

Sustainable WASH Systems Learning Partnership

ASSESSMENT OF SHIFTS IN STAKEHOLDER UNDERSTANDING OF WASH SYSTEMS

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**SUSTAINABLE
WASH SYSTEMS**
LEARNING PARTNERSHIP

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Front cover: Members of the District WASH Task Team in Kabarole, Uganda, discuss the findings of a Building Blocks Analysis. Photo credit: Wilbrord Turimaso, IRC WASH

About the Sustainable WASH Systems Learning Partnership: The Sustainable WASH Systems Learning Partnership is a global United States Agency for International Development (USAID) cooperative agreement with the University of Colorado Boulder (UCB) to identify locally driven solutions to the challenge of developing robust local systems capable of sustaining water, sanitation, and hygiene (WASH) service delivery. The consortium of partners — Environmental Incentives, IRC, LINC, Oxford University, Tetra Tech, WaterSHED, Whave, and UCB — are demonstrating, learning about, and sharing evidence on systems-based approaches for improving the sustainability of WASH services in four countries.

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Acronyms

O&M	Operations and Maintenance
PTA	Purposive Text Analysis
SWS	Sustainable WASH Systems Learning Partnership
USAID	United States Agency for International Development
WASH	Water, Sanitation, and Hygiene
WASHCO	Water, Sanitation, and Hygiene Committee
WRM	Water Resources Management
WUC	Water User Committee

Executive Summary

This study sought to build evidence on the impact systems approaches can have on local stakeholders' ability to conceptualize the complex interaction of factors that influence water and sanitation service delivery sustainability in Ethiopia, Kenya, and Uganda. Specifically, the study explored how stakeholder understanding of *factor interactions* improved over time while engaging within professionalized maintenance and facilitated collective action approaches — the two predominant systems approaches applied within the United States Agency for International Development (USAID) Sustainable WASH Systems Learning Partnership (SWS).

SWS used three criteria to determine whether stakeholder understanding on factor interactions improved over time: (1) the number of factors and interactions mentioned by stakeholders; (2) shifts in understanding of factor interactions that align with the core tenants of service delivery approaches; and (3) stakeholder alignment, determined from a decreased variance in responses, on factor interactions. To assess improvements in stakeholder understanding of factor interactions, the research team performed a rigorous analysis of causal statements from transcribed interviews conducted with hundreds of water and sanitation service stakeholders over the 5-year project duration.

Study findings showed that over the course of the project, stakeholders increasingly conceptualized more factors that influence service delivery and interactions between them, demonstrating a greater understanding of the complexity and nuance of water, sanitation, and hygiene (WASH) systems. In addition, the study showed that systems approaches can shift stakeholder understanding of factor interactions that align with key tenets of sustainable service delivery, in particular the linkages between operations and maintenance, service performance, private sector engagement, and a decreased dependence on community-based management approaches. The study also showed that managing turnover within stakeholder coalitions was highly influential in promoting alignment in a group's understanding of factor interactions.

These findings provide evidence for the merits of applying approaches focused on convening people together in a structured setting to explore the factors and interactions of complex systems such as WASH service delivery. The work of SWS partners shows that these types of approaches bolster stakeholders' ability to “think in systems” and navigate complex challenges posed by service sustainability. This improvement in systems thinking is amplified through engaging stakeholders within collective action and professionalized maintenance approaches, which are inherently multidimensional and systems-focused. These findings also indicate that a key way to promote and retain stakeholder knowledge on WASH system complexity and nuance toward aligned programmatic strategies is to ensure consistency of stakeholder coalition membership (i.e., to minimize turnover) and to develop mechanisms for efficient knowledge transfer between old and new coalition members. Reducing turnover also presents the intrinsic benefit of investing in stakeholder understanding to promote a higher likelihood of service sustainability. More broadly, these findings highlight the importance of assessing understanding to evaluate the efficacy of systems-focused service delivery strategies.

While the findings presented here resulted from a rigorous research process, there are multiple ways to assess stakeholders' understanding of complex issues, including approaches that require lower levels of effort, ranging from qualitative evaluations of informal conversations with stakeholders to more detailed assessments of semi-structured interviews or focus groups. Regardless of the approach applied, assessing and improving stakeholder understanding of WASH systems starts with increasing awareness of the importance of systems thinking and the development of approaches, tools, and techniques that help stakeholders apply systems thinking to better plan and manage WASH services.

Introduction

Over the past decade, the water, sanitation, and hygiene (WASH) sector has become increasingly aware that the planning and management of sustainable service delivery requires an understanding of the interconnected factors that either enable or hinder WASH services.¹ Service sustainability, therefore, hinges on the ability of local stakeholders to conceptualize and strategize service delivery approaches from a systems perspective. The overarching objective of the United States Agency for International Development (USAID) Sustainable WASH Systems Learning Partnership (SWS) is to evaluate the ways in which systems approaches and tools enable stakeholders to strengthen WASH systems.² The SWS theory of change (see Figure 1) begins with the key assumption that if local service stakeholders improve their understanding of the interaction of factors that influence WASH service delivery, they can better develop and implement sustainable service delivery strategies.³



Figure 1. The SWS Theory of Change, Beginning with Systems Understanding

With the overall goal of testing the validity of this aspect of the theory of change, SWS researchers and practitioners conducted a rigorous study to explore how stakeholders conceptualize the interconnected factors that hinder (challenges) or enable (solutions) sustainable water and sanitation service delivery in seven regions throughout Ethiopia, Uganda, and Kenya.⁴ A key part of these efforts was to see how stakeholder understanding of factor interactions shifted over time while engaging with the two predominant systems approaches applied by SWS: professionalized maintenance and facilitated collective action. *Professionalized maintenance* involves trained personnel — who are monitored and evaluated

¹ Valcourt, N., Walters, J., Javernick-Will, A., and Hollander, D. 2019a. Factor Mapping for Rural Water and Small Town Sanitation Services. Sustainable WASH Systems Learning Partnership: United States Agency for International Development.

² For more, see: <https://www.globalwaters.org/sws>.

³ USAID. 2014. Local Systems: A Framework for Supporting Sustained Development. Available at: <https://www.usaid.gov/policy/local-systems-framework>

⁴ SWS also had a program in Cambodia that drew upon the principles of collective impact and systems thinking to facilitate locally led and owned efforts to strengthen rural sanitation and hygiene service delivery. However, because SWS completed its activities in Cambodia in December 2018, it was not included as a case in this study.

against performance indicators and with agreed-upon financing arrangements and transparent, regulated pricing structures — working within clear legal, policy, contractual, and accountability frameworks to carry out repairs and support services for rural water infrastructure. *Facilitated collective action* is a structured process in which sector stakeholders regularly convene and take joint actions to address shared problems. It operates under the key assumption that WASH service delivery challenges are complex and that their solutions require deliberation and action on the part of many actors. Additionally, if members agree on a shared vision and shared problem definition, they can better clarify responsibilities and hold each other accountable for actions.⁵

Within SWS, partners engaged stakeholders in more than 200 learning activities that focused on shifting their understanding of the interactions in local WASH systems and improving decision-making to support more sustainable service delivery outcomes. These activities included interactive network analyses to collectively explore connections between local actors,^{6,7,8} regional learning visit exchanges to share best practices for operations and maintenance (O&M) approaches,^{9,10} and group factor mapping workshops to explore potential leverage points for WASH systems change.^{11,12}

Collectively, these efforts produced notable accomplishments within the project timeline: most of the regional coalitions set agreed-upon priorities, strengthened ties between members of the local network,

⁵ Pugel, K., Javernick-Will, A., Peabody, S., Nyaga, C., Mussa, M., Mekonta, L., Dimtse, D., Watsisi, M., Buhungiro, E., Mulatu, T., and Annis, J. 2022. “Pathways for Collaboratively Strengthening Water and Sanitation Systems.” *Science of The Total Environment*, 149854.

⁶ Hempfling, C., Ristovsky, B., and Fromer, R. 2021. Ethiopia Endline Network Analysis. Sustainable WASH Systems Learning Partnership: United States Agency for International Development. Available at: <https://www.globalwaters.org/resources/assets/ethiopia-endline-social-network-analysis>

⁷ McNicholl, D., Mukanga, J. 2021. Endline Organizational Network Analysis of the Kamuli Rural Water Stakeholder Network. Sustainable WASH Systems Learning Partnership: United States Agency for International Development. Available at: <https://www.globalwaters.org/resources/assets/endline-organizational-network-analysis-kamuli-rural-water-stakeholder-network>

⁸ McNicholl, D., Nyaga, C., and Pugel, K. 2021. Understanding Changes in Coordination in Kitui County’s Water Sector 2018–2021. Sustainable WASH Systems Learning Partnership: United States Agency for International Development. Available at: <https://www.globalwaters.org/resources/assets/understanding-changes-coordination-kitui-countys-water-sector-2018-2021>

⁹ Butterworth, J. 2017a. Learning How to Fix the System and Not Just the Pump: IRC. Available at: <https://www.ircwash.org/blog/learning-to-fix-system-not-just-pump>

Butterworth, J. 2017b. Learning Visit to Uganda on Rural Water Supply Maintenance (USAID SWS Learning Partnership). IRC WASH. Available at: https://www.ircwash.org/sites/default/files/uganda_report_final_version.pdf

¹⁰ Lockwood, H. 2019. Sustaining Rural Water: A Comparative Study of Maintenance Models for Community-Managed Schemes. Sustainable WASH Systems Learning Partnership: United States Agency for International Development.

¹¹ Valcourt et al 2019a.

¹² Valcourt, N., Walters, J., Javernick-Will, A., and Hollander, D. 2019b. Summary Report of Baseline IFML Analyses In Kamuli District, Uganda. Sustainable WASH Systems Learning Partnership: United States Agency for International Development.

and collaboratively made progress toward their stated goals. The authors hypothesize that these positive outcomes are a result of shifts in stakeholder understanding. By studying whether and how shifts in understanding occurred in these successful case studies, this study seeks to provide guidance on how to design more effective programs.

The SWS partners' learning activities can be understood as the “inputs” to systems change, and the improvements in coalition strength, collaborative work, and sustainability of services can be understood as the “outputs.” The mechanisms that produced these results and attribution to specific learning activities have been explored throughout the project using various monitoring, evaluation, and learning tools, most notably outcome mapping.¹³ Outcome mapping uses an approach that asks stakeholders to reflect on recent potential pathways of change by exploring shifts in behavior, actions, or relationships within each regional context.

In addition to the strong and continuous monitoring, evaluation, and learning approach taken throughout the project, this work seeks to provide a complementary, rigorous, and objective evaluation of the associated shifts in stakeholders' understanding of the local WASH systems studied. These shifts occurred between the inputs and outputs of the systems change that the theory of change hypothesized, with a specific focus on professionalized maintenance and facilitated collective action approaches implemented over the 5-year SWS project timeline.

Toward this end, the overarching learning question that guided this study is:

How (if at all) did professionalized maintenance and facilitated collective action approaches improve stakeholder understanding of the interactions of factors that influence water and sanitation service sustainability across regional contexts?

The subsequent sections of this paper provide an overview of the seven regional contexts that SWS studied, followed by the approach the research team used to answer this learning question. The paper concludes with a summary of key findings and associated recommendations for the WASH sector on how engaging stakeholders in professionalized maintenance and facilitated collective action activities can improve their understanding of the interconnected factors that influence service delivery.

SWS Study Regions

SWS works with local partners and stakeholders in seven East African regions in Uganda, Ethiopia, and Kenya that are broken up into three cases encompassing one or more regions and local partners. A brief description of these study regions, partners, and the predominant systems approach applied —

¹³ Hollander, D., Ajroud, B., Thomas, E., Peabody, S., Jordan, E., Javernick-Will, A., and Linden, K. 2020. “Monitoring Methods for Systems-Strengthening Activities Toward Sustainable Water and Sanitation Services in Low-Income Settings.” *Sustainability*, 12(17), 7044.

whether professionalized maintenance or facilitated collective action — are provided below and summarized in Table I.

- Case 1:** IRC and Tetra Tech are working to better understand and strengthen local systems for rural water and small town sanitation service delivery in Kabarole District, Uganda, two *woredas* (districts) in Ethiopia (Mille *woreda* in the Afar region and South Ari *woreda* in the South Omo zone), and two small towns in Ethiopia (Woliso and Debre Birhan). In each location, SWS is working with local partners to promote and facilitate learning alliances as a vehicle for more sector coordination and innovation. These platforms bring together stakeholders at the district and town levels around a shared vision to develop and execute collective actions to strengthen systems for sustaining WASH services.
- Case 2:** Whave is operating as a Ugandan regional service provider in Kamuli, Nakaseke, and Kumi, Uganda, and is working to cultivate a sustainable model for rural water service delivery by testing a professionalized maintenance approach. An important component of Whave’s model is incentivizing local technicians to prevent breakdowns by paying them based on the number of days a water source is functional instead of paying them to make repairs. Whave is also working to help the government build an effective institutional and regulatory structure to establish and enforce professionalized maintenance services.
- Case 3:** The University of Oxford (Oxford) is working with partners UNICEF and Rural Focus Ltd. to develop, scale up, and test the FundiFix model as one response to rural water challenges in Kitui County, Kenya. The goal is to provide a model for universal, rural water service delivery. FundiFix provides a performance-based approach to maintaining water infrastructure, using “smart” hand pumps that collect real-time information on abstraction volumes and breakdown incidents. Oxford is working closely with government officials and other stakeholders, using an existing platform of quarterly county WASH forums, to strengthen the institutional coordination necessary for effective service delivery.

Table I. Overview of SWS Case Contexts, Partners, Stakeholders, and Learning Focus

Regional Context		Partners	Geographic Focus	Sector	Stakeholders Engaged
Case 1	Woliso Town	Tetra Tech	Districts with zonal-, regional-, and national-level engagement	Small town sanitation	Service providers, service authorities, development partners, and policy-makers
	Debre Birhan Town				
	Afar Region, Mille Woreda	IRC	Districts with zonal-, regional-, and national-level engagement	Rural and small town water supply	
	South Omo Zone, South Ari Woreda				

	Kabarole District				
Case 2	Kamuli District	Whave	National, district, and sub-county levels	Rural water services	Regulator and service authorities, providers, and users
Case 3	Kitui County	Oxford, FundiFix, Rural Services Ltd.	County government	Rural water services for communities	County government, development partners or donors, local NGOs, community-operated water approaches, and private sector actors

Study Approach

This section describes the data collection and analysis approach the SWS research team used to evaluate the impact of professionalized maintenance and facilitated collective action approaches on stakeholder understanding of the factors, and their interactions, that influence WASH service delivery over the 5-year project period.

Data Collection

The primary data source for this study consisted of transcribed stakeholder interviews. To minimize undue variability and bias in responses, the research team sought to maintain consistency in interviewees over time whenever possible. In total, SWS interviewed 226 stakeholders across the seven study regions, of which 67 percent were government officials, 12 percent represented NGOs, 12 percent were service providers, 7 percent were service users, and 3 percent were part of a local academic institution. To infer shifts in how stakeholders conceptualize the local WASH system context, SWS asked stakeholders to respond to the following questions related to the challenges inhibiting sustainability and the solutions to address these challenges:

- What do you think are the main challenges impacting sustainable water or sanitation service delivery in your area?
- What are some solutions to these challenges?
- Of these solutions, which do you think are the most important and why?
- If these solutions were implemented, how would they lead to improvements in water or sanitation services?

The researchers audio recorded stakeholder responses, translated (where applicable), and transcribed them. They repeated interviews at three different time steps: baseline (2017–2018), midline (2019), and endline (2020). These three time steps allowed the researchers to evaluate shifts over the course of SWS in the factors and their interactions mentioned by stakeholders.

Data Analysis

Evaluation of improvements in stakeholder understanding of factor interactions focused on three areas: (1) conceptualization of complexity; (2) shift toward service delivery approach; and (3) stakeholder alignment, the alignment in the understanding of factor interactions within each stakeholder group. More detail on each improvement area is provided below.

Improvement Area 1: *Conceptualization of complexity* evaluates how engaging stakeholders within professionalized maintenance and collective action approaches influences their understanding of factor interactions. Researchers considered a region's understanding improved if stakeholders mentioned, on average, increasingly more unique factors and factor interactions per interviewee over the three interview time steps: baseline, midline, and endline.¹⁴

Improvement Area 2: *Shift toward service delivery approach* evaluates how shifts in stakeholders' understanding of factors and their interactions aligns with the core tenets of a service delivery approach, as compared to a hardware-focused or community-based management approach.¹⁵ For example, an increase in references to *private sector*, *planning*, or *government management* as influencing factors on service performance for rural water schemes would imply that their understanding is more closely aligned with the core objectives of the sustainable development goals and the prevailing sector focus on providing sustainable service provision over hardware-centric approaches.

Improvement Area 3: *Stakeholder alignment* evaluates the programmatic and situational nuances that affect how consistent — or inconsistent — stakeholders are on factor interactions within each context. In theory, increased consistency on factors and factor interactions over time would indicate an improved collective understanding of the local WASH system¹⁶ and result in improved decision-making.^{17,18}

An overview of the metrics used to measure these areas of understanding are shown in Table 2.

¹⁴ Doyle, J.K., Radzicki, M.J., and Trees, W.S. 2008. Measuring Change in Mental Models of Complex Dynamic Systems, in: *Complex Decision Making*. Springer, 269–294.

¹⁵ Schouten, T., and Moriarty, P. 2013. The Triple-S Theory of Change (No. 3; Triple-S Working Papers). IRC International Water and Sanitation Centre.

¹⁶ Vennix, J. 1996. *Group Model Building: Facilitating Team Learning Using System Dynamics*, 1st ed. Wiley.

¹⁷ Klimoski, R. and Mohammed, S. 1994. "Team Mental Model: Construct or Metaphor?" *Journal of Management*, 20(2), pp.403-437.

¹⁸ Johnson, T.E. and O'Connor, D.L. 2008. Measuring Team Shared Understanding Using the Analysis-Constructed Shared Mental Model Methodology. *Performance Improvement Quarterly*, 21(3), pp.113-134.

Table 2. Metrics for Evaluating Improved Stakeholder Understanding

Improvement Areas	Measures	Indicators of Improvement
Area 1: Conceptualization of Complexity	Number of factors, number of interactions	Increased number of factors and interactions referenced by regional stakeholders
Area 2: Shift Toward Service Delivery Approach	Shift in percent reference to key factors of the approach	Increase in reference to factors relevant to a service delivery approach (e.g., service performance, planning, O&M, private sector)
Area 3: Stakeholder Alignment	Variance of range of percent reference across stakeholder groups	Smaller variance of range of percent reference over time for most referenced factors, calculated as sum of variance for each factor for each time step

To systematically identify factor interactions from the local stakeholder interviews, the research team used a method known as purposive text analysis (PTA).¹⁹ PTA is a systematic process of thematically coding causal statements in verbatim transcripts to extract cause-and-effect relationships between factors. PTA coding follows a simple yet rigorous process (see Figure 4) that allows researchers to explore how people discuss complex problems as a virtue of cause-and-effect relationships. The output from applying the PTA coding process to a group of individual interview transcripts is a combined conceptualization of causal interactions between factors for each of the seven study regions. The researchers then used this information to evaluate (1) how stakeholders conceptualize factor interactions within their local context, (2) how this understanding shifted over the 5-year SWS time span, and (3) how these shifts align within stakeholder coalitions and the different systems approaches applied. The PTA coding process is explained below and illustrated in Figure 2.

- Causal statements are identified in the text (i.e., “this led to or would lead to that”).
- One factor is identified as a *cause* factor and the other as an *effect* factor.
- Factor names are inductively coded (emergent from the text) using the specific terminology used by the interviewees within each context. This process produces a list of factors, or “codes,” unique to each regional context.
- Each causal statement is labeled as either a “challenge” or “solution” depending on the context described by the interviewee.

Figure 2 provides an example of this for a stakeholder’s causal statement.

¹⁹ Kim, H. and Andersen, D.F. 2012. Building Confidence in Causal Maps Generated from Purposive Text Data: Mapping Transcripts of the Federal Reserve: H. Kim and D. F. Andersen: Building Confidence in Causal Maps. *Syst. Dyn. Rev.* 28, 311–328. <https://doi.org/10.1002/sdr.1480> (creators of PTA).

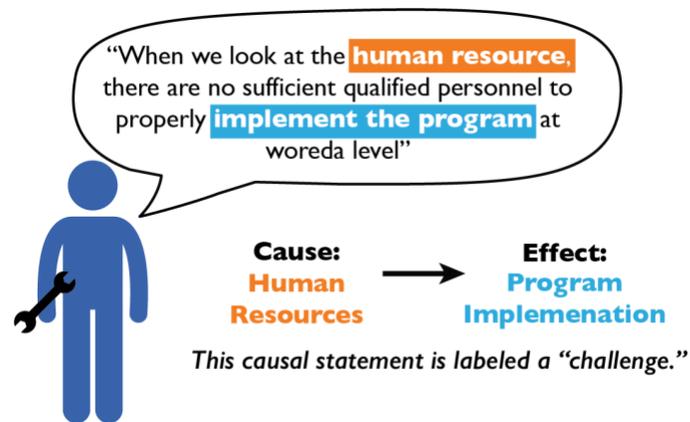


Figure 2. Example Coded Causal Statement

PTA coding of stakeholder interviews within each region across the three time steps produced a rich and varied list of factors that researchers affinity-grouped to create a list of “cross-case” factors to consistently compare shifts in stakeholder understanding of how these factors interact across the seven East African regions. This process also helped evaluate improvement in understanding per the previously mentioned improvement areas.

More than 200 (226) stakeholder interviews generated 1,050 pages of transcribed text, which, when coded, produced over 2,100 unique causal statements (interactions + cause or effect + challenge or solution). These statements consisted of a combined total of 273 factors spanning the seven study regions. This high number of unique causal statements and factors demonstrates both the breadth and richness of the topics interviewees discussed. To compare findings across contexts, the research team collected the region-specific factors into a smaller group of cross-case factors that represented the nuance of the language in the transcripts while also providing a more concise and manageable number of factors for analysis. Table 3 presents the 17 cross-case factors that resulted from this activity. Table A1 in the Annex includes more region-specific information about these cross-case factors.

Table 3. Cross-Case Factors and Definitions

Cross-Case Factor	Definition
Capacity Building	Training activities, community outreach, and support focused on improving the capacity of users, user committees, and other local actors to implement WASH policies and deliver services.
Community / Users	Elements of community and end-user behavior, including willingness to pay, demand for services, proper use of infrastructure, health, and livelihoods.
Community Finance	Financial support mechanisms for WASH services that community members provide.
Community Management	Dimensions of service management that the community provides, including water user committees, user participation, and ownership.
Coordination	Coordination mechanisms, platforms, and processes for collaborative work, including data sharing and learning.

Environmental	<i>Geophysical factors that affect or are affected by WASH services, including water resources management, availability, and pollution.</i>
Government / External Funding Finance	<i>Financial support for services that entities external to a community, such as NGOs, donors, and regional or national governments, provide.</i>
Government Management	<i>Roles and activities performed by local, regional, and national governments for the planning, implementation, and O&M of services.</i>
Infrastructure	<i>Physical infrastructure or hardware required for the delivery of collecting, treating, and supply of water or the collection, treatment, and disposal of fecal waste.</i>
Laws and Regulations	<i>Laws, policies, and regulations proposed, developed, and/or implemented to support service provision.</i>
Monitoring	<i>Monitoring, supervision, and data collection of services and supporting factors.</i>
O&M	<i>Factors supporting the operation and management of services and repair of hardware, including spare parts, technicians, and operating costs.</i>
Planning	<i>Planning for current and future service delivery and hardware, including dimensions of urban and rural settings and population change (i.e., urbanization).</i>
Politics	<i>The role and influence of politicians, political will, and political processes.</i>
Private Sector	<i>The role and actions of private sector entities in developing and supporting services.</i>
Service Performance	<i>Elements of the day-to-day functionality of services and quality of performance.</i>
Sustainability	<i>Discussions of long-term and/or sustained service delivery.</i>

Using these cross-case factors, the research team calculated the frequency of references to each factor as a percent of the total number of stakeholders' causal statements that mentioned that factor as either a cause or effect factor within a challenge and solution causal statement. For example, the research team could evaluate how frequently interviewees referenced O&M as a solution out of all the factors that were mentioned in causal statements about solutions across each time step within a particular context.²⁰ It is important to note that in three regional cases midline interviews were not conducted due to logistical and time constraints; accordingly, cross-concept comparisons are only presented across baseline and endline time steps. However, shifts in factors for individual regional contexts (presented in the Annex) include the midline time step for contexts where data are available.

²⁰ Using the coded dimensions of both cause or effect and challenge or solution together, the research team could also identify how frequently O&M was mentioned as either the cause of a solution or the effect of a solution, providing greater detail into how stakeholders conceptualized the interactions between factors.

Additional Stakeholder Understanding Data Collection and Analysis²¹

In addition to the data collection and analysis presented in this report, SWS partners conducted a variety of other activities to assess different dimensions of shifts in stakeholders' understanding of WASH systems. This work included the use of pre- and post-activity surveys, questionnaires, and short interviews with coalition members. The questionnaires were used to explore self-reported changes in understanding and were assessed with likert scale measures. Responses to surveys and short interviews were analyzed using fit-for-purpose rubrics that coalition facilitators and support staff evaluated. These supplemental tools helped facilitators evaluate how stakeholders shifted their understanding of the factors and interactions within each coalition, which further supported efforts to improve understanding of local WASH systems.

Improvement Area 1: Conceptualization of Complexity

These findings show a general increase in stakeholders' understanding of service delivery complexity, with five out of seven regional stakeholder groups or coalitions mentioning more unique factors between baseline and endline and four out of seven regional stakeholder groups mentioning more unique interactions between baseline and endline. Figure 3 shows these results as the number of unique factors and interactions²² per regional group or coalition for baseline and endline time steps. These results appear to reveal an increased awareness and improvement in understanding the complexity of systems that deliver sustainable water and sanitation services. For example, an interviewee in Kitui County, Kenya, outlined how improving water coverage would raise additional funds, further improving water service reliability:

If the funds are managed well, approaches can be able to [develop] pipeline extensions and establish more water points. This would increase water coverage and access to the population. They would also have enough money to do repairs, and this would mean that water services would be reliable.

– NGO, Kitui County, Kenya (endline)

Beyond the mechanisms that drive WASH services themselves, interviewees also identified feedback effects that would occur as a result of improvements in service delivery:

If there is sustainable water service in the woreda, the rural community will not migrate from place to place in search of water. Thus, they can settle in one place, send their children to schools, and access other services like health and adult education.

– Woreda official, Mille, Ethiopia (endline interview)

²¹ For more information on the assessment of stakeholder understanding within each region, see “Driving Change: Strengthening Local Systems for Better Public Services.” Available on Globalwaters.org/SWS in October 2021.

²² Unique factors and interactions refer to a specific one-on-one (pairwise) combination of a cause factor or effect factor in a causal statement within each time step.

These results point to a fundamentally beneficial outcome from engaging stakeholders in intentionally systems-focused approaches with the goal of providing more holistic solutions to complex service sustainability challenges, per the SWS theory of change (see Figure 1). Professionalized maintenance approaches, for example, necessarily require stakeholders to consider various combinations of interconnected dimensions of service delivery, such as service finances, supply chains, and the invariable feedback of service delivery and sustainability on user fees and service scalability. Additionally, the process of engaging stakeholders within structured discussion on service delivery strategies — a key aspect of facilitated collective action approaches — improves stakeholders’ ability to better conceptualize service delivery complexity and nuance. Overall, these results show that engaging stakeholders in professionalized maintenance and facilitated collective action approaches led to a wider understanding not only of the factors driving sustainable service delivery but also of the effects of sustainability itself on service users’ livelihoods.

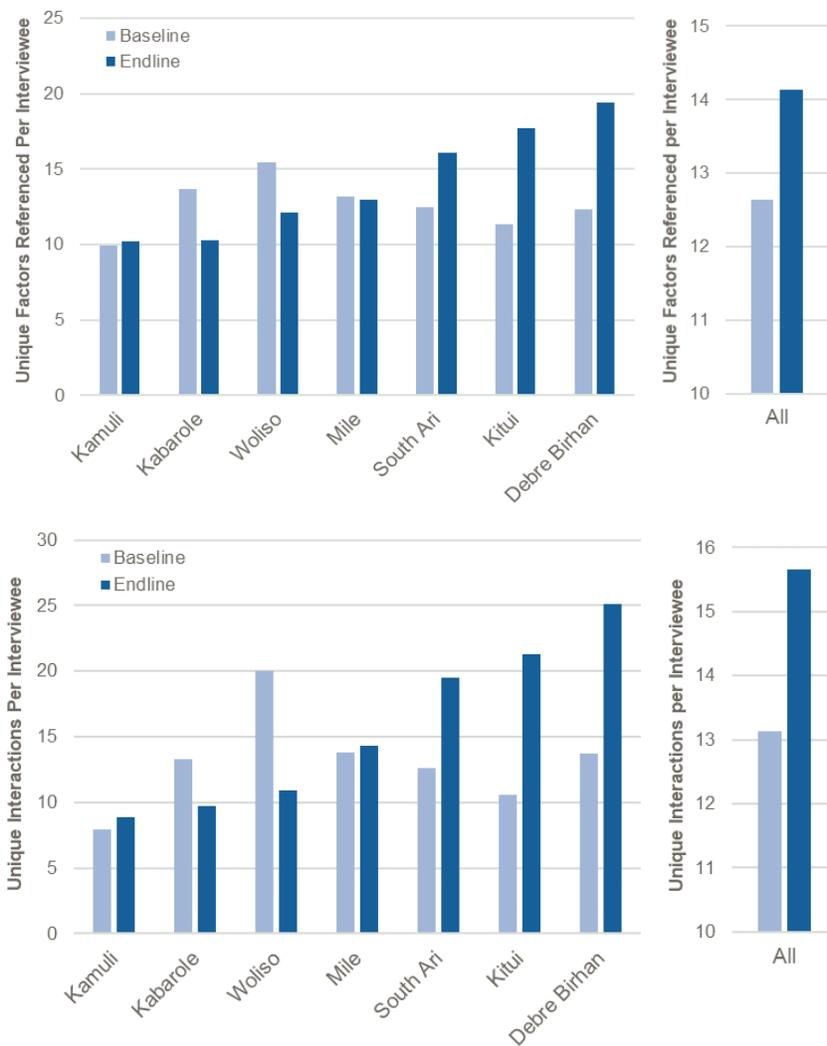


Figure 3. Unique Factors (Top) and Interactions (Bottom) Mentioned by Region Stakeholders per Time Step

(The total number of unique references to factors and interactions is shown to the right of both figures using the same color designation for baseline (2017 and 2018, light blue bars) and endline (2020, dark blue bars) time steps.)

Improvement Area 2: Shift Toward Service Delivery Approach

This improvement area evaluates how professionalized maintenance and collective action approaches inform and shift stakeholder understanding on particular factors emphasized within prevailing service delivery approaches. Figure 4 presents shifts in understanding on factor interaction for references to solutions to service delivery for baseline and endline time steps. The x axis of this graph represents the overall percent reference to a factor for all factor references in a causal statement about “solutions” and shifts between baseline (gray dots) and endline (blue dots) time steps. For example, the right panel of Figure 4 shows a 3 percent overall shift in the frequency of references to the *private sector* as a solution to service delivery challenges between baseline and endline time steps. Findings for factor shifts as challenges and solutions for each of the seven regions are presented in Annex Figures A2–A8.

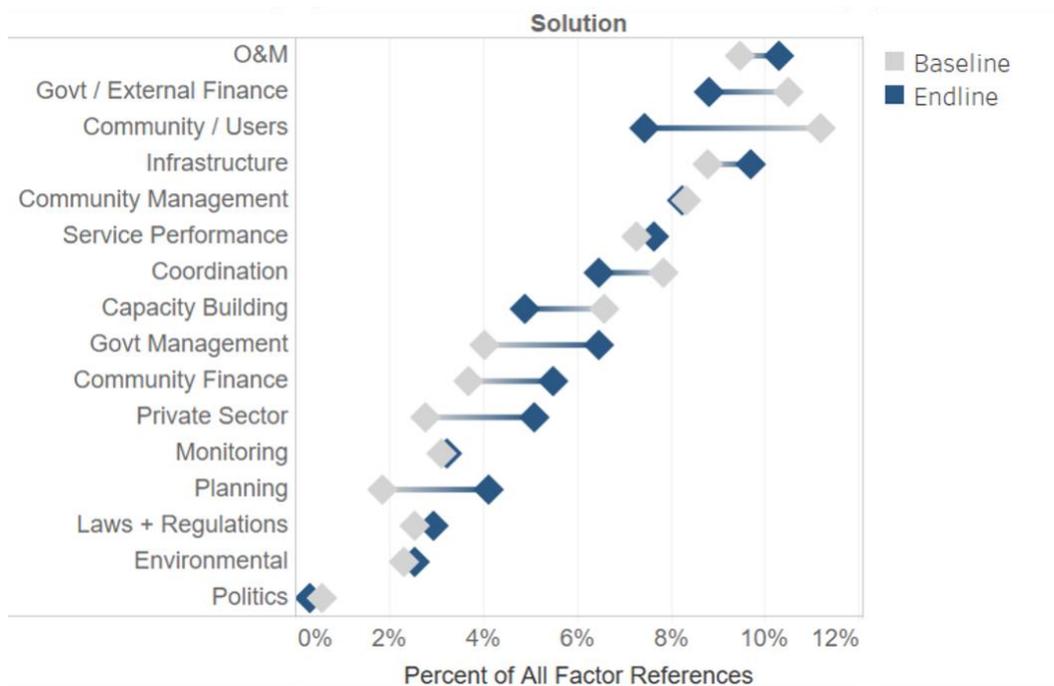


Figure 4. Percent Reference to Causal Factors for Stakeholder Reference to Solutions to Service Delivery by All Seven Regional Stakeholder Coalitions

(Shifts are represented as the range in percent reference between gray (baseline) and blue (endline) dots.)

Figure 4 shows a shift in stakeholders’ understanding of causal factors that closely align with the objectives and tenets of a service delivery approach, in particular one that promotes sustainable service provision through maintenance by trained personnel within formalized accountability frameworks and pricing structures. For example, the results show a slight decrease in reference to *community management*²³ as a solution and a dramatic decrease to *community/users* as a solution. The authors also

²³ There is increasing awareness in the WASH sector that community-based management is often insufficient to support sustained services due to limitations in communities’ capacity to support O&M. This awareness has led the sector toward investigating professionalized service delivery approaches.

see an increase in the *private sector* as a solution and an increase in *government management* as a solution. The shifts in references to *private sector* suggest that the scaling-up of a professionalized maintenance-type engagement would promote the need for increased engagement with, and thus influence of, mechanics, technicians, hand pump mechanics associations, spare parts suppliers, and contractors. Accordingly, these results show an increased stakeholder awareness of the *private sector* as a solution factor. A stakeholder in Kitui County, Kenya, points to a private water service provider supporting water committees as key to sustainable service delivery:

Committees can engage partners like FundiFix (Rural Focus) to get advice, they can also engage them on operation and maintenance issues... We also need to have a policy that can ... make these approaches sustainable even if they are private. With proper legislation, then I think it will work.

– County staff member, Kitui County, Kenya (endline)

The authors also interpret a decrease in references to *community/users* as relating to the willingness or ability to pay for services, suggesting that stakeholders see this as a key, yet less consequential, challenge under professionalized maintenance approaches. Results also show an increase in references to *service performance*, pointing to a shift from hardware-focused approaches to service-focused approaches. Additionally, they see a pronounced increase in references to *planning* as a solution across cases. Aspects of *planning* mentioned by stakeholders ranged from pre-project studies to the identification of viable spare part supply chain mechanisms. It is important to note that many of the references to *planning* related to groundwater studies in areas with limited water resources, such as the South Ari woreda, in the Southern Nations, Nationalities, and People’s Region of Ethiopia:

One of the basic problems related to sustainability of water service is that we do not conduct comprehensive study prior to development of water approaches to identify areas that have potential water resources. Most of the water facilities are developed without a clear understanding of the potential of the areas. Because of this, the water approaches do not supply water for a long period of time.

– Technicians training school, South Ari woreda, Ethiopia (endline)

However, emphasis on *planning* is also not unique to water-stressed regions in Ethiopia, because other stakeholders exhibited an improved awareness about the importance of conducting thoughtful technical, economic, and social feasibility studies before implementing a new service:

To ensure sustainable sanitation service, there should be coordinated planning and activities between sectors. The town administration or municipality should assign tasks related to sanitation to concerned bodies and follow their [implementation] status every time.

– Local government official, Debre Birhan, Ethiopia (endline)

These findings, taken together, point to a movement away from solutions focused on hardware (*infrastructure*) to those focused on service delivery, with an emphasis on the increased role of *government management* and the *private sector* and a decreased reliance on community-based management of WASH services. Per the criteria of this improvement area, these findings point to an improvement in stakeholder understanding on the mechanisms through which sustainable service provision is achieved.

Improvement Area 3: Stakeholder Alignment

This improvement area looks at the alignment in stakeholder perception on factor interactions that influence service delivery. By evaluating the combined percent reference of cause and effect factors for the five types of stakeholder groups (government officials, NGOs, service providers, service users, and local academic institutions), researchers could evaluate where the largest statistical variance (or deviation) of understanding exists for a range of different regional combinations. This enabled them to explore how programmatic or contextual nuances affected the alignment (or agreement) in stakeholder responses on factors, and their interactions, that influence service sustainability. A *low* statistical variance on the factors was assumed to indicate a *high* level of alignment, and vice versa. Analyzing the data in this form enabled the research team to quantitatively compare and contrast regional context combinations that affected alignment between stakeholder responses. The research team considered the following five programmatic or contextual combinations:

1. **Starting point for collaboration:** A comparison between regions where collective problem identification took place (effectively collective action regions) and that had a predefined approach (effectively professionalized maintenance regions).
2. **Network or coalition age:** A comparison between regions with existing stakeholder coalition relationships or new relationships.
3. **Stakeholder turnover:** A comparison between regions with a manageable versus unmanageable level of stakeholder turnover.
4. **Work plan:** A comparison between regions with formalized WASH work plans and strategies versus those without such plans.
5. **External funding types:** A comparison between regions receiving different forms of external funding.

Of the five programmatic or contextual combinations analyzed using the statistical variance metric, stakeholder turnover revealed the clearest impact on aligned understanding. Each regional context was designated as having either *manageable* or *unmanageable* turnover, and then the percent references to causal factors for each of these two designations were combined. Designation of a regional context as having manageable or unmanageable turnover was based on the perception of SWS partners. They defined *unmanageable turnover* as having minimal to no onboarding or handoff trainings and *manageable turnover* as having regular instances of handoff trainings or events with minimal shifts within the stakeholder coalitions.²⁴ Figure 5 shows the statistical variance for factor interactions that regional stakeholders mentioned as service delivery solutions from baseline to endline for regions with manageable and unmanageable turnover. Researchers calculated overall alignment “scores” as the sum of

²⁴ Pugel et al. 2022.

variances across the factors for each time step (baseline and endline). Coalitions with manageable turnover included: Debre Birhan, Woliso, and South Ari, Ethiopia; Kamuli District, Uganda; and Kitui County, Kenya. Coalitions with unmanageable turnover included Kabarole District, Uganda, and Mille, Ethiopia.

These results show a greater alignment in understanding (reduced sum of variance) of factors and their interactions for regions with manageable stakeholder turnover. In the manageable cohort the alignment increased 32 percent, whereas in the unmanageable cohort alignment decreased by 17 percent. This demonstrates a substantial difference in outcomes for coalitions that are able to manage turnover of stakeholders.

This supports other work from SWS showing that stakeholder turnover has a detrimental effect on collective action approaches for sustainable service delivery.²⁵ However, the study findings provide further evidence about the potential mechanism through which turnover impacts program focus and efficiency: the *aligned understanding* by key stakeholders of the interconnected factors that influence service sustainability. Practically, high turnover negatively impacts institutional knowledge of how to move forward with cogent decisions and productive action, as a Mille stakeholder explains:

High turnover of the staff, particularly the top-level managers, is the first major problem. Due to the increasing political instability in the region, a staff member can stay for about 6 months, on average. New staff should take some time to learn what has been done in the sector and move to a decision. This has its own effect on project lifetime and efficiency.

—Regional government official, Mille, Ethiopia

²⁵ Pugel et al. 2022.

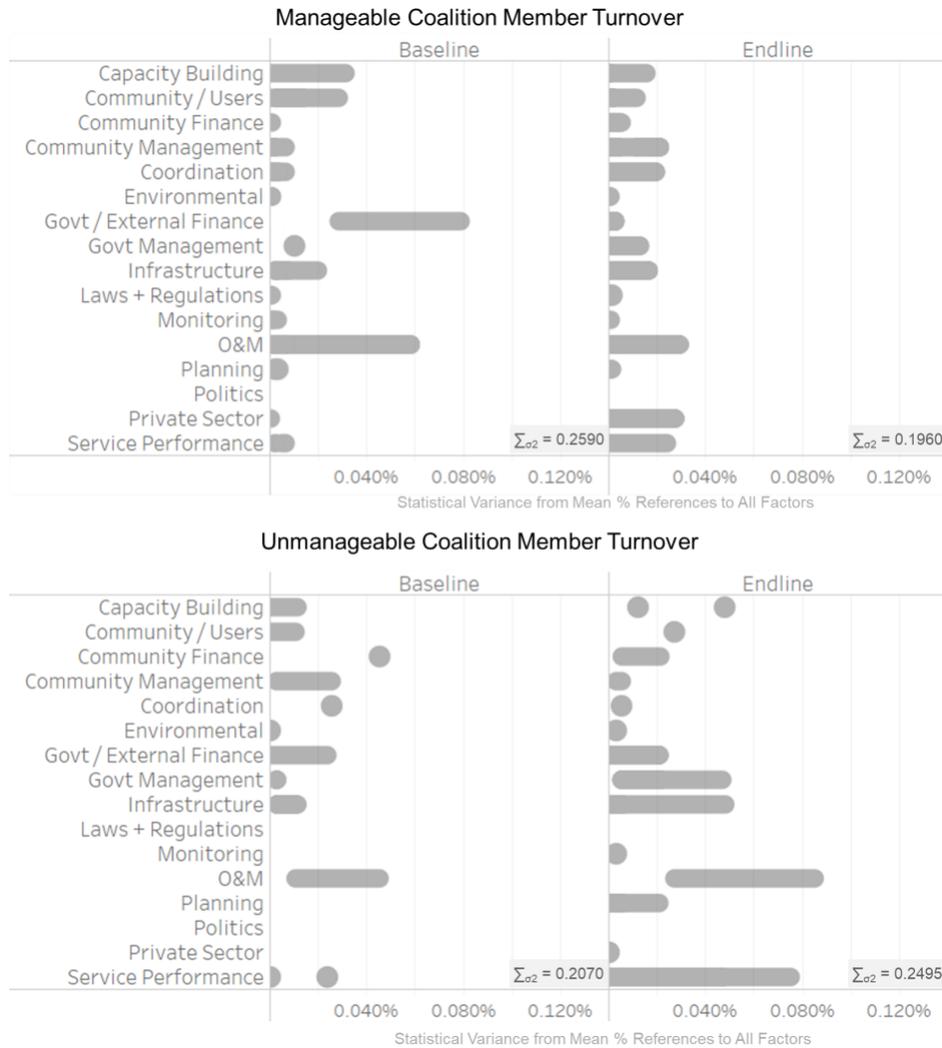


Figure 5. Variance of Factor Solution Consistency by Turnover of Coalition Members

(Top: manageable turnover showed a 32 percent reduction (0.259 baseline → 0.196 endline). Bottom: unmanageable turnover showed a 17 percent increase (0.2070 baseline → 0.2495 endline). Factor categories with null values (no variance) in both baseline and endline are not shown for clarity.)

The effect of turnover on a groups’ collective alignment of factors and interactions was most notable in Kitui County, Kenya, where membership was the most consistent from both an organizational and a personnel perspective. The effects of this consistency on aligning stakeholder understanding can be seen in Figure 6, which shows a 52 percent improvement in alignment from baseline to endline of references to factors by stakeholder group. This finding strongly suggests that alignment of stakeholders’ perspectives on factors and interactions is heavily influenced by the ability of a coalition to retain members.

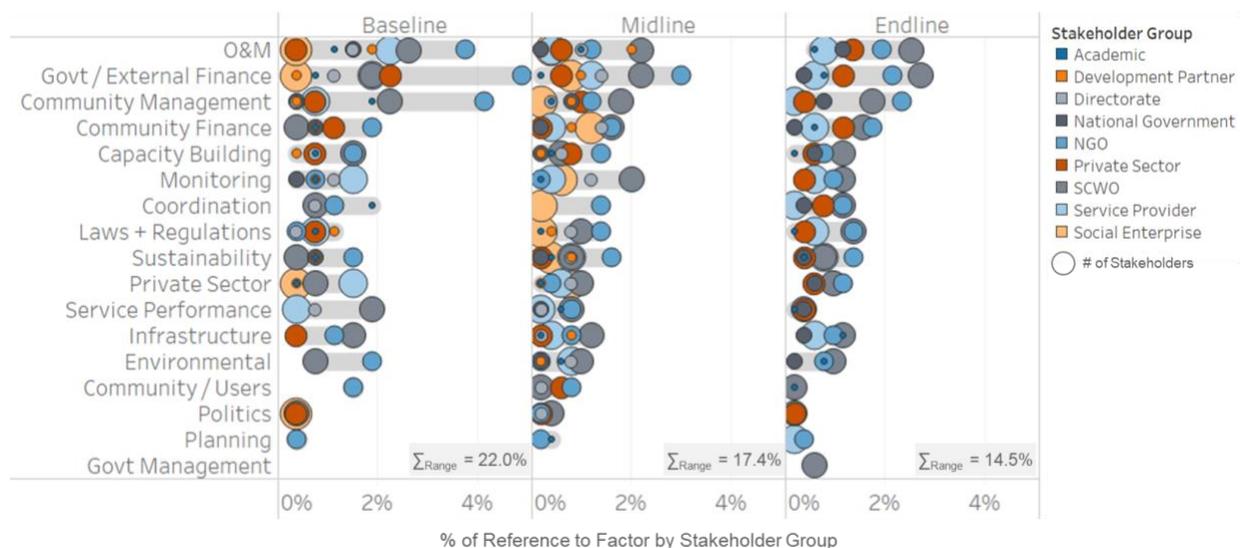


Figure 6. Factor Alignment of Solutions by Stakeholder Group in Kitui County, Kenya

(Factor alignment shows a 52 percent reduction in range from baseline (22 percent) to endline [14.5 percent].)

Merging Findings with Additional SWS Stakeholder Understanding Data Collection

The findings presented above are bolstered by the additional stakeholder understanding data collection that SWS partners conducted partners within each context. For example, with regard to improvements in understanding local WASH systems, factors, and interactions, 51 percent of approximately 350 stakeholders surveyed across multiple regions responded that their understanding had improved “very much,” and an additional 40 percent responded that it had improved “somewhat,” for a total of 91 percent self-identifying some form of improvement in understanding.²⁶ For interview responses scored using rubrics to assess understanding, analysis of more than 50 sets of interviews across multiple regions at the baseline, midline, and endline showed that 695 stakeholders out of 930 (75 percent) were determined to have demonstrated an improvement in understanding. These findings add support to the analysis conducted using PTA while also identifying nuances in how improvement shifted within each regional context.

Conclusions

This study evaluated a key assumption of the SWS theory of change, which proposes that an increased likelihood of sustainable service delivery begins with an improvement in stakeholder understanding of WASH system complexity. The researchers accomplished this goal through a rigorous and systematic study of shifts in how stakeholders understand the interconnected factors that influence service delivery

²⁶ SWS. 2021. INDICATOR I.1 “% of coalition participants reporting an improvement in WASH system understanding” [unpublished]. Performance Indicator Tracking Sheets.

SWS. 2019. Assessing Cross-Concept Stakeholder Understanding: Baseline Analysis [unpublished].

by examining three improvement areas: conceptualization of complexity, shift toward service delivery approaches, and stakeholder alignment.

Regarding the conceptualization of complexity, the study showed that, over the course of the project, many project stakeholders increasingly conceptualized more interactions between factors that influence service delivery, demonstrating a greater understanding of the complexity and nuance of WASH systems. The research team believes engaging stakeholders in approaches that are inherently systemic and that require them to discuss and consider the multidimensional drivers of service delivery and their effects on one another contributed to this understanding.

Regarding shifts in understanding toward service delivery approaches, the study showed that professionalized maintenance combined with facilitated collective action approaches can shift stakeholder understanding of factor interactions that align with key tenets of sustainable service delivery. In particular, the researchers found that stakeholders better understood the link between O&M and service delivery and better understood that increased engagement with the private sector and decreased dependence on community-based management can improve service delivery. Overall, this understanding aligns with the prevailing move away from the millennium development goal focus of hardware-driven approaches toward providing more sustainable development goal-focused approaches that emphasize sustainable service provision.

Finally, regarding stakeholder alignment on factor interactions, the study investigated shifts in consistency based on five dimensions thought to influence the effectiveness of collective action and decision-making. Of these dimensions, the study showed that low stakeholder turnover was most influential in promoting alignment in understanding on factor interactions within groups. Conversely, high turnover negatively impacts institutional knowledge for how to move forward with cogent decisions and productive action.

The nature of the data collection and analysis strategies did not allow evaluation of statistical significance(s) in order to remove outlier cases, stakeholder groups, or factors. However, the study findings clearly show various benefits of engaging WASH service stakeholders within professionalized maintenance and facilitated collective action approaches. This engagement enhances their understanding that WASH system complexity is an important starting point toward improving the likelihood of sustained service delivery, as proposed in the SWS theory of change (Figure 1).

Sector Implications and Recommendations

Findings from this research present three practical recommendations for improving stakeholder understanding on WASH service complexity toward sustained service delivery.

First, the findings provide evidence for approaches focused on convening people together in a structured setting and format to talk about the factors, and their interactions, that influence service delivery. The work of SWS partners shows that this approach improves stakeholders' ability to "think in systems" and navigate the complex challenges to service sustainability. This improvement in systems thinking is amplified through engaging stakeholders within collective action and professionalized maintenance

approaches, which are inherently multidimensional and systems-focused. Research supports this insight. It shows how well-facilitated group workshops help stakeholders share, formalize, and align their perspectives within a group to learn how certain “factors” contribute to outcomes of the local “system,”²⁷ as well as to provide a platform with which to discuss complex problems using common terminology.²⁸ Ultimately, this helps to better facilitate group consensus in discussing and deciding shared strategies and future actions.

Second, the findings also indicate that a key way to promote and retain stakeholder knowledge on WASH system complexity and nuance toward aligned programmatic strategies is to ensure consistency of coalition membership, minimize turnover, and develop mechanisms for efficient knowledge transfer between old and new coalitions. Reducing turnover also presents the intrinsic benefit of investing in stakeholder understanding to promote a higher likelihood of service sustainability.

Third, these findings highlight the importance of assessing understanding to evaluate the efficacy of service delivery strategies, as illustrated in the SWS theory of change (Figure 1). Although the findings presented here resulted from a rigorous research process, there are multiple ways to assess stakeholders’ understanding of complex issues, and some require lower levels of effort, as highlighted by the rubric-based assessments that SWS partners conducted.²⁹ These approaches range from qualitative evaluations of informal conversations with stakeholders to more detailed assessments of semi-structured interviews or focus groups. Regardless of the approach applied, assessing and improving stakeholder understanding of WASH systems starts with a sectoral awareness of the importance of systems thinking toward the development of approaches, tools, and techniques that build the capacity of service stakeholders to better plan and manage WASH services.

²⁷ Bérard, C. 2010. Group model building using system dynamics: an analysis of methodological frameworks. *Electron. J. Bus. Res. Methods* 8, 35–45.

²⁸ Rouwette, E.A.J.A. 2012. Does Group Model Building Work? Evidence from and Comments on the Paper by Videira et al.: Does Group Model Building Work? *Systems Research and Behavioral Science*, 29(6), 620–623. <https://doi.org/10.1002/sres.2149>

²⁹ SWS. 2021.

Annex

Table A1. Cross-Case Factors, Definitions, and Sub-Factors Included for Each Cross-Concept Factor

Cross-Case Factor	Definition	Included Factors
Capacity Building	Training activities, community outreach, and support focused on improving the capacity of users, user committees, and other local actors to implement WASH policies and deliver services.	Capacity building, capacity, mobilization, sensitization, committee training, training
Community/Users	Elements of community and end-user behavior, including willingness to pay, demand for services, proper use of infrastructure, health, and livelihoods.	Awareness, children, community, health, hygiene, illegal dumping, population, quality of life, education, users, ability/willingness to pay, community conflict, community members, demand, sanitation + hygiene, livelihoods, user behavior, user demand, agriculture, migration, settlements, vandalism, water demand, women, gender, proper use, user awareness, farmers, improper disposal
Community Finance	Financial support mechanisms for WASH services provided by community members.	Accountability/transparency, community contributions, income, income of users, maintenance fees, management of project finances, savings accounts, tariffs, transparency, user fees, willingness to pay
Community Management	Dimensions of service management provided by the community, including water user committees, user participation, and ownership.	Community ownership, community ownership + participation, community participation, community use + care, user participation, user participation/ownership, WASH committees, WASHCO capacity, WASHCO continuity, water user committee, water user committee capacity, water user committees (WUC)
Coordination	Coordination mechanisms, platforms, and processes for collaborative work, including data sharing and learning.	Coordination, duplication of effort, NGOs
Environmental	Geophysical factors that affect or are affected by WASH services, including water resources management, availability, and pollution.	Climate, environment, geography, natural resources, pollution, water resources, water resources management (WRM)
Government/ External Finance	Financial support for services provided by entities external to a community, such as NGOs, donors, and regional or national governments.	Budget, budget use, continuity of support, donors, external support, finances, funding, government budget, government support, govt budget, tax collection
Government Management	Roles and activities performed by local, regional, and national governments for the planning, implementation, operations, and maintenance of services.	City admin, district govt, government, govt capacity, institutional capacity, local capacity, local govt, municipal capacity, subcounty govt, town administration, woreda capacity, woreda government, zonal government

Infrastructure	Physical infrastructure or hardware required for the collection, treatment, and supply of water or the collection, treatment, and disposal of fecal waste.	Boreholes, communal latrines, construction, dumping site, electricity, energy source, energy type, hardware, implementation, infrastructure, new infrastructure, project implementation, public latrine, septic tanks, solar, solar power, transportation, waste reuse, waste treatment
Laws and Regulations	Laws, policies, and regulations proposed, developed, and/or implemented to support service provision.	Enforcement, laws + regulations, policy, national govt, land ownership, laws + regulation, regulation
Monitoring	Monitoring, supervision, and data collection of services and supporting factors.	Monitoring, monitoring and evaluation, supervision + monitoring, data
O&M	Factors supporting the operation and management of services and repair of hardware, including spare parts, technicians, and operating costs.	Maintenance, management, mechanics, O&M, operating costs, operator capacity, preventive maintenance, rehabilitation, repairs, service costs, service management, spare parts, technician/mechanic, technicians
Planning	Planning for current and future service delivery and hardware, including dimensions of urban and rural settings and population change (i.e., urbanization).	Planning, urbanization, pre-project studies, urban vs. rural, town growth
Politics	The role and influence of politicians, political will, and political processes.	Politics, political influence
Private Sector	The role and actions of private sector entities in developing and supporting services.	Businesses, economy, local enterprises, private sector, water service provider, WHave
Service Performance	Elements of the day-to-day functionality of services and quality of performance.	Coverage/access, functionality, reporting breakdowns, response time, sanitation, sanitation services, service performance, waste dumping trucks, water quality, water quantity, water services
Sustainability	Discussions of long-term and/or sustained service delivery.	Service sustainability, sustainability, sustainable services

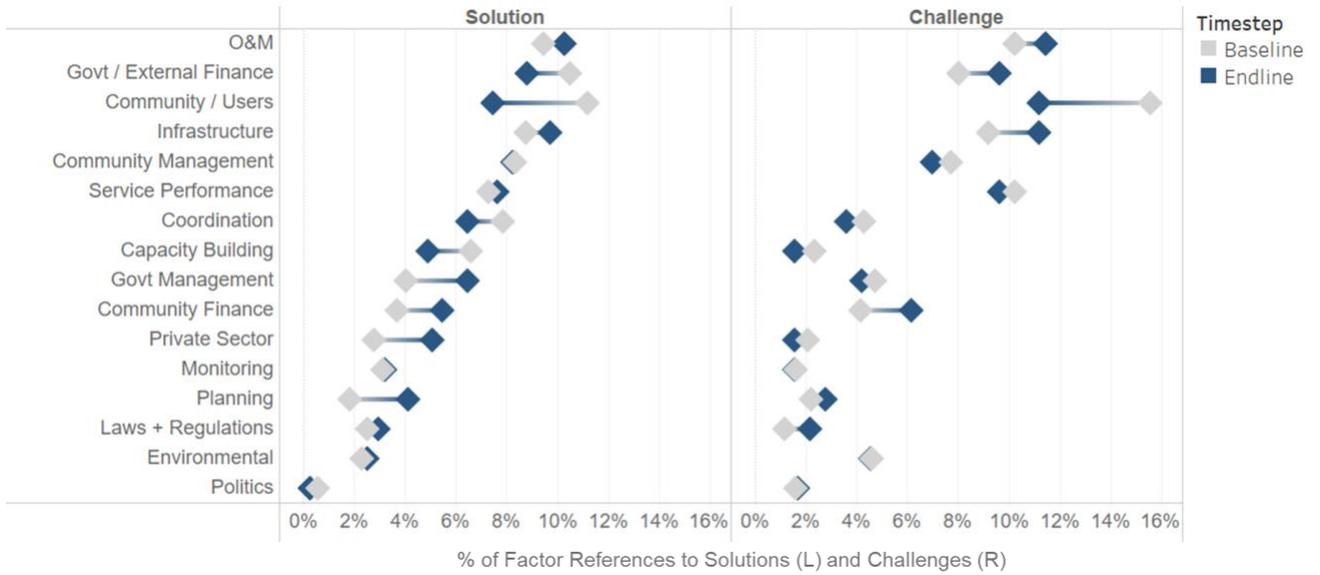


Figure A1. All Regions – Shifts in References to Factors as Solutions and Challenges

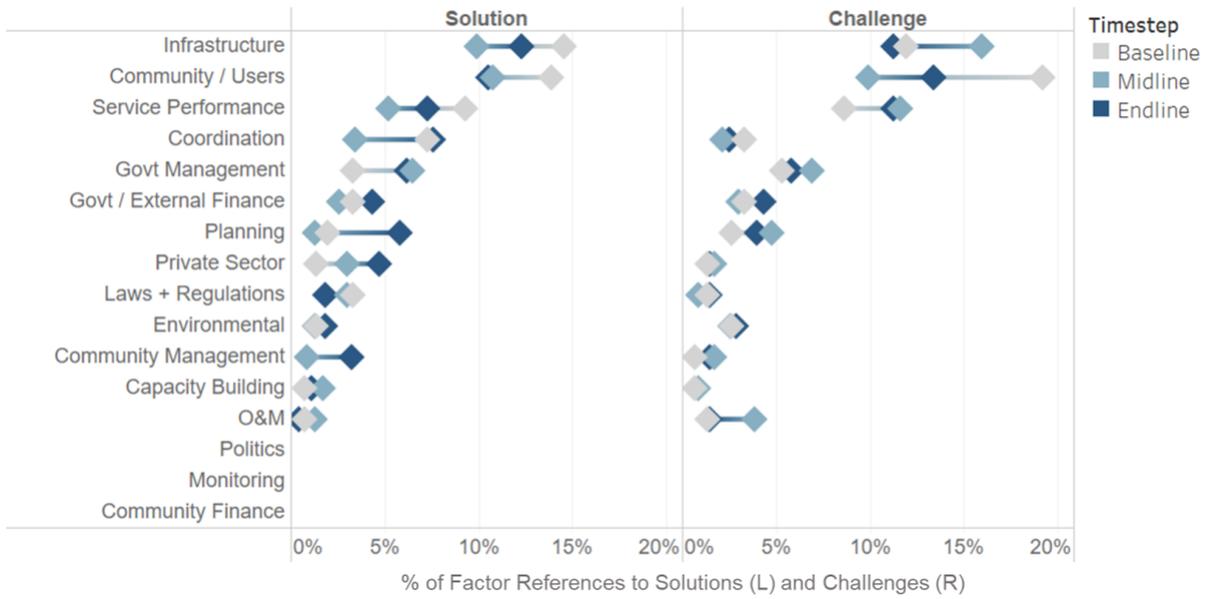


Figure A2. Debre Birhan, Ethiopia – Shifts in References to Factors as Solutions and Challenges

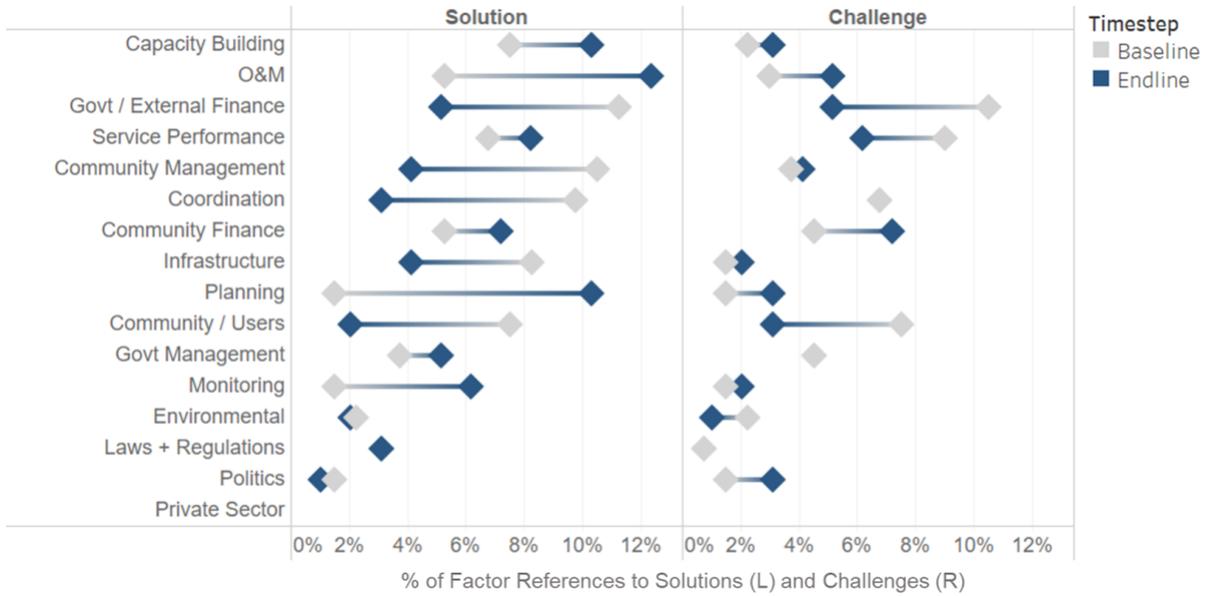


Figure A3. Kabarole, Uganda – Shifts in References to Factors as Solutions and Challenges

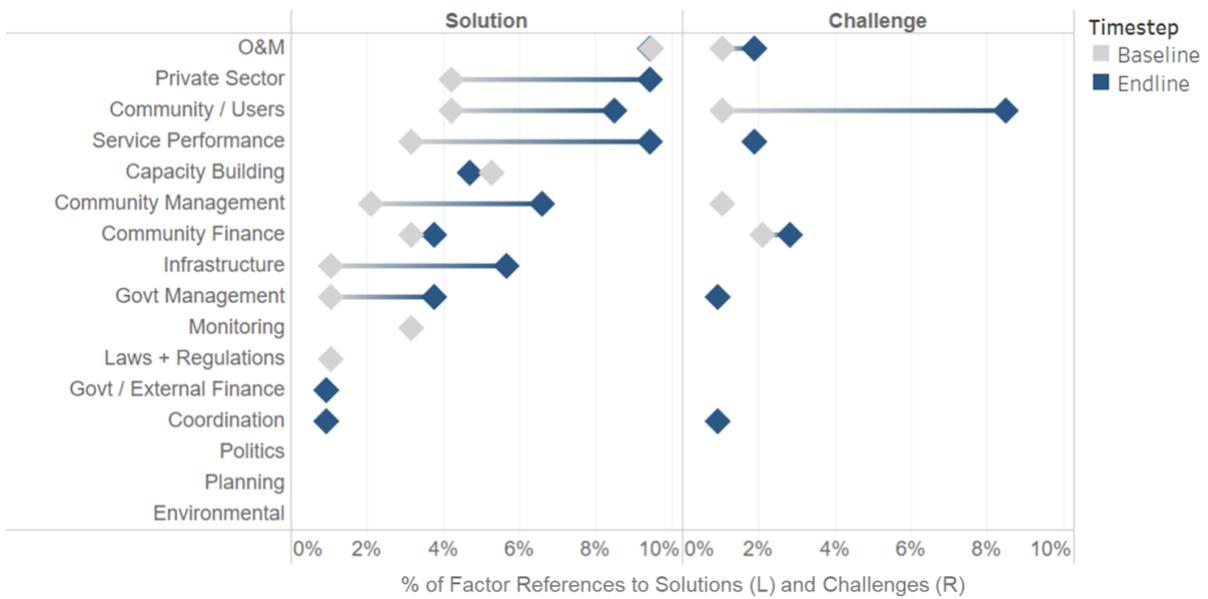


Figure A4. Kamuli, Uganda – Shifts in References to Factors as Solutions and Challenges

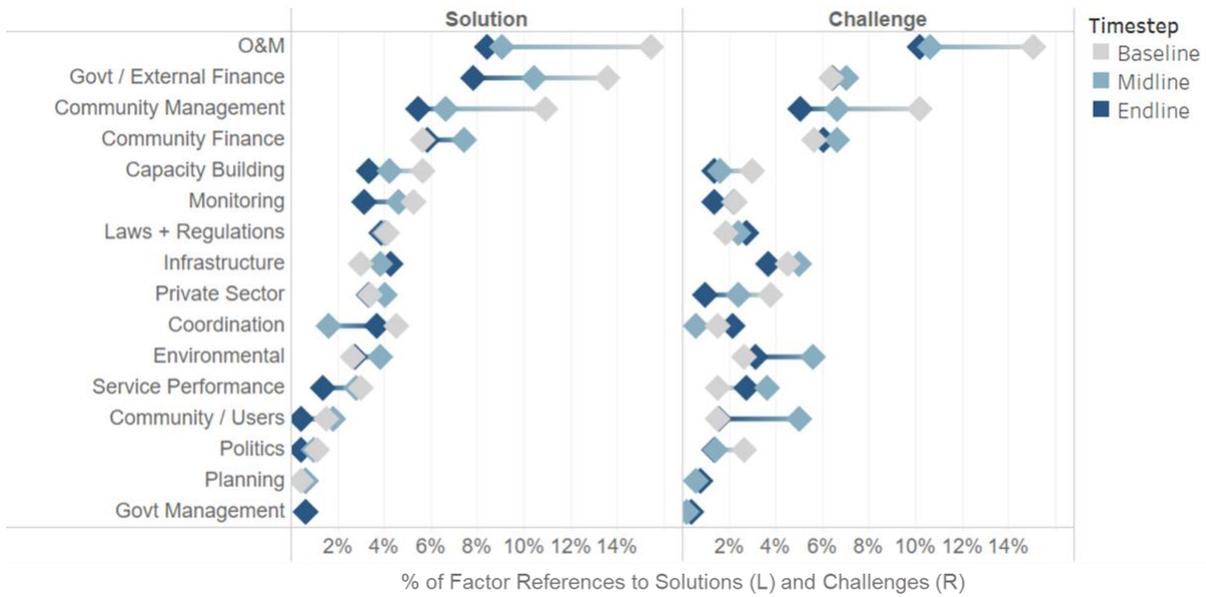


Figure A5. Kitui, Kenya – Shifts in References to Factors as Solutions and Challenges

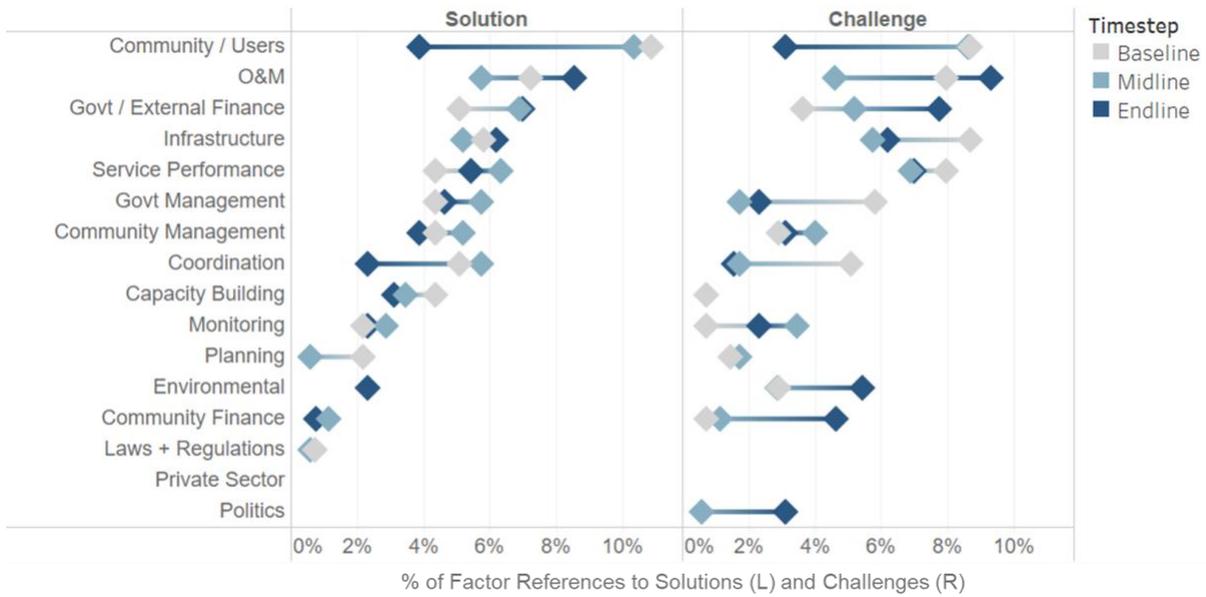


Figure A6. Mille, Ethiopia – Shifts in References to Factors as Solutions and Challenges

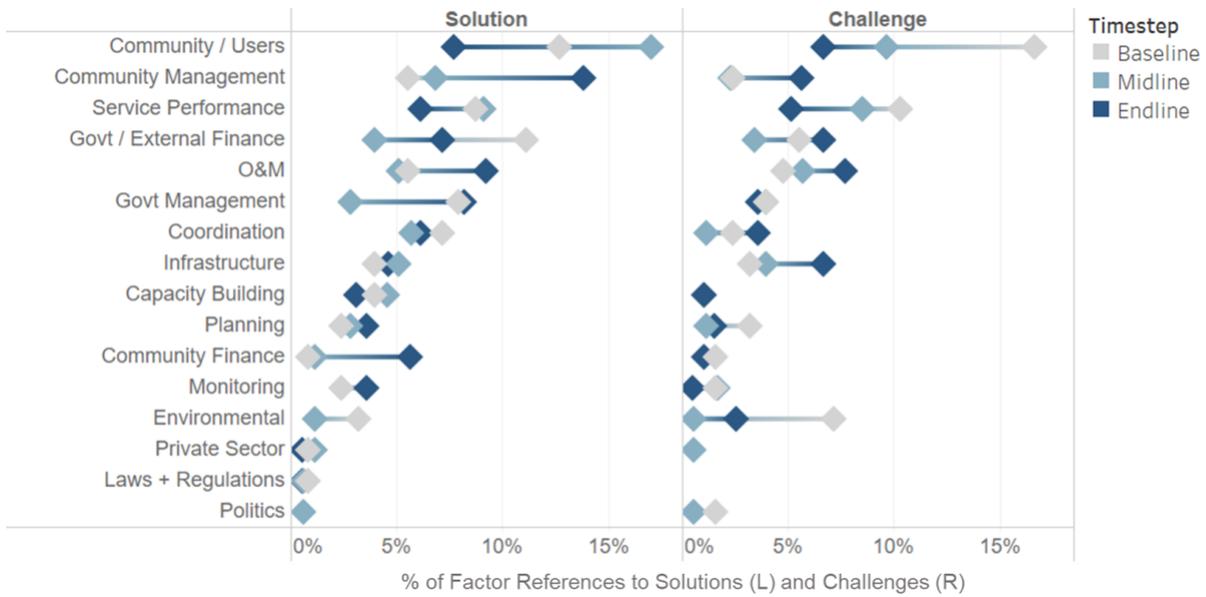


Figure A7. South Ari, Ethiopia – Shifts in References to Factors as Solutions and Challenges

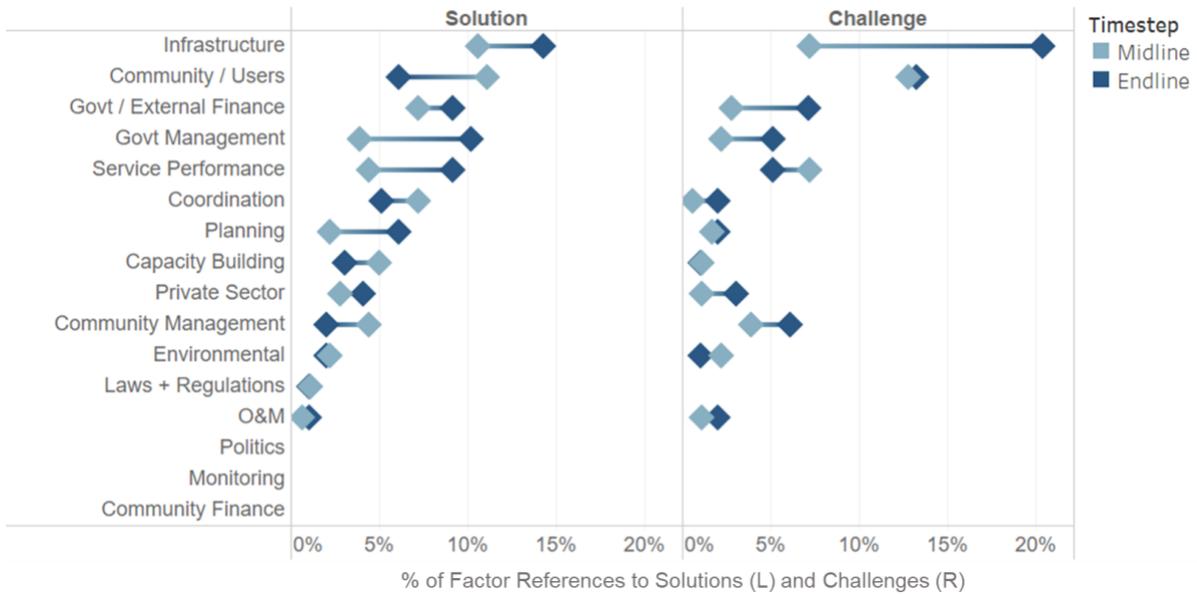


Figure A8. Woliso, Ethiopia – Shifts in References to Factors as Solutions and Challenges