEPAM/USAID WPs for providing clean,[50] safe water—something they may feel is more important for drinking and cooking, but less important for agriculture, gardening, and livestock-focused uses.

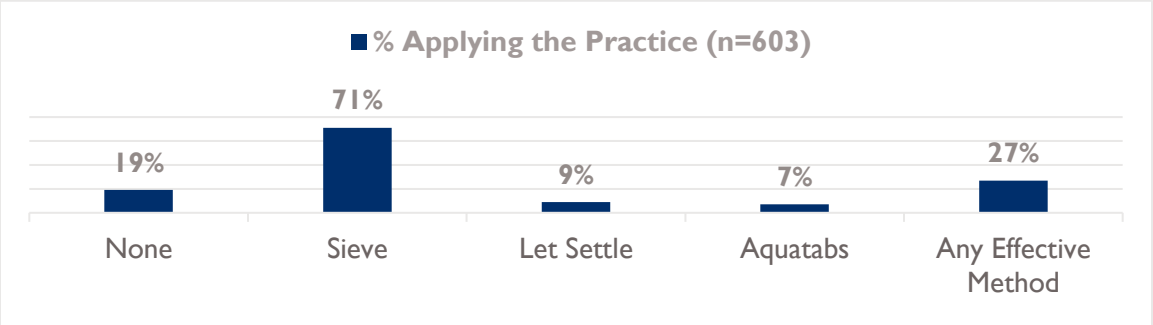
> "Community members use the water from this water point for drinking and cooking because they are convinced of the drinkability of the water and this is not the case with the other water points used for chores."
>
> *– Water Management Committee Member*

The sanitation survey also asked HHs about whether (and how) they treated their drinking water. PEPAM/USAID promoted the use of Aquatabs for water purification, but other effective means such as treatment with chlorine, Pur, and other methods are also options.

Figure 15 summarizes household water treatment practices, which found that only 7 percent used Aquatabs, and less than one-third of HHs used a potentially effective form of water treatment.[51] Some interviewees noted that they had difficulty obtaining products like Aquatabs at the local level.

[50] Interviewees reported believing that the water from activity WPs was "clean" and thus, the term is used here. However, this is only a reflection of their perceptions, not of the findings of water quality tests.
[51] Potentially effective water treatment methods include chlorination, boiling, water filters (ceramic, sand, or composite), Aquatabs, Pur, solar disinfection, Biosand filters, or coagulant.

Figure 15. Self-Reported Water Treatment Practices (Household Sanitation Survey)



As is true in many countries, women did the majority of the water collection at observed locations in Senegal. During the structured observations of WPs, enumerators counted the number of adult females/males and girls/boys under 15 who waited in line for water during the observation. Adult females made up the majority of the water users (58 percent). Girls under 15 made up an additional 24 percent of observed users. Males, both young and old, made up the remaining 19 percent of users observed (nearly evenly split between children and adults). The enumerators noted no regional differences in collection practices.

SUMMARY OF CURRENT STATUS AND USE

The ET found WP functionality to be mediocre, but on par with what has been found on other, similar studies of small, community-managed water infrastructure. Water users did not report water quantity and quality as major issues. Though most respondents spent less than 30 minutes round trip, most required multiple trips to meet their HHs' needs and spent nearly an hour of their day collecting water. Only a small proportion of respondents noted significant reliability issues.

Where functioning, the well-used PEPAM/USAID WPs provided water most frequently for drinking and cooking uses. Most respondents used multiple sources to meet their needs, however, revealing that drinking and cooking water more frequently came from the activity WPs, while respondents relied upon secondary (often unprotected) sources for agriculture and watering animals.

FACTORS AFFECTING SUSTAINABILITY

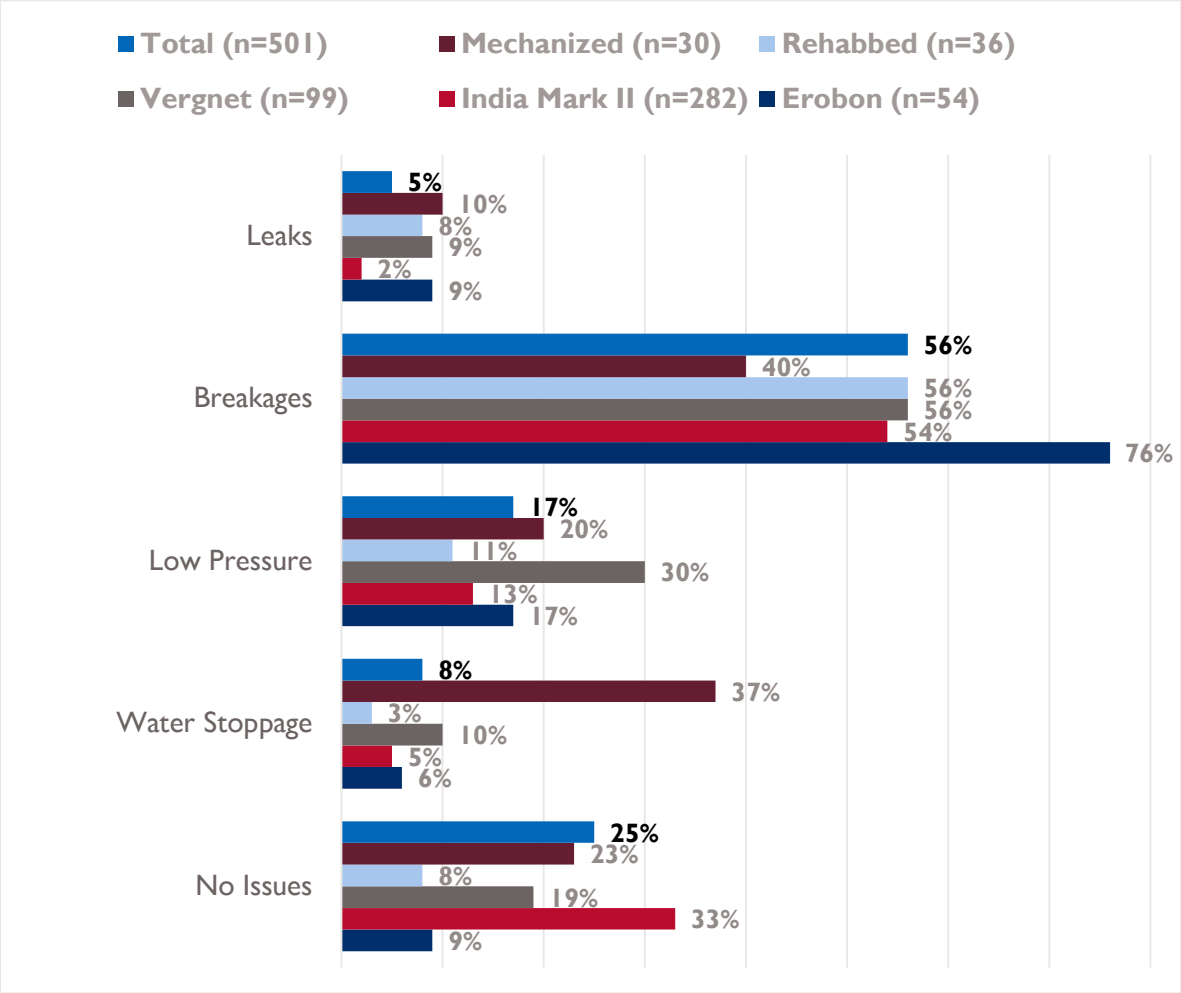
Management Factors. Water users reported in 87 percent of cases that an active water management committee oversaw their WP. Additionally, 76 percent of respondents with committees in place felt that the committee managed the WP well or very well. The ET detected no notable differences across regions or other subgroups.

Despite positive reviews from community members, an examination of key management practices revealed less than ideal adherence to the best practices PEPAM/USAID promoted. Eighty-nine percent of community members surveyed reported that their committee held regular meetings (though they did not specify the frequency of those meetings). However, only

63 percent reported ever having attended a meeting. In qualitative interviews with management committees, only four out of 11 committees reported holding meetings monthly.[52] And only four of 11 (though not all the same four as noted above) reported taking minutes for their meetings,[53] only two of which reported making the minutes public.[54] One government official summed up the challenges the water committees faced:

"At the beginning of the program everything worked well, with the establishment of structures for the management of WPs. The committees were formed and members' capabilities [built]. Since there has been no follow-up, the Management Committees do not work anymore. The lack of monitoring and mentoring has been a reason, and this is attributable just to the lack of means… Some of the equipment is in failure, and craftsmen repairers lack … spare parts…. Even if they *[the craftsmen]* are present in the village they can do nothing."

Figure 16. Reported WP Problems by Pump Type (Water User Survey)[55]



[52] PEPAM/USAID indicator
[53] ibid.
[54] ibid.
[55] Respondents could note multiple problems for the same WP. Thus, total percentages may equal more than 100 percent.

In many cases, the government did not continue supporting the small, volunteer, community management committees due to a lack of resources vis-à-vis the large number of WPs. Water users generally reported no major issues over the last four years with their WP (75 percent of respondents). **Figure 16** outlines the issues discussed, by the type of pump.

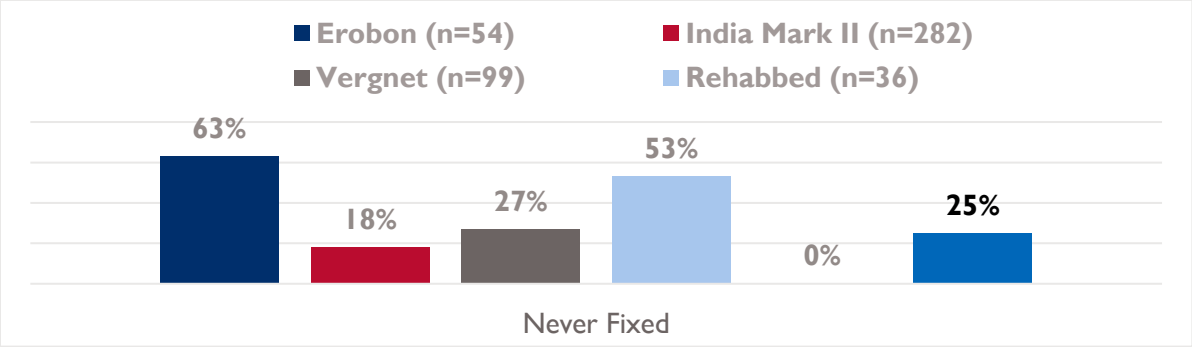
Some of these issues showed statistically significant differences depending on pump type. Though the India Mark II and mechanized pumps had similar percentages of respondents reporting no issues, the India Mark II pumps had a higher and statistically significant share of respondents reporting no issues compared to the Vergnet, Erobon, and rehabilitated WPs. The India Mark II pumps also appeared to be the least likely to show leakage issues, with statistically significant differences compared to other types with the exception of rehabilitated WPs.[56]

Mechanized WPs had the highest rate of stoppage issues, a statistically significant difference in all comparisons. The ET found the Vergnet pumps the most likely manual pumps to have water pressure issues, a statistically significant difference compared with each other type of manual pump. The Erobon pumps broke more frequently than all other pump types, with statistically significant differences compared to all other pump types except rehabilitated points.[57]

Forty-five percent of water users reported that WP repairs occurred quickly (within one to three days). And 25 percent of water users reported that repairs on their problematic WPs never took place. Comparing the survey data with the structured observation data enabled the ET to confirm that in 92 percent of the cases where enumerators observed nonfunctioning PEPAM/USAID WPs, respondents reported these WPs had never been repaired. Though the survey didn't directly ask about the time required to repair WPs for each type of issue noted, respondents who reported issues with breakages (41 percent) or with leakage (28 percent) most commonly reported that the WP had never been repaired.

Overall, respondents reported the Erobon and rehabilitated pumps as the least likely to be fixed or repaired (63 percent and 53 percent, respectively), while no one reported unresolved repairs related to mechanized pumps (**Figure 17).** The ET found comparisons among all pump types to be statistically significant except for the difference between Erobon rope pumps and the rehabilitated pumps.

Figure 17. Reports of Repairs that Were Never Fixed, by Pump Type (Water User Survey)



[56] Compared to rehabilitated WPs, the P-value was .08 and thus not statistically significant. But this may be due to the small sample size of rehabilitated WPs.
[57] When compared to rehabilitated WPs, the P-value was .06 and thus not quite statistically significant. However, given the low number of rehabilitated WPs, the lack of significance may be related to the low sample size.

In interviews, both water management committees and local entrepreneurs noted that the supply chains for water pump parts had broken down since the end of the PEPAM/USAID activity. The activity had helped entrepreneurs access the necessary parts, but after the activity ended, it appears that sources for many of the replacement parts have become harder to find. As one local entrepreneur stated,

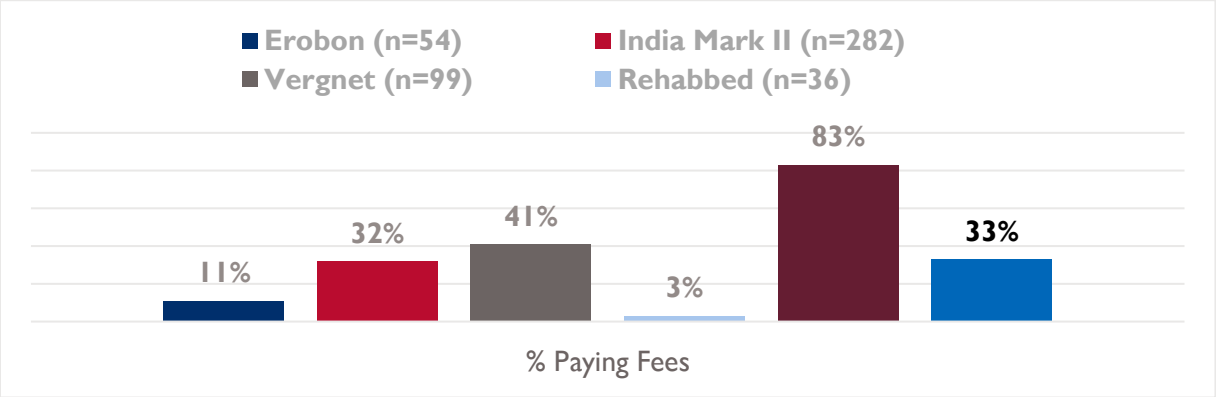
"…when USAID came, they brought us products like the Polymer and "bentome" that we drillers used. But after USAID left, there was some lobbying going on in getting access to these products, so right now we don't even know how to get them."

Difficulties obtaining parts can inhibit long-term sustainability of the WPs.

Financial Factors. During implementation, PEPAM/USAID trained water management committees not only in good management practices, but also in financial best practices such as keeping transparent records and opening a bank account. However, in the qualitative interviews, committee members noted difficulties following through with these best practices. The ET discussed record keeping with eight water committees and not one said they actively kept transparent records of expenses and revenues.

In the surveys, very few water users (33 percent) reported paying for water at their WPs, though this figure varied by pump type (**Figure 18**).

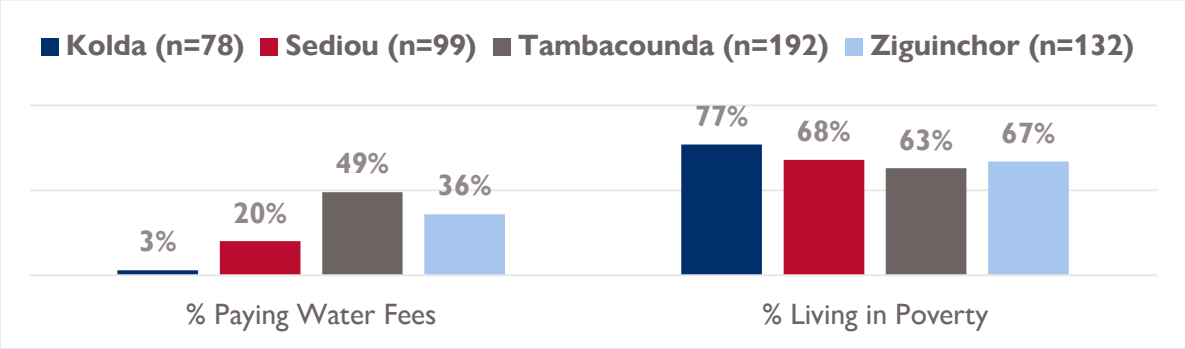
Figure 18. Water Fee Collection by Pump Type (Water User Survey)



Respondents in villages with a mechanized WP most commonly paid water fees, a statistically significant difference in all comparisons (**Figure 18**). One of the potential reasons committees with mechanized WPs are able to collect fees is that operation of the pumps generally requires the purchase of fuel (i.e., if people do not pay, the pump will not operate). The evaluation also found the mechanized pumps to be the most reliable, and people may be willing to pay more for reliable water access. (However, it is unclear from the data whether people paid more because the WP was more reliable, or whether the fact that they've paid more has enabled the WP to be more reliable). Those in villages with rehabilitated WPs paid fees less often, a statistically significant difference except in comparison with Erobon rope pumps, which also reported low fee collection. In cases where water committees did not systematically collect fees, interviewees noted that the committees might try to collect money when/if the WP broke down.

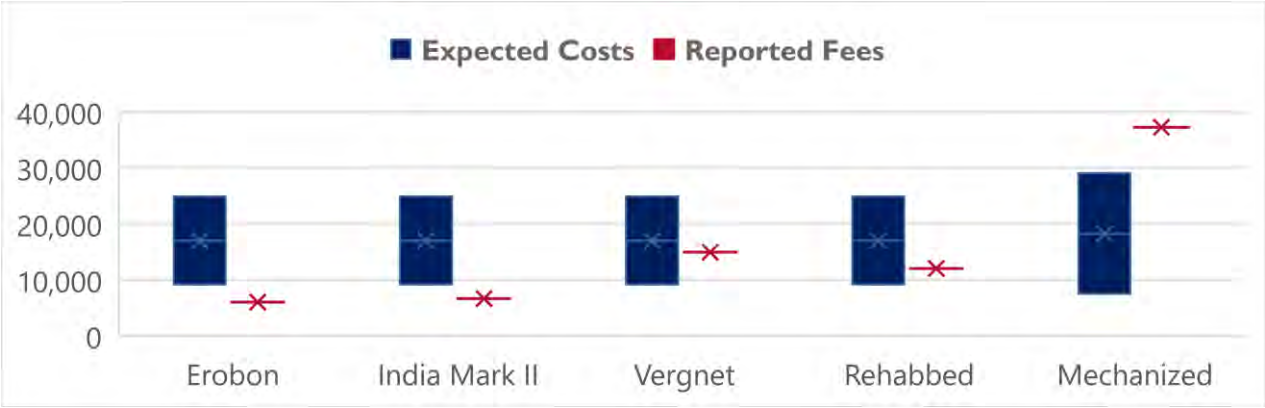
Water fee payment also appears to vary substantially by region. Socio-economic factors, such as the local poverty rate, may partially explain the regional variation in water fee payment (**Figure 19).** The ET noted statistically significant differences in all region to region comparisons *(P<.02* in all cases) and nearly statistically significant differences *(P=.05)* when it compared the regional percentage of people paying for water to the region's poverty rate.[58]

Figure 19. Water Fee Payment by Region (Water User Survey)



The ET also noted pump type and regional variations in how much people paid for water (if they paid at all). **Figure 20** illustrates these differences and provides a comparison to PEPAM/USAID's predicted O&M costs. PEPAM/USAID established extensive estimates of the expected O&M costs, which vary by well depth, population served, and type of pump (manual or mechanized).[59] The activity then provided (nonbinding) guidance based on this information to the committees to help them set tariffs. What this guidance process looked like in practice is not clear from the documents. However, the midterm evaluation found that the majority of WPs (65 percent) experienced severe threats to their financial viability.[60]

Figure 20. Amount of Water Fees Paid by Pump Type Compared with Expected O&M Cost Range, in CFA (Water User Survey & PEPAM/USAID Costing Study)[61])



[58] Agence National de la Statistique et de la Démogarphie (ANSD). 2011. Second Poverty Survey in Senegal/Deuxième Enquête de Suivi de la Pauvreté au Sénégal.
[59] PEPAM/USAID's documents did not include pump by pump estimates, but the documents noted that the variation by manual pump type was small. Thus, the figures illustrate all pumps using an overall average for the type of pump (manual vs mechanized). The averages ranged from 9,130–24,900 CFA per HH per year (about $15.50–$42.50/HH/year) for manual pumps and 7,470–29,050 CFA per HH per year (about $12.75–$49.50/HH/year) for mechanized pumps.
[60] SEMIS. 2013.
[61] RTI. 2014. Water Supply Technology Selection in Senegal: Experiences and Analysis from the USAID/PEPAM Project.

In many cases, water users reported paying water fees within or at least close to the expected range of O&M costs (**Figure 20**). Despite this finding, management committees often noted in the interviews that funds collected did not cover costs. It is not clear from the documents how PEPAM/USAID derived the expected O&M estimates, whether from empirical data with the specific pumps in other contexts, or if they made hypothetical estimates. It is also not clear whether inaccurate estimates or fees being set too low for the given wells have led to the shortfall.

Whether users paid for water and how much they paid significantly related to WP functionality at the time of visit *(P<.001* in both cases). While this in part could be attributed to the fact that water users stopped paying fees after a WP stops functioning, the finding is in line with other studies that highlight the importance of collecting sufficient water fees to ensure life cycle O&M costs are covered and WP functionality is maintained.[62]

During implementation, the activity attempted to help water committees set up fee structures to recoup full O&M costs. However, only four of 11 water committees reported having sufficient funds. Notably, larger ASUFOR committees accounted for three of those four committees; only one smaller community-level committee reported adequate funds. As already noted, water fee collection and fee amounts have been higher for the larger, mechanized water systems.

Many committees highlighted the difficulty of collecting fees and reported that water users regularly complained about the fees being too high. To increase fee collection, some committees reported barring access to those who have not paid their fees. In other cases, the committees lowered the fees in response to these complaints, but in so doing, started to jeopardize their ability to cover the necessary costs.

Pump Technology. As seen in the preceding sections, WP technology is related to several key outcomes and contributing factors. Users of submersible pumps more frequently paid for their water and also paid higher fees. These pumps proved to be the most reliable over time. The Erobon pumps and rehabilitated pumps performed poorly and proved to be the least reliable. And between the Vergnet and India Mark II pumps, the latter performed better and with fewer issues than the Vergnet pumps. While it is likely that the technology itself is a factor in these differing outcomes (which is why the activity stopped using the Erobon pumps), it is also possible that underlying factors play a role as well. PEPAM/USAID selected technologies for specific reasons—namely well depth, population to be served, logistical digging/construction considerations, anticipated costs (both for construction and for O&M), community preference, etc. Thus, it's possible that these underlying determinants of the chosen technology also played a role in the outcomes observed.

Local Entrepreneur Engagement. The PEPAM/USAID activity identified, trained, and provided drilling equipment to 14 local drilling enterprises to install boreholes and 60 local repairmen to operate and maintain water supply infrastructure. The activity also conducted three hydrogeology trainings for well drillers, private enterprises, and government technical

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[62] Fonseca, C., R. Franceys, C. Batchelor, P. McIntyre, A. Klutse, K. Komives, P. Moriarty, A. Naafs, K. Nyarko, C. Pezon, A. Potter, R. Reddy, and M. Snehalatha. 2010. Life-Cycle Costs Approach. IRC International Water and Sanitation Centre. https://www.ircwash.org/sites/default/files/Fonseca-2010-Life.pdf.

service units. The activity helped establish local enterprises in Tambacounda and Ziguinchor, provided equipment to entrepreneurs (drilling and other equipment), and assisted with the import of new and replacement borehole parts.

Eight out of the 11 water committees interviewed continued to engage the local entrepreneurs. However, none of the management committees currently have formal contracts with these enterprises in place. Some had contracts in place during the project period, as the activity's implementation plans called for formal contracts. However, all of those contracts have since lapsed. Despite the lack of contracts, engagement appears to continue, just not in the manner anticipated.

Interviewees noted several reasons why formal contracts between local entrepreneurs and their clients have dwindled. First, community water committees have not always paid the amounts required under the contracts. Second, competition exists between entrepreneurs, and the PEPAM/USAID–supported entrepreneurs sometimes lose out to lower cost competitors. Third, the entrepreneurs have had difficulty sourcing spare parts. And finally, since the activity's closure, local entrepreneurs indicated that a lack of oversight has led to a lapse in contracts. Despite the challenges, local entrepreneurs indicated a strong demand existed and continues to exist for repairs/maintenance and for well drilling and also noted an increased efficiency in drilling due to PEPAM/USAID training. Thus, the lack of contracts appears to reflect difficulties with the use of contracts, as well as a lack of incentives for using them, and not a problem related to the services being provided. In fact, the ET found no government officials familiar with the contracts the activity originally put in place and, therefore, they could not play an enforcement or follow-up role to make sure that both sides upheld the agreed-upon terms.

Women's Engagement. PEPAM/USAID encouraged active engagement of women in WP management as a key priority. The activity required that all committees include women and aimed for women to hold 50 percent of committee positions. In interviews, regional government officials echoed this perspective, noting this remains a priority. In fact, the government encourages 50/50 male-to-female participation on the committees, though they noted that not all communities follow this guidance.

Ten out of 11 water committees interviewed still have at least one female member. As one male committee member said, "The opinion of women is taken into account in this village because men are aware that they [women] are the ones who systematically use water in households. From this point of view, women's participation becomes essential." Interviewers found that women held 17 out of 40 possible water user committee positions (i.e., president, treasurer, etc.), which is close to the 50 percent target. Interviewees said that, in some communities, women played a key role in encouraging community members to pay for water and collecting fees. Interviewees also indicated that women had a strong role in ensuring WP cleanliness and served as important water stakeholders since they are the primary ones responsible for water collection and for ensuring hygiene and sanitation in their homes.

Interviewees said that illiteracy among female community members and a lack of awareness around key water issues can make it more difficult for women to effectively engage in community water management. However, this information is based solely on the interviews and

may be biased by the respondents' preconceived notions. For context, in Senegal, only 32 percent of rural women over age 15 are literate.[63]

CONCLUSIONS

The share of WPs still functioning four years after the end of the activity (63 percent) is on par with findings from other studies of small, community managed water infrastructure. The quantity and quality of water that functioning WPs provide is generally good. Accessibility, as defined by USAID and JMP, has improved, with only 17 percent of respondents reporting they spend more than 30 minutes per trip to collect water. However, most respondents are still spending nearly an hour of their day collecting water. Reliability of the water points is generally good, though variations exist among different pump types and regions.

Typically, where PEPAM/USAID WPs are still functioning, users rely on that WP as their primary water source. Among those who rely on multiple sources, people typically use the PEPAM/USAID WPs for drinking water and cooking. They rely more heavily on alternate (often unimproved) sources for agriculture and livestock uses.

Several factors appear to influence the status and use of the PEPAM/USAID WPs. Despite training during the activity, many of the water management committees struggle to implement best practices such as holding regular meetings or maintaining transparent financial records. Collecting water fees and the amount of fee collected strongly correlate with WP functionality.[64] Though the fees were at or near the ranges estimated by PEPAM/USAID, many of the management committees report having insufficient funds to cover O&M costs. It is unclear if this is because PEPAM/USAID made inaccurate estimates at the time or if another reason is at play.

Local entrepreneurs continue to be engaged in WP construction and repair. None report using formal contracts with community water committees, however, which is something that the activity emphasized. Some challenges remain for the local entrepreneurs, including issues with nonpayment for services and access to parts.

Women also continue to be actively engaged in WP management, with the support of local and regional government entities. They play particular roles in water point fee collection and in maintaining WP cleanliness, but challenges to their full participation remain.

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[63] DHS. 2017. https://statcompiler.com/en/

[64] Foster, T. "Predictors of Sustainability for Community-Managed Handpumps in Sub-Saharan Africa: Evidence from Liberia, Sierra Leone, and Uganda." *Environmental Science & Technology* 47.21 (2013): 12037-12046. And Foster, T. and R. Hope. "Evaluating Waterpoint Sustainability and Access Implications of Revenue Collection Approaches in Rural Kenya." *Water Resources Research* 53.2 (2017): 1473-1490.

HOUSEHOLD LATRINES

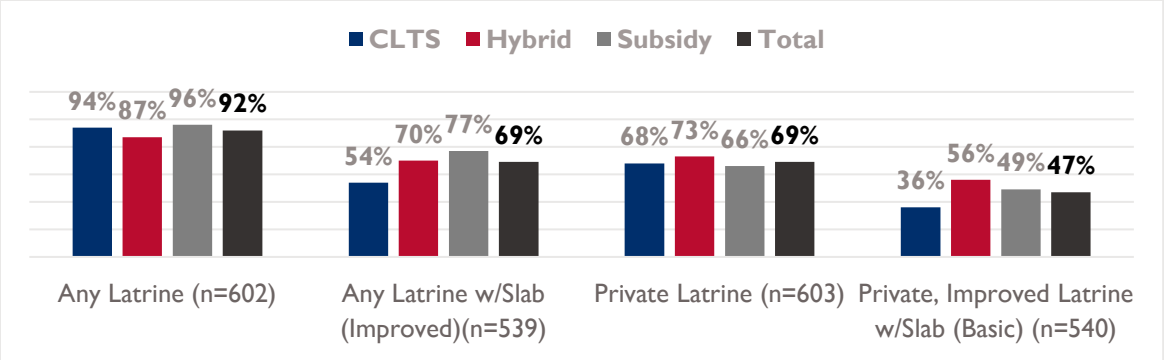
FINDINGS

These findings address the current status of sanitation in PEPAM/USAID sanitation intervention communities. To aid in understanding which of the three approaches (CLTS-WI, subsidy, or hybrid) might be to be the most sustainable, results from the HH sanitation survey (n=617) and latrine observations (n=551) are presented based on the sanitation approach used rather than the region where the intervention occurred. As mentioned above, comparing the three approaches and understanding any differences may provide further insight into the debate over subsidies.

CURRENT STATUS

Access to Sanitation. To end OD, people must have access to and use some type of latrine. According to HH sanitation survey respondents, 92 percent had access to a latrine. As seen in **Figure 21**, CLTS-WI approach village HHs reported a high level of latrine access, almost on par with subsidy village HHs (the highest), while hybrid village HHs reported an access level nine percentage points lower than subsidy village HHs (a statistically significant difference in both cases at P<.02). In the qualitative interviews, community members often mentioned that neighbors shared latrines if they did not have their own or if theirs did not function, which may explain why reported access to any latrine is so high. JMP and USAID (HL.8.2-2) define basic sanitation services as a household having a facility designed to hygienically separate excreta from human contact (e.g., flush/pour flush to piped sewer system, septic tank, or pit latrines; ventilated improved pit latrines, composting toilets, or pit latrines with slabs) and specifies that the latrine should not be shared with other households.[65,66]

Figure 21. Latrine Access in PEPAM/USAID Sanitation Communities (Household Sanitation Survey)

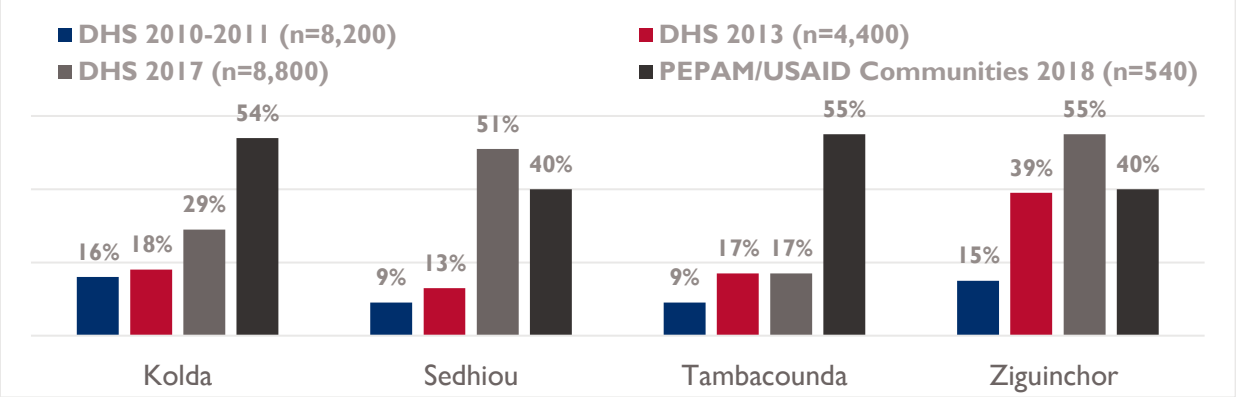


Hybrid villages reported the highest proportion of latrines that met basic sanitation service access (HL.8.2-2), followed by subsidy villages. Notably, CLTS-WI villages performed markedly

[65] JMP. 2018. https://washdata.org/monitoring/sanitation. Note the JMP and USAID definitions for sanitation service have changed since the activity closed.
[66] Since the PEPAM/USAID activity ended, JMP modified international WASH indicators to align with the Sustainable Development Goals, and USAID followed suit.

poorer for this indicator. The difference between the hybrid and subsidy approaches' means compared with the CLTS-WI approach are statistically significant *(P=.001)* and *(P=.02)*, respectively. **Figure 21** suggests that while the CLTS-WI approach broadly facilitates access to a latrine, it does poorly in facilitating access to basic sanitation. For additional context, **Figure 22** provides insight into the regional status of the basic sanitation indicator from multiple data sources: DHS (2010–11, 2013, 2017) and PEPAM (2018). However, it is important to note that the sample size differences preclude direct comparison. Qualitative data indicate that across approaches, community members value latrines and latrine access. PEPAM/USAID communities appear to be above or within 15 percent of the regional averages.

Figure 22. Latrines Meeting Basic Sanitation Services by Region and Data Source



PEPAM/USAID Latrine Designs. PEPAM/USAID promoted and aimed to create demand for three improved latrine designs: the Sanitation Platform (SanPlat), DVL, and VIP **(Table 6)**. Some of the interviewees (community members, IPs, government) indicated that they valued the quality and features (e.g., reduced water use) of the promoted latrines. In some instances, community members reported replacement of latrines with the same models as PEPAM promoted, however, more frequently they cited barriers to either building a PEPAM/USAID latrine in the first place or replacing one. The ET observed latrines and noted that PEPAM/USAID–promoted latrines did not appear to be widely used.[67]

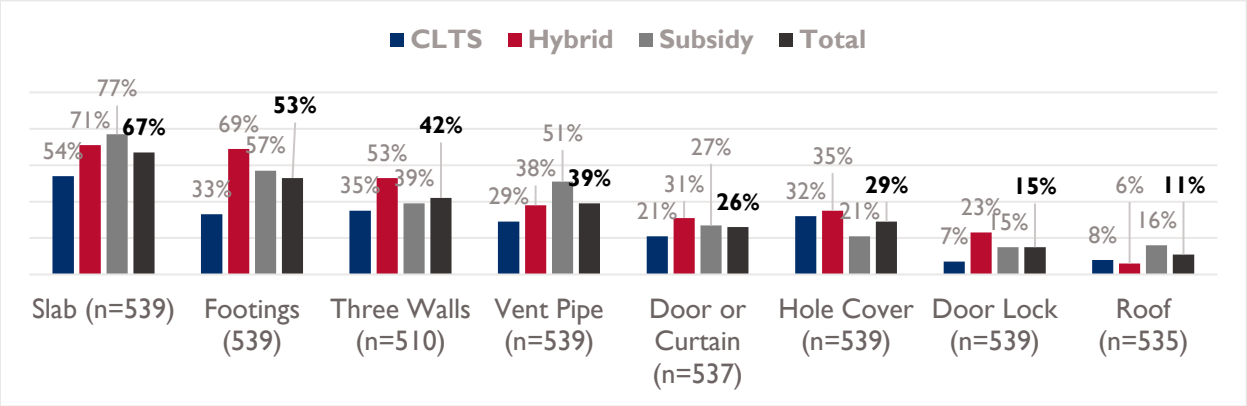
Across all approaches only 2 percent of HHs had a VIP latrine. The ET observed that 38 percent of HHs likely had a SanPlat or DVL latrine. That accounts for 48 percent of subsidy village HHs, 38 percent of hybrid village HHs, and 24 percent of CLTS-WI village HHs. The CLTS-WI results are statistically significant compared to hybrid and subsidy at *(P=.01* and *P<.001)* for both, but between subsidy and hybrid the results indicated no statistical significance. The qualitative data did not directly address the specific latrine types. Aside from a local entrepreneur who offered this explanation of why subsidy and hybrid intervention villages did not appear to rebuild PEPAM/USAID–promoted latrine options: "As for latrines, the proposed model is very well appreciated by people, but since the end of the project, people no longer have the means to build them. The head of the household chooses the type of latrine according

[67] Based on characteristics required of PEPAM/USAID's latrine design, the ET determined that if the enumerators observed a latrine with a vent pipe and slab, the HH was considered to have a likely SanPlat or DVL latrine. Those latrines with two pits, a roof, walls, vent pipe and a slab were categorized to likely be a VIP latrine.

to their means…." Further insight into latrine building, replacement, and repair are provided the "Factors Affecting Sustainability" section below.

Latrine Characteristics. Latrine characteristics, such as walls, roofs, and doors, are indicative of quality and have implications for use and sustainability. The latrines observed across approaches often lacked key superstructure, privacy, and other features. Notably, **Figure 23** illustrates that the CLTS-WI approach consistently underperformed on all indicators compared to villages involved with the hybrid and subsidy approaches except for the existence of drop hole covers and roofs. Across indicators, the hybrid and subsidy approaches show mixed results when compared to each other. However, the hybrid approach shows statistically significant differences for more indicators (walls, holes, locks, footings (P<.02) or less) compared to subsidy. For notably fewer indicators (vent pipes and roofs (P<.01) or less) the subsidy approach outperformed the hybrid approach. The ET found no statistically significant differences between approaches for slabs and doors.

Figure 23. Latrine Characteristics by Approach (Latrine Observations)



Overall, key structural characteristics such as presence of three latrine walls (42 percent) are sub-optimal, while latrines with a roof is very low at 11 percent. A regional government official and a few community members reported concerns about latrines without sound superstructure elements. Some of the same interviewees also noted that these latrines can be susceptible to failure.

Overall, only 2 percent of latrines had a door and 15 percent had a lock, two major privacy and safety components. Latrines that lack key privacy features like these are known to have a negative impact on use.[68]

USE

Latrine Use. Community members and NLs interviewed consistently shared that a majority of community members used latrines and often overcame access challenges (e.g., sharing with a neighbor). Evidence of observed proxy indicators suggested a high level of latrine use—86 percent of latrines observed appeared to be in use. Pairwise analysis indicated that latrines in hybrid villages showed the lowest signs of use, a difference with CLTS-WI and subsidy villages

[68] Garn. et al. 2017. The Impact of Sanitation Interventions on Latrine Coverage and Latrine Use: A Systematic Review and Meta-Analysis. https://www.sciencedirect.com/science/article/pii/S1438463916302619.

that is statistically significant in both cases (P<.001 and P=.001, respectively) **(Figure 24)**. The ET found no statistical difference between subsidy and CLTS-WI results. The CLTS-WI villages performed the best based on the general use indicators (appears in use and worn path), which contrasts with what one would expect, given that the hybrid and subsidy approaches had better structural latrine characteristics. A large meta-analysis on sanitation coverage and latrine use cited odor as a reason people indicated they did not use a latrine. **Figure 24** illustrates that the hybrid and subsidy villages HHs' latrines performed better on this indicator (e.g., they had less odor). The ET also found a positive correlation between a latrine having odor and not having a vent pipe (r=.11, P=.008). Also, of note, the hybrid approach performed best for cleansing materials, with subsidy not too far behind. However, overall the CLTS-WI village HHs recorded the highest level of use. Based on limited details of PEPAM/USAID's actual implementation of the CLTS-WI and hybrid approaches (beyond providing water as an incentive for ODF status under the CLTS-WI and introducing a subsidy a set time after CLTS triggering in the hybrid approach), it is unclear what may have factored into the differences in use. However, it could be possible that the way different implementers carried out their approaches impacted outcomes (e.g., one may have been better at behavior change communication). Alternately, perhaps hybrid HHs' became less motivated to carry out sanitation behaviors once they became aware that they would be eligible for a latrine subsidy. Understanding the potential differences could have an impact on future activities and drive use.

Figure 24. Observing Evidence of Latrine Use (Latrine Observation)

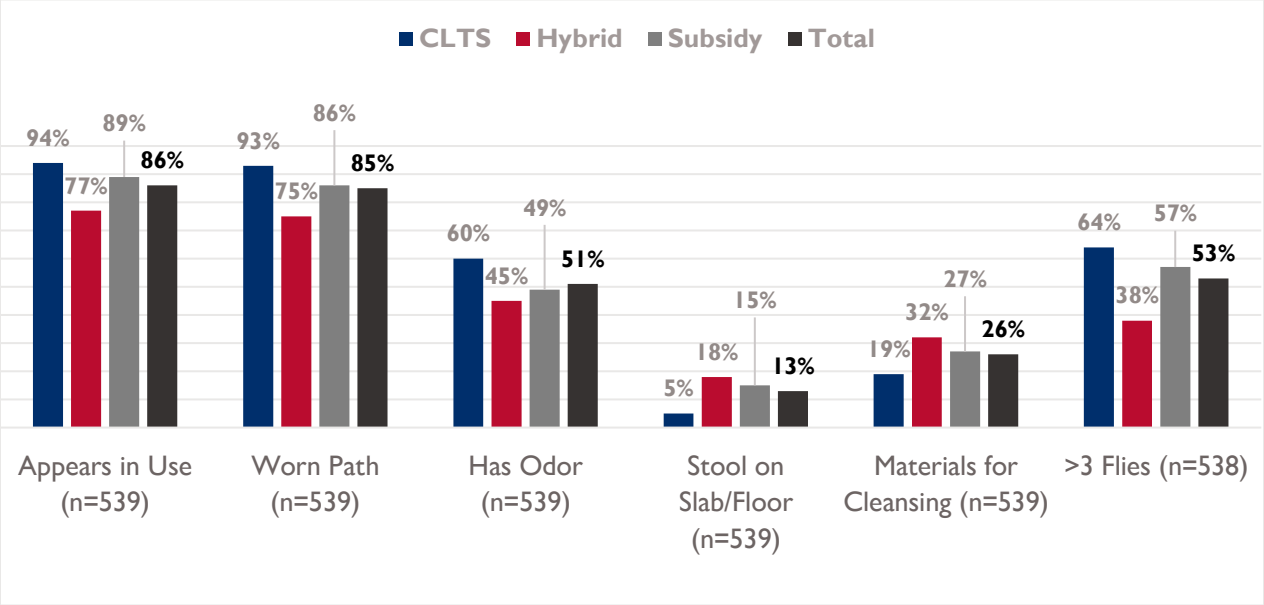
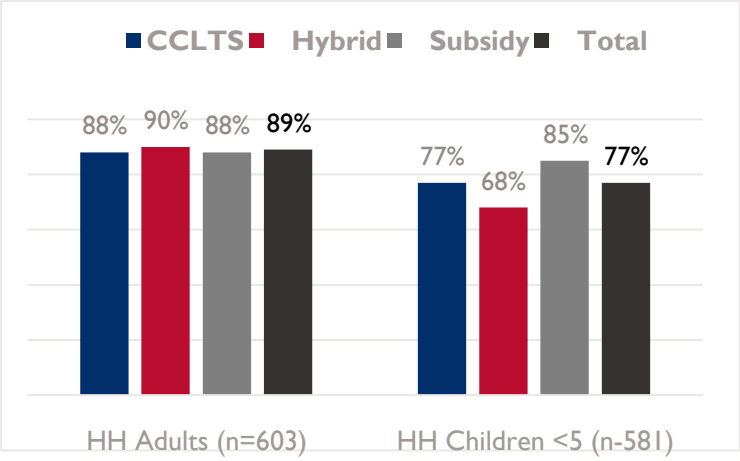


Figure 25 shows respondents self-reported safe feces disposal/defecation practices, which included using a latrine of any type (public, private), and children using potties and diapers when they defecated. Eighty-nine percent of adults and 77 percent of children under 5 reportedly practiced safe feces disposal and defecation. For children under 5, the subsidy and CLTS-WI village HHs performed well and within 5 percent to 7 percent of each other, however, the hybrid villages performed relatively poorly. When compared with either CLTS-WI or subsidy villages, hybrid approach village HHs showed lower percentages of safe feces disposal/defecation practices that reached statistical significance *(P=.04* and *<.001*, respectively). Latrine accessibility and proximity to one's house is often associated with latrine use.[69] The ET observed that 90 percent of latrines measured within 5 meters of the compound where the respondent resided. By approach, the CLTS-WI villages had more latrines 5 meters outside of their compound (20 percent) than subsidy villages (8 percent) or hybrid villages (5 percent).

Open Defecation. In the qualitative interviews across all approaches, both natural leaders and community members discussed open defecation in contrasting terms: either it never happened or had been eradicated (e.g., even when people worked in the fields they used latrines); it only happened in specific circumstances (e.g., in the field or because a HH lacked a latrine or resources to build one); or only among specific populations (e.g., young children, those from other villages, those without resources). The ET team received mixed reports from qualitative interviews regarding the occurrence of open defecation. While 68 percent of HH sanitation survey respondents stated that no one in their village defecated in the open, 14 percent of CLTS-WI, 31 percent of subsidy, and 43 percent of hybrid approach village HHs reported knowing someone in their community who openly defecated (all pairwise comparisons are statistically significant at (P<.01)).

Figure 25. Self-Reported Safe Feces Disposal/ Defecation Practices (Household Sanitation Survey)



While not directly comparable, regional trends in self-reporting of open defecation among PEPAM/USAID communities compared to notably larger DHS samples are shown in **Figure 28.**

The reasons that HH sanitation survey respondents cited that open defecation still occurs included: no other choices (19 percent), latrine is broken (10 percent), small children (7 percent), habit (6 percent), and latrine is full (6 percent). An NL from a water and sanitation CLTS village said: "The reasons people continue to defecate in the open air are that HHs without latrines have almost no manpower to build latrines…" Sustainability of latrines plays a key role in addressing the enabling environment to end open defecation. Overall, only 7 percent of respondents had visible feces in their compound: 10 percent of subsidy villages, 6 percent of hybrid villages, and 4 percent of CLTS-WI villages. Of note, during PEPAM/USAID all

[69] ibid.

CLTS-WI villages received ODF certification according to USAID indicator HL.8.2-1. While the ET did not assess entire communities for feces, the self-report and visible feces did represent at least minimal slippage.

SUMMARY OF CURRENT STATUS AND USE

All approaches reported a high level of access to sanitation facilities as well as the common practice of sharing latrines. Hybrid villages performed markedly better (20 percent) than CLTS-WI villages for access to basic sanitation service. The ET did not widely observe PEPAM/USAID latrine designs in use. CLTS-WI villages underperformed for all latrine characteristic indicators, whereas subsidy and hybrid villages showed better, but mixed results. However, CLTS-WI villages' latrine observations indicated that they showed the most signs of use. Sixty-eight percent of respondents reported that no one in their village defecated in the open.

FACTORS AFFECTING SUSTAINABILITY

Latrine Issues. HH sanitation survey respondents shared the issues they encountered with their latrine (n=357) and subsequently rated the most severe issues and indicated what, if any, action they took to remedy the situation. As seen in Table 8, respondents reported full pits as the most severe issue, followed by slab damage, and wall issues. Regardless of approach, community members and NLs commented on latrines filling and that they lacked the resources to empty them. PEPAM/USAID developed guidance plans for sanitation infrastructure and sludge/waste removal (e.g., pit emptying) for masons to use under the guidance of the IPs. In addition, indicators directly assessed pit emptying. However, it is unknown whether IPs implemented these guidance plans and whether they would have been sufficient to have an impact. A community member in a sanitation hybrid village put it simply: "The only problem is that some latrine pits are full, and people don't know how to empty them." The JMP reports that in rural areas of Senegal, only 37 percent of

Table 8. Latrine Issues Encountered and Rated Most Significant (Household Sanitation Survey)

ISSUE	% ENCOUNTERED (N=558)	% RATED SIGNIFICANT/ SEVERE
Full pit	21%	32%
Slab damage	24%	26%
Wall issue	29%	24%
Lid damage	20%	8%
Vent pipe damage	18%	6%
Roof issue	9%	4%
Other issue	5%	-

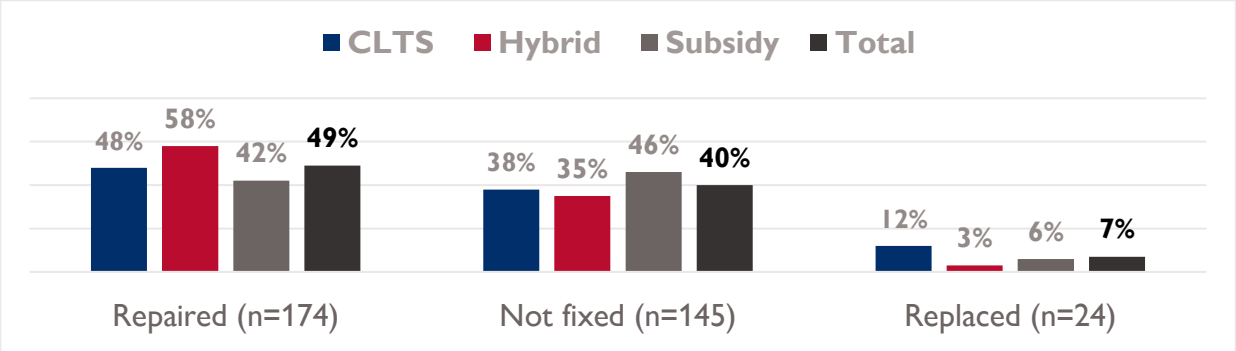
onsite sanitation facilities have ever been emptied.[70]

Overall, 49 percent of HH sanitation survey respondents indicated that they repaired the most severe issue, whereas 40 percent did not fix the issue (**Figure 26**). More hybrid village HHs repaired or fixed their most severe issue. When respondents reported they repaired or replaced their latrines, the ET detected no statistically significant differences among the types of approaches.

PEPAM/USAID trained masons to build and perform maintenance on latrines (including pit emptying). Government officials and local entrepreneur interviewees discussed the value of PEPAM/USAID's sanitation-related technical assistance and training contributions. Specifically, they cited the cadre of trained masons as a resource that the community and other projects can access. A regional government official said, "One of the positive points in the implementation of this program, PEPAM/USAID, is the training of masons. They have been capacitated for the construction of improved latrines. In many villages you will find masons capable of building improved latrines."

An NGO commented, "This situation is one of the forces behind sustainability because it has allowed the families after the departure of the project to dig latrines, but which are not traditional." It seems that the masons demonstrated how to dig structurally sound pits. The masons identified that the training received and skills developed as a result of PEPAM have made them "in demand." However, only 1 percent of HHs reported hiring someone to make a repair when they encountered a severe repair issue. It appears that only those who can afford the fees hired the trained sanitation masons and usually to build latrines, not to make repairs.

Figure 26. Method of Addressing Most Significant Issue (Household Sanitation Survey)



Community members and NLs indicated that latrine replacement commonly occurred across all regions and approaches. When latrines failed to be repaired or replaced, respondents attributed this to a lack of financial and material resources and insufficient manpower. A local entrepreneur stated, "All latrine models are good, but there were heads of households who were unable to dig their pit, and if the project could take it into account soon it would be better."

[70] WHO and UNICEF. 2017. Progress on Drinking Water, Sanitation and Hygiene: 2017 Update and SDG Baselines. Geneva: WHO and UNICEF.

A community member from a sanitation only CLTS-WI village said, "There are households that still use PEPAM latrines, but others are full and replaced. People replace their pit if it is full but sometimes if the head of the household does not have the financial means and physical strength to dig his own pit, these are the kinds of difficulties that can prevent some families from replacing their latrine. They use the neighbor's latrine until they can build their own..." Similar findings emerged from the HH sanitation survey. The 46 HHs that did not currently have a latrine gave lack of money (32 percent) and lack of materials (14 percent) as the primary reasons.

The photo on the left in **Figure 27** shows a full PEPAM/USAID latrine with its vent pipe still visible. The photo on the right shows the latrine built to replace it. While the replacement had a cement slab and raised footings, it lacked a vent pipe, roof, drop hole cover, or other characteristics that the previous latrine likely had. This is an example of latrine replacement that may have been considered "improved," but latrine quality is likely diminished.

Figure 27. Full PEPAM/USAID Latrine and Replacement Latrine

An additional theme that emerged related to latrine construction and replacement touches on quality and frequency of replacement. A community member in a village that opted for the water incentive following ODF verification under the CLTS approach summed it up saying: "However, they [PEPAM/USAID] should have supported us financially so that we could build modern toilets. Because the ones we build with our own means don't last and we have to dig every year."

These quotes also illustrate the linkage between financial barriers and latrine quality. Training a cadre of local masons and creating demand for latrines did not appear to be sufficient enough to move all members of a community up the sanitation ladder to basic sanitation.

Latrine Quality and Sustainability. As reported earlier **(Figure 25)**, suboptimal latrine characteristics led to quality and sustainability concerns. A salient theme that emerged from the qualitative interviews with community members and NLs indicated that limited material resources led to poor quality latrine construction, which in turn impacted sustainability. Specifically, respondents frequently discussed limitations based on cement use or lack thereof. CLTS-WI village respondents commonly referred to cement as important for latrine construction and cited the material as the difference between latrines that last and those that do not. Respondents also noted that the use of cement depended on the HHs' means. An NL in a CLTS-WI village that opted for the water incentive said, "The latrines built as part of this project by some have lasted but others have not because these toilets were built without cement." A community member from a subsidy village shared almost identical sentiments but also discussed the need for cement in relation to soil type to help latrines last. Based on the qualitative interviews, it appeared that the demand creation in subsidy villages motivated people to build latrines. Some HHs availed themselves of the subsidies, but the respondents noted that if they did not have the means they did not build with cement. It seems that those that did not build with cement did not use the subsidy PEPAM/USAID offered. The hybrid approach

respondents did not provide much detail but almost universally mentioned that PEPAM/USAID provided cement, iron, and a mason in the case of subsidized construction and they expressed satisfaction with their latrines.

While acknowledging that traditional latrines helped address open defecation, NLs, community members, and IPs cited the overall quality of traditional latrines several times as a concern related to sustainability. Reportedly, many HHs used traditional latrines of poor quality (e.g., no roof) that also raised health and environmental concerns (e.g., pit too close to water source) and, as mentioned above, needed to be replaced frequently. An NL from a CLTS-WI village that opted for a WP, summed up the concerns:

"There is no challenge except that the larine models they [PEPAM/USAID] proposed do not last. Every two years we build them. It is at this level that I appeal to them, we really need financial or material support to be able to build modern, sustainable latrines."

An NL from a sanitation subsidy intervention village elaborated:

"Frankly, we are not faced with a challenge in trying to convince the population to build or maintain latrines because the majority of households had latrines before the implementation of the PEPAM project and we were aware of the consequences of defecation in the open air. Therefore, the support of the population in the construction of latrines does not pose any problem. Now it is the fact of having quality latrines, which lasts a long time that was difficult."

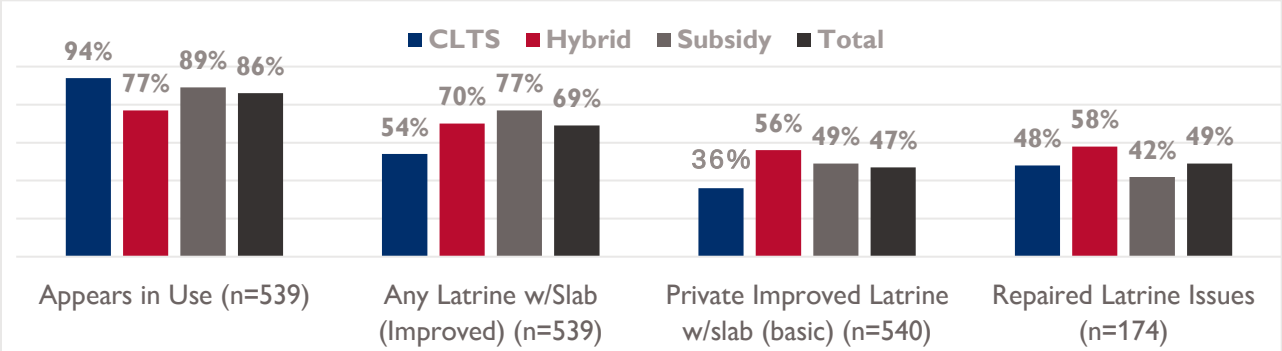
An IP shared a similar sentiment:

"It remains, however, a lot of things to do, especially in the field of the management of the sanitation facilities but particularly to reduce the gap of households that do not have adequate facilities to the standards of the PEPAM for better durability."

Additional Themes/Factors. Regional government respondents reported that funding and other resource limitations constrained the regional government's oversite of sanitation.[71] According to the interviewees, this resulted in limited human resource capacity, which in turn impacted the government's ability to fully monitor and track donor and project achievements. Central to WASH planning and monitoring is the Plan Locaux d'Hydraulique et d'Assainissement/Local Water Supply and Sanitation Plan (PLHA), which Senegal's sanitation code mandates that every rural community have. All four regions' government officials spoke of the utility of PLHAs when they exist. PEPAM/USAID supported the development of 52 PLHAs in Ziguinchor and Kolda. According to government officials, the plans helped identify communes' water and sanitation access rates and needs. Originally developed to help Senegal meet the Millennium Development Goals in 2015, the plans have not been updated, and some deemed them obsolete. While it did not emerge from the interviews, it seems evident that building a government monitoring information system for WASH would have longer term utility compared to one-time activities that are funded piecemeal like PHLAs.

[71] The regional government sanitation offices play many roles related to sanitation as the overall overseers of their regions' sanitation situation e.g., they should be aware of all government and non-government sanitation activities, statistics, and reporting where available, PHLAs, etc.

Figure 28. Key Outcomes by Approach (Latrine Observations and Household Sanitation Survey)



Comparing Implementation Approaches. In an effort to inform USAID, GoS, and other stakeholders, the ET sought to understand which implementation approach proved the most sustainable.

The qualitative interviews indicated that the hybrid villages had the most sustainable latrines in terms of latrine quality, based on multiple reports that the latrines built as part of PEPAM/USAID lasted until full. Whereas the CLTS-WI and subsidy interviewees often cited issues with latrine quality and durability leading to frequent replacement. The HH sanitation survey and observation data presented a trade-off between the approaches. Specifically, CLTS-WI had the best outcomes on primary indicators of use (which is the primary goal of CLTS and therefore considered a success), but respondents noted latrine quality concerns. While CLTS is recognized for galvanizing communities to build latrines, studies often note that many of the latrines built are unimproved (have quality concerns) and do not aid in progressing HHs up the sanitation ladder.[72] The hybrid approach performed best related to repairs and for USAID's indicator for access to basic sanitation. Most regional government officials, IPs, and some community members expressed notable support for the hybrid approach. After providing an explanation of how CLTS helps raise community awareness of sanitation and mentioning challenges with building traditional latrines, a regional government official concluded:

"This is why the door must remain open to the CLTS approach and the subsidized approach comes in behind for vulnerable households. It is the hybrid approach is the best."

Two implementing NGOs, neither of which participated in the hybrid approach, stated:

"We implemented the subsidized approach… It is a very good approach, but it should not be generalized. By the time that [it] ran its course it was abandoned by all development projects for its lack of sustainability in the facilities and the achievements in place. I think that we must start by the CLTS and subsidize after. We have certainly succeeded in changing behaviors by the CLTS approach, but the problem is the sustainability of the latrines…. If there was a subsidy, there at least the latrines would be more durable because more solid. If the latrine is not solid and that the owner *is not in the provisions to be able to rebuild, this person returns to its bad habits.*"

[72] Cavill, S., R. Chambers, and N. Vernon. 2015. "Sustainability and CLTS: Taking Stock," *Frontiers of CLTS: Innovations and Insights Issue 4*. Brighton: IDS

Community members shared somewhat similar sentiments without explicitly naming the approaches. As noted above, they focused more often on quality of materials and the need for assistance for some HHs.

CONCLUSIONS

The evaluation team analyzed HH sanitation survey and latrine observation data and qualitative interviews to understand the extent to which HHs in PEPAM/USAID villages have been using and replacing latrines and what factors contributed to sustainability. Demand for quality latrines is high, and it is evident that latrines are valued among PEPAM/USAID communities. In PEPAM/USAID villages latrine access is high and this is likely due to reported ability to access other community members' latrines. Looking forward to future USAID programming, latrines that meet basic or safely managed sanitation service definitions are critical. As such, findings related to these indicators are of importance.

The latrine models that PEPAM/USAID promoted do not appear to be widely in use, and many HHs instead appear to rely on traditional latrines. Across approaches, observed latrine characteristics indicate that latrine quality in PEPAM/USAID villages is suboptimal. Specifically, CLTS-WI village HH latrines appear to be of poorer quality than the other approaches, which aligns with reports from CLTS-WI villages that rely upon traditional latrine construction as well as previous studies. Overall, relatively few latrines observed had key superstructure (such as roofs or walls) and quality components, which are known to have a negative impact on use but did not have much of an actual impact based on this evaluation. Reported latrine use is high overall, but results are mixed by approach. This may relate to implementation of the different approaches. For example, the CLTS-WI approach used ODF certification as an incentive for a subsidized water point, whereas the hybrid approach did not. It is of critical importance for future WASH activities to further explore the impact of differences between the implementation approaches and how they motivated behavior change around latrine use and OD practices. Despite reported high latrine access, open defecation persists across approach type, with the highest rates recorded in hybrid communities. The reports and presence of observable stool in some compounds in CLTS-WI communities previously certified as ODF represent minimal slippage. It should be noted that at least some slippage occurs after implementation of CLTS and other sanitation interventions, and the CLTS villages' slippage appears to be within a "normal range."[73] The complex factors that contribute to slippage rates are beyond the scope of this evaluation.[74, 75, 76]

Both the qualitative and quantitative data indicated that the most severe issue encountered related to latrines are full pits. PEPAM/USAID's reports indicate that the activity developed guidelines to address this issue, but their exact mode of implementation is not known, and no communities discussed these potential resources. According to the qualitative interviewees, latrine construction and replacement commonly occurs and latrines are valued across approaches, but they noted several barriers. Resource limitations of some HHs contributed to

[73] Research indicated that the ranges varied widely e.g., about 2%–50%, although based on a number of studies ranges in the lower teens were the most common.
[74] Tyndale-Biscoe, P. et al. 2013. ODF Sustainability Study. Plan International.
[75] Shivanarain, S. et. al. 2015. Sustainability of ODF Practices in Kenya. UNICEF.
[76] We Consult. 2013. Sustainability Check 2013. UNICEF.

the inability to build/replace or maintain a latrine and/or to the use of poor materials (e.g., without cement). In addition, it appears that latrine standards/quality characteristics are not always maintained when replacement occurs. Reportedly, the cadre of trained masons are only hired for latrine construction when a HH can afford them; they do not appear to be used for maintenance as PEPAM/USAID envisioned. However, regional government officials appear to highly value the trained masons and view them as an asset to regional sanitation improvement and sustainability. The interplay among latrine quality, repair, and replacement influence sanitation habits (defecation behavior) and norms. Moving up the sanitation ladder does not guarantee latrine quality, which is critical to enable and sustain sanitation norms.

Comparing Implementation Approaches Conclusions. As the GoS National Strategy of Rural Sanitation shifts its focus to a market based/private sector approach and moves from full subsidy to none or limited subsidies, it is important to consider the evidence and determine the trade-offs to achieve sanitation service for rural residents. In the past, many in the WASH sector viewed sanitation subsidies and traditional CLTS as diametrical, however, PEPAM/USAID's hybrid approach is an example of a shift in thought that the approaches can be complementary. The quantitative data indicate a trade-off between the approaches. However, given aspirations to move HHs up the sanitation ladder, which HHs are likely to repair their latrine, the barriers noted above, and a variety of stakeholder opinions, it appears that the hybrid approach strikes a balance and may be able to bring more HHs basic sanitation service as well as establish norms.[77] However, implementers need to understand the factors that drove high latrine use in CLTS-WI villages and comparatively poor use in hybrid villages. Perhaps, requiring ODF verification as a prerequisite for a water point subsidy provides a common communal goal and, therefore, a stronger commitment to changing sanitation behavior. Based on some limitations in understanding exactly how implementation occurred, it is likely that hybrid implementation approaches could be modified to address use and other issues and maximize sanitation service in rural contexts. For example, ensuring the presence of trained masons is likely not sufficient to spur quality latrine construction because of limited resources in rural communities. Demand creation appears to have been internalized as most community members reported valuing latrines, however, HHs built latrines that lacked the quality and sustainability to move a high percentage of community members toward lasting basic satiation. Across all of the implementation approaches, the larger structures that PEPAM/USAID used to facilitate sanitation service (e.g., training masons, behavior change, etc.) likely had an impact and would need to be considered in terms of their role in facilitating sustainable sanitation service delivery.

HANDWASHING

This section addresses the current status of PEPAM/USAID's handwashing infrastructure and behavior among PEPAM/USAID communities. This report presents the quantitative and qualitative data based on the sanitation approach (CLTS-WI, subsidy, hybrid) paired with each handwashing activity. The ET assessed handwashing indicators during the HH sanitation survey, which included handwashing station observations (n=291).

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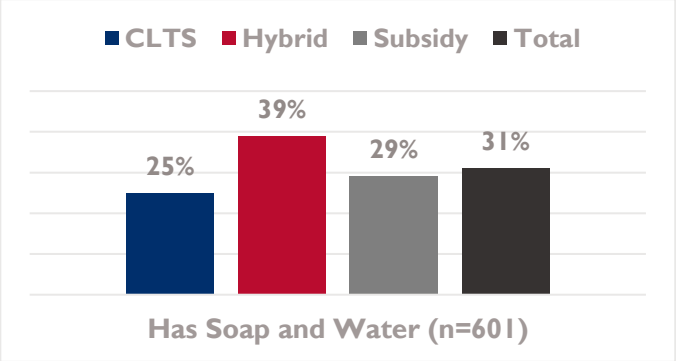
[77] USAID, 2018. An Examination of CLTS's Contributions Toward Universal Sanitation. Washington, DC.: USAID Water, Sanitation, and Hygiene Partnerships and Sustainability (WASHPaLS) Project.

FINDINGS

CURRENT STATUS

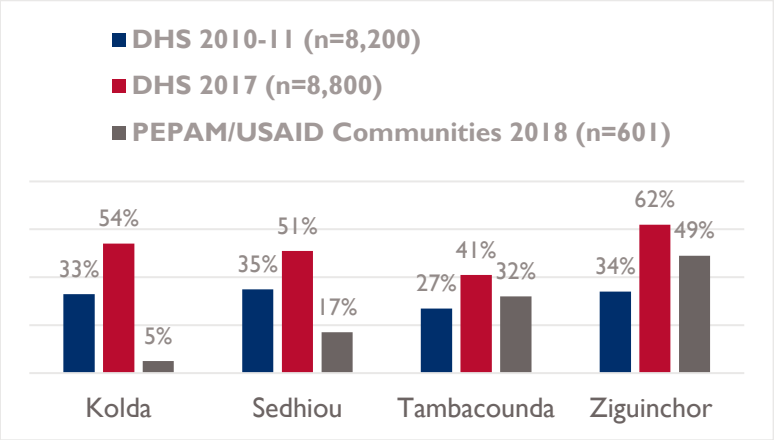
PEPAM/USAID promoted the use of tippy taps, which are fixed handwashing stations,[78] during activity implementation and provided manuals to help community members build them. These handwashing stations cue users to practice handwashing behavior at critical times, such as after defecating when placed outside of a latrine or before food preparation when placed near a kitchen area. In the qualitative interviews, community members and NLs indicated that regardless of village type (e.g., water only, sanitation and water combined, etc.) and approach (CLTS-WI, subsidy, or hybrid) tippy tap construction guidance was a component of the WASH interventions in each village. All but one interviewee from a sanitation intervention village reported that they or others in their community built tippy taps as a result of PEPAM/USAID sensitization. Of the 600 HH handwashing observations, only 6 percent of HHs had a fixed handwashing station or facility (this includes tippy taps), and 51 percent of HHs did not have any handwashing facilities or materials. The current status of handwashing stations based on observation aligned with the qualitative results, which indicated that across all regions, WASH interventions, and implementation approaches, respondents almost universally reported that no tippy taps introduced during PEPAM/USAID were in use. Almost all respondents cited a reversion to mobile handwashing stations (water kettle or bottle). An NL in a CLTS-WI village reported, "At the very beginning of the sensitization, people applied these measures. But as soon as the tippy tap breaks down, I notice that tippy tap are not recommended and as a result, some no longer have these tippy tap but we have replaced them with other ways of washing hands. By replacing the tippy tap with basins, pots, kettles."

Figure 29. HH with Observed Soap and Water for Handwashing by Approach (Handwashing Station Observations)



[78] USAID indicator HL.8.2-5 specifies that a handwashing station can be in a fixed location or a movable device that can be used by the HH.

Figure 30. Observed Handwashing Station with Both Soap and Water (Handwashing Stations Observations)



The HH sanitation survey reported that the average length of time a **handwashing station lasted** ranged from 25 months in hybrid village HHs to 72 months in CLTS-WI village HHs. Subsidy village HHs reported their tippy taps lasted 49 months—the middle of the range. Convenient access to a handwashing station with soap and water is widely accepted as a key factor in enabling handwashing behavior.[79]

PEPAM/USAID encouraged HHs to install handwashing stations in their compounds, and some qualitative interviewees reported that the activity promoted installment near latrines. When enumerators observed handwashing station location, they found 15 percent near a cooking area, 10 percent near a latrine, and 35 percent had no specific place or were used at multiple places. These findings indicated a limited ability for handwashing stations to be a cue to action at critical times.

Overall, 35 percent of HH sanitation survey's respondents had a handwashing station/materials for observation. The enumerators found that more villages that applied the hybrid approach had handwashing materials (63 percent) compared to 46 percent of subsidy villages and 33 percent of CLTS-WI villages; all pairwise comparisons reached statistical significance at *P<.02*. Only 62 percent of HHs overall had soap present during the observation. Comparing approaches, CLTS-WI villages recorded the highest number of HHs with soap (76 percent), followed by subsidy (66 percent), and the substantially lower number of hybrid HHs (52 percent) (the latter two figures are statistically significant; *P=.002* and *P=.02,* respectively). Only 28 percent of HHs met USAID indicator HL.8.2-5: percentage of HHs with soap and water at a handwashing station commonly used by family members (no statically significant difference in pairwise comparisons by approach). However, a statistically significant and positive correlation should be noted between other WASH activities being carried out in a village and having soap and water available (r=.18: *P<.001*). This aligns with what one would expect (e.g., presence of WASH activities leads to improved signs of handwashing). Regional variations appeared to be substantial with all differences being statistically significant at *P<.04* or lower. Among the HHs observed, **Figure 33** shows low to extremely low adherence to the practice of handwashing with soap and water in all regions. The figure also presents the much larger DHS sample to provide a sense of regional trends. While direct comparison is not possible, it does appear that the PEPAM/USAID HHs are worse off than others in the region. The qualitative interviews with community members and NLs yielded high levels of self-reported handwashing habits, including use of soap and ash. HH sanitation survey respondents corroborated this fact; 85 percent of

[79] Devine, J. 2010. Beyond Tippy-Taps: The Role of Enabling Products in Scaling Up and Sustaining Handwashing. https://www.ircwash.org/sites/default/files/Devine-2010-Beyond.pdf.

respondents self-reported that they wash their hands with soap. Qualitative interviewees offered two different perspectives: some said that before PEPAM/USAID people did *not* often wash their hands with soap; others stated that they *did* wash their hands before, but sensitization activities reinforced this practice.

USE

PEPAM/USAID provided training on how to make soap, which one qualitative interviewee indicated still occurs. The ET noted regional variations of about 25 percent in reports of handwashing with soap. Hybrid village HHs (91 percent) reported the highest level of handwashing with soap, and subsidy village HHs (79 percent) reported the lowest, a statically significant difference *(P<.001)*. More respondents self-reported that they washed their hands with soap than had soap available during observation, as discussed above. However, only 38 percent of HHs with handwashing stations showed any signs of use (e.g., wet soap, wet ground, wet basin, etc.). CLTS-WI HHs showed the highest signs of use (60 percent), followed by subsidy HHs (47 percent), and hybrid HHs (21 percent), which had a lower statistical significance than the CLTS-WI and subsidy approaches at *(P<.001)* in each case. The ET found a statically significant and positive correlation between other WASH activities being carried out in a village and signs of handwashing (r=.13: P=*.03*). While the ET did not specifically determine what other WASH activities focused on or promoted, it does seem evident that additional WASH programming had a positive impact on observed proxy indicators for use.

Figure 31. PEPAM/USAID Latrine

SUMMARY OF CURRENT STATUS AND USE

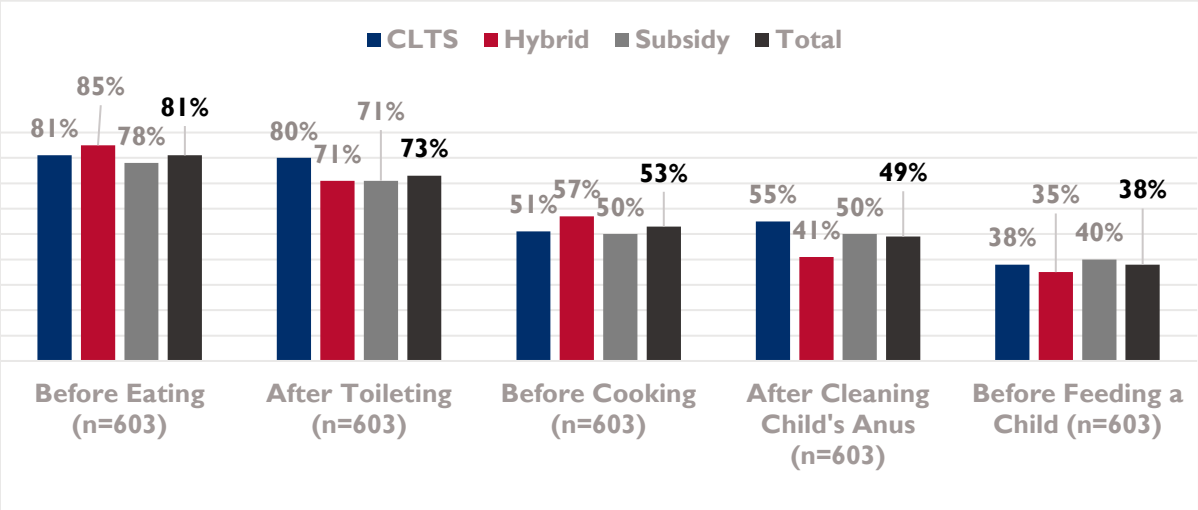
In sum, CLTS-WI village HHs displayed the most durable handwashing stations (72 months) and the highest signs of use (60 percent). However, PEPAM/USAID–promoted tippy taps did not stand the test of time and appeared to no longer be in use. Overall signs of handwashing station use of any kind across the intervention approaches was low (38 percent) and indicates that handwashing promotion during PEPAM/USAID did not become normative.

FACTORS AFFECTING SUSTAINABILITY

Behavioral Sustainability Factors. PEPAM/USAID did not measure handwashing behavior change at the conclusion of the activity. However, PEPAM/USAID used the SARAR/PHAST strategy to conduct 10,245 HH visits to share WASH behavior change messages. Across implementation approaches, community members and NLs shared health and wellness themes as motivators for handwashing. In addition, they demonstrated consistent knowledge of critical times for handwashing with soap—one of PEPAM/USAID's primary behavior change messages. While PEPAM/USAID strengthened knowledge of critical handwashing times and health messages (e.g., handwashing can decrease germs, reduce diarrheal disease, etc.), it did not appear to have shifted norms. This is also evident based on HH sanitation survey respondents' self-reporting of when they washed their hands **(Figure 35)**. Handwashing at critical times occurred most frequently among all approaches before eating, followed by after using the latrine; CLTS-WI village HHs reported the highest level of compliance. All other critical times

for handwashing recorded suboptimal results: before cooking (range 51–57 percent), after cleaning a child's anus (range 41–55 percent), and before feeding a child (range 35–40 percent).

Figure 32. Self-Report of Handwashing at Critical Times (Household Sanitation Survey)



The potential of response bias should be noted when interpreting respondent's self-report of handwashing at critical times.

> "They [PEPAM/USAID] made us aware of handwashing with soap and it was very useful because we found that there are fewer diarrheal diseases."
>
> *– Community member in a sanitation CLTS village*

PEPAM/USAID carried out HH visits and used social marketing in an effort to change behavior across all implementation approaches. A key factor in changing behavioral norms and supporting habit formation is the promoter's consistent follow up of that behavior.[80] In qualitative interviews with a regional WASH official, an IP, and community members, interviewees shared their thoughts on the need for consistently engaging with HHs on handwashing behavior. An NL from a CLTS-WI village who opted not to take the water incentive shared his perspective on what may be required to change norms in a PEPAM/USAID village long term, "…what has not worked is the fact that the people from the project who came to teach us these practices did not come back later to at least refresh our thoughts. If you show or learn things to people and you stay for years without coming back to refresh their ideas about what has been done, people will eventually forget what they have learned. It would be interesting to follow up with people until they assimilate what they have learned…"

[80] Wantland, D., B. Bewick, and T. Palermo. 2009. (Ed). Ritterband, L. "Periodic Prompts and Reminders in Health Promotion and Health Behavior Interventions: Systematic Review." *Journal of Medical Internet Research*, 11(2). and Ory, M., M. Smith, N. Mier, and M. Wernicke. 2010. "The Science of Sustaining Health Behavior Change: The Health Maintenance Consortium." *American Journal of Health Behavior*, 34(6), 647-659.

In reference to sustaining behavior change, a regional official added, "This is not easy, people tend after the departure of the promoters and entrepreneurs to return to their different habits."

A systematic review of handwashing behavior found that of the 30 handwashing studies reviewed only four demonstrated behavior change lasting one year after the intervention.[81] The findings in this evaluation align with the review's findings, e.g., handwashing behavior is unlikely to be sustained. As mentioned above, consistent presence of a handwashing promoter or behavior change agent is integral to shifting norms and helping to enshrine behavior.[82] PEPAM/USAID's behavior change appeared to be insufficient to establish handwashing habits and norms.

Tippy Tap Sustainability Factors. The ET observed tippy tap failures occurred for a number of reasons: sun damage and time affected the durability of the plastic containers and poor durability made the device prone to damage. In reference to the PEPAM/USAID tippy tap, an NL from a CLTS-WI village said: "The only problem with the device is that it does not last long. The cans do not resist the sun, the fact that they were built all the time made the population discouraged. Nevertheless, we have other handwashing devices that are mobile, different from the PEPAM model."

The PEPAM/USAID midterm evaluation report noted these factors and others related to understanding the maintenance manuals as undermining tippy tap sustainability. It is unclear based on the data and interviews if PEPAM/USAID made any course corrections/adjustments.

Repair and replacement of handwashing stations occurred 56 percent of the time. The reasons respondents cited for handwashing station replacement included: no specific reason (91 percent), structural damage (7 percent), container damaged (5 percent), and generally needing replacement (12 percent). When respondents encountered a problem with their handwashing station, 37 percent fixed the issue within their own HH, 12 percent either built or purchased a new handwashing station, and 32 percent did not fix the issue.

CONCLUSIONS

The ET examined whether, and to what extent, PEPAM/USAID–promoted handwashing stations or other handwashing stations were in use, reported handwashing behaviors, and factors influencing the sustainability of handwashing. These factors could be both structural (enabling environment) and behavioral. Based on the interviews and direct observations, it is evident that the PEPAM/USAID–promoted handwashing stations are by in large no longer in use. This is ascribed to poor quality and durability issues. The lack of handwashing observed is not surprising given that few of these handwashing stations have been replaced, so just under half of the HHs have any observable means of washing hands. When replacement does occur, it appears to be with a movable handwashing station, which limits the potential for it to act as a cue to action at critical times. The qualitative interviewees consistently shared their desire and motivation for handwashing with soap. However self-reported handwashing at critical times is

[81] Vindigni, S. 2011. Systematic Review: Handwashing Behaviour in Low- to Middle-Income Countries: Outcome Measures and Behaviour Maintenance. https://onlinelibrary.wiley.com/doi/full/10.1111/j.1365-3156.2010.02720.x
[82] Wantland, D., B. Bewick, and T. Palermo. 2009. and Ory, M., M. Smith, N. Mier, and M. Wernicke. 2010.

suboptimal. This, coupled with the lack of actual handwashing materials, makes habit formation difficult. It is simpler to revert to previous practices when the enabling hardware does not last.

Details about the implementation of the PHAST/SARAR behavior change approaches are insufficient to draw a definitive conclusion, however, based both on qualitative interviews with multiple stakeholders and the quantitative data, the behavior change strategy does not appear to have been sufficient to change handwashing behavior long term. Respondents pointed to the need for sustained behavioral intervention and promoter presence to enable HHs to change habits and shift norms.

RECOMMENDATIONS

1. **Consider building on the hybrid (combined CLTS and subsidy) approach for future rural sanitation service programming.** To meet basic sanitation service (USAID HL.8.2-2) or higher, promote quality latrines, and support maintenance across communities, consider modeling future sanitation projects after the hybrid approach of initial CLTS triggering activities with subsidies to follow a period of time later. Pay attention to enhancing promotion of improved quality latrine facilities and determining the appropriate subsidy.
2. **Conduct a cost-benefit analysis of WP pump, well borehole options, and the three sanitation implementation approaches.** PEPAM/USAID created extensive cost estimation documents for WP construction and O&M costs. USAID should build off of existing cost documents and combine them with benefit data to create an additional resource to aid in decision-making for future programming. Determining the cost of achieving specific benefits will provide evidence for USAID and other stakeholders to make informed decisions.
3. **Consider alternative models for small-scale WP management and governance**. Ensure that these models include linkages and consistent interactions with larger WASH governance and support structures. Given the GoS's shift toward private-sector management of larger scale (multi-village) rural water supply systems, work with the government to explore how the private-sector model might influence and inform best practices/systems for small-scale water points. Finally, any approach should continue to include women in a significant way.
4. **Consider incorporating human-centered design of handwashing stations** into future projects, provide access (via markets, subsides, or other mechanisms) to fixed handwashing stations (enabling environment) beyond a basic tippy tap, and develop supply chains for quality handwashing station materials appropriate for rural and peri-urban settings. In addition, develop guidelines on handwashing station material quality (e.g., if program's handwashing stations will be placed outside, ensure that materials are UV resistant).
5. **Continue to engage in private-sector partnerships that foster local capacity building and entrepreneurship training** while ensuring that specific plans are in place to transition financial systems (bank accounts/guarantee of payment) for WASH services when a project ends. Poor transition plans for committee financial systems under PEPAM/USAID contributed to poor financial practices and challenges with contracts. Simultaneously, ensure that supply chain systems are sustainable after the project concludes,

potentially by focusing on limited technology options or transitioning oversight to government or other entities.

6. **Support system strengthening for sustained championing of WASH behavioral norms.** Promote the journey to self-reliance through work with host governments to strengthen systems that support community health workers or community WASH champions to provide longstanding and consistent behavior change activities. Changing behavior and shifting norms around water, sanitation, and handwashing with soap and water will require sustained messaging.
7. **Support adaptive management recommendations in midterm evaluation reports and follow up** to ensure that implementers have the flexibility to make course corrections. Based on the data, it appears that IPs did not modify all implementation approaches in accordance with independent midterm evaluation findings regarding threats to sustainability. For example, it appears that IPs stopped using the Erobon pump as the evaluation recommended, but handwashing station sustainability concerns did not appear to be addressed.