Research Report

Sustainable WASH Systems Learning Partnership

MAPPING STAKEHOLDER CONNECTIONS TO IMPROVE WASH COLLABORATION IN ETHIOPIA

Matt Guttentag, LINC
July 2018

USAID
FROM THE AMERICAN PEOPLE

SUSTAINABLE WASH SYSTEMS
A LEARNING PARTNERSHIP

Prepared by: Matt Guttentag, LINC

Front cover: Women fetching water in South Ari woreda, Ethiopia. Photo credit: IRC.

Acknowledgements: This paper was prepared by Matt Guttentag, with valuable contributions and support from SWS colleagues Rich Fromer, Dan Hollander, Amy Javernick-Will, Eddy Perez, Kimberly Pugel, John Butterworth, Lucia Henry, Ella Lazarte, and Elizabeth Jordan. For more information, contact Rich Fromer (rfromer@linclocal.org).

Suggested citation: Guttentag, Matt. Ethiopia Baseline Organizational Network Analysis Report. Washington, DC: Sustainable WASH Systems Partnership (USAID), 2018.

About the Sustainable WASH Systems Learning Partnership: SWS is working to identify and test locally-driven solutions to the challenge of developing robust local systems capable of sustaining Water Sanitation and Hygiene (WASH) service delivery. This report is made possible by the support of the American people through the United States Agency for International Development (USAID) under the terms of the Cooperative Agreement AIDOAA-A-16-00075. The contents are the responsibility of the Sustainable WASH Systems Learning Partnership and do not necessarily reflect the views of USAID or the United States Government. For more information, visit www.globalwaters.org/SWS, or contact Elizabeth Jordan (EJordan@usaid.gov) or Eddy Perez (Eddy.Perez@colorado.edu).

Table of Contents

List of Figures

List of Tables

Acronyms

AMREF	African Medical and Research Foundation
IRC	Refers to the Netherlands-based WASH NGO
NGO	Non-Governmental Organization
ONA	Organizational Network Analysis
SWS	Sustainable WASH Systems [Learning Partnership]
UCB	The University of Colorado at Boulder
USAID	United States Agency for International Development
WASH	Water, sanitation, and hygiene

Executive Summary

In Ethiopia, the Sustainable WASH Systems Learning Partnership (SWS) employed Organizational Network Analysis (ONA) to assess the relationships among organizations providing WASH services in specific locales. This analysis will be used to support and evaluate SWS efforts to improve local water and sanitation service sustainability. SWS is currently working in three WASH systems in Ethiopia: the rural water systems in the *woredas* (districts) of South Ari (part of the South Omo 'zone') and Mille (part of the Afar region), and the urban sanitation system of Woliso (a small town in the Oromia region). In each of these locales, SWS identified organizations (non-governmental organizations [NGOs], public institutions, academic institutions, and private sector organizations) actively providing or contributing to the provision of WASH services to participate in a Learning Alliance. The goal of each Learning Alliance is to increase collaboration and knowledge sharing among stakeholders for improved efficiency, effectiveness, and sustainability of local WASH services. SWS selected and trained a local community member, referred to as a local facilitator, to guide the Learning Alliance through a process to design and implement a strategy to achieve the Learning Alliance's goals.

Improving the underlying structure of the network of relationships among Learning Alliance participants is a critical part of the Learning Alliance approach. To this end, LINC carried out an ONA of local WASH stakeholder organizations selected for participation in each Learning Alliance. The objective of this analysis was to understand the current network of relationships among these organizations to inform Learning Alliance goals, activities, and structures, and to provide a baseline for tracking changes in the network over time.

Methodology

To maximize the utility of the ONA results for the Learning Alliance, the ONA was planned using an iterative process based on input from SWS Ethiopia partner organizations (IRC Ethiopia, Tetra Tech, and UCB), local facilitators, and local WASH stakeholders. The design process included determining the types of relationships (e.g., information sharing) and assessing attributes or features of the relationship (e.g., receiving or sharing information, frequency) that were noted as important for local water or sanitation sustainability.

The survey was administered in-person to representatives from all organizations selected for participation in the local Learning Alliance; these organizations made up the network for the analysis. Each respondent was asked to identify whether their organization had interacted with any other organization in the network for each of the selected relationship types. Respondents were also asked to list the other organizations in the network they perceived to be most influential, most connected, and most disconnected from others.

Following an initial analysis of the data, LINC shared a broad set of results with the local Learning Alliance facilitators to understand which results would be most useful to share back with the Learning Alliance participants. Specifically, the facilitators were asked to assess, based on their previous engagement with these organizations, which results would likely stimulate actionable discussions and decisions regarding the structure and objectives of the Learning Alliance. The local facilitators then presented these selected results back to the respondents during the Learning Alliance kick-off meetings for feedback and to guide the group discussions on structuring the Learning Alliance to consider existing

relationship dynamics and critical relationship gaps. These discussions further informed the research team's interpretation of the results and helped the SWS team understand how the ONA can be adapted for future iterations to maximize its usefulness to the Learning Alliance participants and facilitators.

Findings

Although the specific ONA findings differed between the locations, three themes emerged from the analysis and feedback discussions with implications across the Learning Alliances.

1. NGOs play important but distinct roles in the different systems.

In South Ari, the ONA revealed significant engagement points between NGOs and both zone and woreda government offices, but very few engagement points among the different NGOs. This result was validated during follow-up interviews with NGO representatives, who stated there is currently no standing forum for WASH engagement among local NGOs, and they often share the same information separately with woreda government offices and zone government offices. This finding has two implications: (1) NGOs appear to serve as important information bridges between zone and woreda government offices, a role that can be capitalized on during Learning Alliance activities that require coordination between geographic levels; and (2) there is a need to improve information flows between NGOs in the network.

In Mille, NGOs occupy a different place in the network: although there is engagement among NGOs, there is a lack of engagement between NGOs and woreda government offices. Discussion of this finding during the Learning Alliance kick-off meeting indicated that water infrastructure developed by NGOs is often abandoned due to a lack of information sharing and coordination with woreda government offices that might otherwise enable these offices to provide periodic maintenance and upkeep. In addition, problem-solving requests from woreda government offices were less reliably addressed than requests from either NGOs or regional government offices. This suggests that in Mille, one way the Learning Alliance can improve water service sustainability is by focusing specifically on information and problem-solving relationships between NGOs and woreda government offices.

2. Learning Alliance membership structures can build on existing organizational clusters.

The three networks exhibited different patterns of clustering, or ways in which organizations tend to form densely connected sub-groups within the overall network. In South Ari, there is strong clustering of government office relationships by geographic level. In other words, woreda offices tend to engage with other woreda offices, and zone offices similarly tend to engage with other zone offices, while NGOs serve as a bridge between these clusters. In both Woliso and Mille, on the other hand, the networks have one core cluster of densely connected organizations, with other organizations less connected to this cluster and almost completely disconnected from one another.

The specific nature of clustering in each network was discussed during the kick-off meetings in terms of implications for how the Learning Alliance could be structured. In South Ari, participants suggested the clusters reflect the reality that many day-to-day issues around sustainability must be dealt with among a broad set of stakeholders within each geographic level, with less frequent but more targeted engagement between organizations at different geographic levels. The Learning Alliance could therefore have separate

overall engagement points for all organizations working at the zone and woreda levels, with a smaller group also coordinating between these levels. In Woliso, the discussion of the presence of an existing "core" set of organizational relationships led to two suggestions. First, the Learning Alliance could build on the strong existing relationships with tiered levels of engagements for participants. This core group has the most political capital to affect change in the sanitation system, so more regular engagement among this group on sustainability issues will yield the most results. Second, the Learning Alliance should deliberately try to increase engagement between this core group and some specific organizations currently not highly engaged with the rest of the network, such as the local women's association that manages a communal latrine. These organizations have a deep understanding of how sustainability issues are playing out in the community to help ensure the core group's activities reflect the reality on the ground.

3. Local stakeholder perception of organizational influence generally aligns with the ONA results, with some exceptions.

In the ONA, LINC derived quantitative influence measures for each organization based on the extent to which a given organization's relationships indicate a position to exert influence on the rest of the network. There are various such measures of influence: for example, one measure is based on how many total relationships a given organization has and another is based on whether an organization's relationships place it at the center of the network or more towards the periphery of the network. LINC compared these influence measures with survey responses that directly asked which organizations are most influential. With some exceptions, derived organizational influence levels generally aligned with the perceptions of organizational influence indicated by the respondents in all three locations. This indicates local stakeholders already have a reasonably strong understanding of the local organizations that have the most and least influence on WASH issues. The Learning Alliances will not, therefore, achieve impact simply by informing participants of which local organizations tend to be more or less influential. Rather, the Learning Alliances can build on this extensive existing local knowledge base to provide a structure and process to help participants understand how relationships within the network could shift in a way that improves local water and sanitation sustainability.

Lessons Learned

In addition to the findings for each specific Learning Alliance, the baseline analysis allowed the SWS team to reflect on and uncover important lessons to consider for future network analyses both in Ethiopia and in the WASH sector more broadly.

Participatory engagement in design and analysis improves the usefulness of results

The way in which network analysis research is designed and implemented determines the extent to which the results are applicable to the network members. In order to develop appropriate surveys and derive useful results, LINC began by engaging various Learning Alliance members and facilitators in Ethiopia to better identify areas of interest. By doing this, LINC was able to generate and communicate findings with actionable implications, such as the findings outlined above, with direct implications for Learning Alliances membership structures. Despite this process, there were certain parts of the survey and analysis that proved less useful and took considerable time to collect and analyze. For instance, the survey and

analysis included a detailed breakdown of the specific types of problem solving requests being made in the network; however, the nature of these requests was largely a function of each organization's mandate (e.g., finance requests tend to go to the finance office). Since these mandates are generally not something that can be changed, the local facilitators and stakeholders considered these findings less actionable than those around information sharing and coordination. An up-front engagement process that included more in-depth discussions of potential results and their implications with a broader set of the Learning Alliance members may have allowed for more targeted analysis.

Focus with greater depth on fewer relationship types

Stakeholders noted that although the overall number of connections for some relationship types appears to indicate a high degree of network connectivity, these connections are not actually indicative of meaningful collaboration. In follow-up analyses, it will be beneficial to dive more deeply into the strength of relationships, in particular around information-sharing and coordination relationships, with regards to how these relationships impact WASH sustainability. For example, for coordination, it will be helpful to analyze not only whether coordination happened, but also whether that coordination contributed to some perceived improvement in WASH sustainability. For information sharing, in addition to asking whether the information was used, it will be useful to understand if and how this information related specifically to one of the factors identified by the Learning Alliance as a key driver of WASH sustainability.

Introduction

The Sustainable WASH Systems (SWS) Learning Partnership is a global U.S. Agency for International Development (USAID) cooperative agreement to identify and test locally-driven solutions to the challenge of developing robust local systems capable of sustaining water, sanitation, and Hygiene (WASH) service delivery. Led by the University of Colorado at Boulder (UCB), the project includes collaboration with four concept teams in four countries: Ethiopia, Kenya, Uganda, and Cambodia.

In Ethiopia, SWS (led by IRC in collaboration with Tetra Tech and LINC) is working with key stakeholders to develop and test a structured and replicable approach to understanding, engaging with, and strengthening decentralized *woreda* (district) and small-town level systems for water and sanitation service delivery. SWS is currently working in three local WASH systems: the rural water systems in the *woredas* of South Ari (part of the South Omo 'zone') and Mille (part of the Afar region), and the urban sanitation system of Woliso (a small town in the Oromia region).

In each of the three currently active local contexts, SWS identified organizations (non-governmental organizations [NGOs], public institutions, academic institutions, and private sector organizations) at the town, district, zone, and regional level actively providing or contributing to the provision of WASH services to participate in a Learning Alliance as members. The goal of each Learning Alliance is to increase collaboration and knowledge sharing among stakeholders for improved efficiency, effectiveness, and sustainability of local WASH services. SWS selected and trained a local community member, referred to as a local facilitator, to guide the Learning Alliance through a process to design and implement a strategy to achieve the Learning Alliance's goals. Though the facilitator manages this process, Learning Alliance members are responsible for designing and implementing the changes identified as critical to improving WASH service sustainability. The expected outcomes of these Learning Alliances in Ethiopia include stronger service delivery systems in the targeted woredas and small towns with strengthened institutional arrangements for service delivery models, financing, capacity and monitoring.

Learning Alliances

Learning Alliances are locally-led platforms that bring together stakeholders around a given WASH issue to improve collaboration – essentially improving the processes, tools, knowledge, and collaboration that will make all of the local WASH "hardware" run effectively and sustainably.

Improving the underlying structure of the network of relationships among Learning Alliance participants is a critical part of the Learning Alliance approach to improving local WASH sustainability. By quantifying and visualizing the relationships within the WASH stakeholder network, ONA offers a critical perspective on opportunities for improving the current structure of relationships as well as tracking how these relationships shift over time. When combined with other analyses, this can also shed light on how changes in relationships contribute to changes in sustainability. To this end, LINC carried out a baseline Organizational Network Analysis (ONA) of local WASH stakeholder organizations selected for participation in each of the three Learning Alliances.

This Report

This report includes findings from the baseline ONA of WASH stakeholders in Ethiopia in the three SWS sites. The ONA has three overarching objectives, developed in partnership with SWS partners IRC and Tetra Tech:

1. Establish a baseline of the strength and nature of relationships among the network of prospective members of each Learning Alliance to track changes in the Learning Alliance network over time;
2. Provide Learning Alliance facilitators with insights into the current state of the local network as a tool for designing interventions and structures to strengthen collaboration and improve WASH sustainability; and
3. Provide Learning Alliance members with an understanding of important network dynamics to consider as part of their own participation in the Learning Alliances.

As such, the ONA can be thought of as both a monitoring and evaluation tool as well as a program design and stakeholder engagement tool. To achieve its objectives, the ONA is focused on providing insights and analysis including:

- Overall assessment of the three sites' network structures;
- Identification of notable patterns in each network, including clusters or groupings of organizations that could have significance for the Learning Alliance structure and strategy; and
- Analysis of specific actors in each network to identify highly central or peripheral organizations that may be important to consider in the Learning Alliance activities.

The ONA design, implementation, and analysis process were all carried out with input from SWS partners IRC, Tetra Tech, and UCB as well as feedback from local WASH stakeholders (see more details in the Methodology section below).

Methodology

Design

The initial ONA design was carried out as part of the overall SWS planning process in Ethiopia in early 2017. During this period, LINC worked closely with IRC to establish the objectives of the ONA and the overarching research and analysis plan to ensure the ONA would be as useful as possible in supporting SWS activities in Ethiopia. These discussions led to the decision to draw the network boundary (i.e., those organizations included in the analysis) to include only the specific organizations identified as prospective participants for each of the Learning Alliances.

Network Boundary
The network boundary reflects the method through which organizations are considered to be part of the network for the analysis. The network for this analysis includes organizations likely to be Learning Alliance members, as identified by the SWS local lead in each district.

This boundary reflects a specific interest in understanding how and to what extent Learning Alliance participants interact with one another, and whether this interaction changes over time as Learning Alliance activities progress. This boundary represents a closed roster of organizations; that is, the network

members were defined up-front and network members were only asked about their relationships with others in this pre-defined network. In certain cases, an organization identified during the roster development was determined to be non-active in the local WASH sector during the survey process and were deleted from analysis. These are noted in the analysis section for the relevant site.

During the design process, the Learning Alliances had not yet been fully created and thus the final list of Learning Alliance members had not been set. However, the local Learning Alliance facilitators had already spent months engaging local stakeholders in advance of the Learning Alliance development and formalization and were therefore able to offer a list of prospective Learning Alliance participants in each district to include in the analysis.

Table 1: Ethiopia Learning Alliance Overviews

Learning Alliance	Participants
Mille (Woreda; Rural Water)	7 Mille woreda government offices 5 Afar region government offices 6 NGOs 1 town public organization 1 academic institution Total: 20 organizations
South Ari (Woreda; Rural Water)	7 woreda government offices 7 South Omo zone government offices 5 NGOs 2 town public organizations 1 academic institution Total: 22 organizations
Woliso (Small Town; Urban Sanitation)	13 town government offices 2 private organizations Total: 15 organizations

Following these initial decisions LINC worked with SWS partners IRC, Tetra Tech, and UCB to develop a detailed concept and timeline for ONA data collection and analysis. To identify the most relevant types of relationships to include in the survey, LINC had the SWS partners consider the potential types of interactions that may be important for Learning Alliance success given previous experiences with building WASH networks. This resulted in an initial set of relationship types and related draft survey questions that examined formal and informal partnership, information exchange, and seeking or receiving advice.

In June 2017, LINC joined UCB, Tetra Tech, and IRC for a scoping trip in Ethiopia to interview prospective Learning Alliance members in South Ari and Woliso as well as discussions with the IRC and Tetra Tech local facilitators. This trip led to the revision and finalization of the survey to account for the realities on the ground and the most salient relationship types and organizational categories for the local WASH stakeholders. For example, these consultations revealed that the conceptual categories of formal partnership arrangements would not make much sense, since most of the prospective Learning Alliance members are local government offices that do not create formal partnership agreements; therefore, the survey was adjusted to ask about active coordination in planning or implementing WASH activities (see Table 2 below for full list of final relationship types). LINC also received input on the best way to include attributes for each relationship, including a measure of the strength of the relationship.

Table 2: Network Relationship Types

Relationship Type	Definition	Attributes
Problem solving request (made and received)	Making or receiving a request for support to solve a WASH-related problem in the previous six months	Types of requests (based on categories); Reliability in addressing request
Information sharing (shared or received)	Providing or receiving WASH-related information in the previous six months	Frequency (based on categories); Use of information (noted by recipient)
Formal reporting	Receiving a formally-mandated report in the previous year	Timeliness and adequacy of reports
Direct coordination of activity planning or implementation	Jointly planning (with significant input) or implementing WASH-related activities in the previous six months	None

Data Collection

During the scoping trip, LINC recruited two local enumerators who carried out the surveys. LINC also conducted a training and survey pilot with these enumerators to ensure their familiarity with the survey software and process, as well as the purpose and content of the ONA survey itself. The main issue that emerged during the pilot was whether respondents should consider interactions only relevant to WASH issues in their responses, or whether respondents should include any inter-organizational interactions at all. To maintain a focus on WASH services, LINC instructed the enumerators to clarify to respondents that the focus should be on interactions specific to WASH issues.

Following this training, between July and September the enumerators conducted all ONA interviews in South Ari, Mille, and Woliso, spending approximately one and a half to two weeks at each site. Each interview took between thirty minutes and one hour. In total, to complete the trainings, travel, interview set-up, and interviews, each enumerator logged approximately 35 days of effort.

SWS conducted the survey in person with each organization's representative or representatives (as proposed and identified by the organization after outreach by IRC and Tetra Tech) using the Egoweb 2.0 platform[1] loaded onto tablets. The interview guide for the full survey tool is available in Annex 2.[2] The first set of questions established specific organizational characteristics. The respondent was then asked to go through the full network roster and identify all organizations with which the respondent organization had interacted in the previous six months.[3] For each relationship type, the respondent noted whether his or her organization had interacted with each previously identified organization. This approach had the benefit of comprehensively addressing every potential interaction, without requiring the full list of network members to be reconsidered for each question. Finally, the respondent was asked about his or her perspective on the most and least connected actors in the network, and open-ended questions on the most important factors influencing sustainable WASH services. These last questions were included as part of the UCB-led factor analysis, which serves as a highly complementary systems analysis tool. In order to capture the factor analysis responses, the enumerators recorded and later transcribed this portion of the survey, rather than including responses in the Egoweb software. Results from the factor analysis are not included in this report.

Data Analysis

After data collection was complete, LINC conducted an initial analysis of the data to identify notable patterns, trends, and points of potential interest in the data, including:

- Deriving network-level metrics for each relationship type. These metrics measure attributes of the entire network, rather than any one network member (see Table 3 on page 15);
- Deriving organization-level influence metrics, which measure attributes for each actor within each relationship type (see Table 3 on page 15);
- Identifying sub-groups of closely connected organizations within the overall network;
- Visualizing the network for each relationship type; and
- Comparing patterns in these analyses for attributes such as sector and geographic level.

The analysis was completed by exporting the raw survey data from Egoweb as a .csv file, then converting this data into network analysis formats (i.e., edge list, node list, and matrix formats) using Microsoft Excel. The network data was then analyzed using a combination of software tools, including:

- UCINET[4] to derive network-level metrics, actor-level metrics, and core/periphery analysis;
- NodeXL[5] to derive communities within the network using the Clauset-Newmann-Moore algorithm[6] and to visualize the network data, varying between the Fruchterman-Reingold layout and the Harold-Koren Fast Multiscale layout;

[1] Egoweb 2.0 is an open-source front-end interface that uses the Egonet software, developed by a consortium of Universities interested in social network analysis. See http://www.qualintitative.com/wiki/doku.php/egoweb_2.0_home for more details.
[2] The interview guide was translated into Amharic for the enumerators, who then input data into the Egoweb platform in English.
[3] Except, as noted previously, for formal reporting, for which the respondent was asked to consider interactions for the previous year.
[4] See https://sites.google.com/site/ucinetsoftware/home
[5] See https://nodexl.codeplex.com/
[6] See https://arxiv.org/abs/cond-mat/0408187

- The igraph[7] and networkD3[8] libraries in R to create a sub-set of interactive visualizations during the analysis process for easier pattern exploration; and
- Microsoft Excel to analyze descriptive statistics.

Table 3: Standard Metrics Used for Analysis

Metric	Explanation
Size (# nodes)	The number of actors/organizations in a network.
Ties (# of edges)	Number of reported connections among actors. In-degree ties are ties into a given node; out-degree ties are ties out of a given node.
Density	The proportion of actual ties relative to all possible ties in a network.
Average Distance	The average steps required to get between any two actors in a network.
Average Degree	The average number of ties of actors in the network.
Reciprocity	The extent to which directed relationships are reciprocated.
Degree Centrality	A normalized measure of the number of unique ties a given actor has. Serves as an indication of importance/significance of an actor for the network. This can be separated into in-degree centrality (for incoming ties) and out-degree (for outgoing ties) for directed relationship types.
Betweenness Centrality	The extent to which a node acts as a bridge along the shortest path between two other nodes.

Stakeholder Consultations

LINC provided the overall results back to the facilitators to get feedback on which results should be investigated more deeply through further analysis. To do this, the results were compiled and shared in PowerPoint and framed in a way to make it easy to interpret the findings, with each result including an accompanying potential implication for the Learning Alliance. The facilitators were then asked to assess, based on their past work on WASH issues at each Learning Alliance site, which results would have the most important implications for designing effective Learning Alliances, and which results would likely stimulate actionable discussions and decisions by prospective Learning Alliance members for their own strategic planning. This assessment was done through a series of discussions in the weeks leading up to the Learning Alliance kick-off meetings. Given the limited time available to present results back to the prospective Learning Alliance members, during these discussions LINC worked with the facilitators to prioritize 2–3 findings per site to highlight.

[7] See http://igraph.org/r/
[8] See https://christophergandrud.github.io/networkD3/

The local facilitators then presented these selected results back to the respondents during the Learning Alliance kick-off meetings for feedback and to guide the group discussions on structuring the Learning Alliance to consider existing relationship dynamics and relationship gaps. These discussions further informed LINC's interpretation of the results and helped the SWS team understand how the ONA can be adapted for future iterations to maximize its usefulness to the Learning Alliance participants and facilitators. A description of the takeaways from these meetings is included in the analysis of each site.

Table 4: ONA Process Summary

Time Frame	Activities
January – March 2017	Overarching ONA objectives and process developed
April – May 2017	Initial draft survey developed
June 2017	Interviews with prospective Learning Alliance members and facilitators to refine survey; Enumerator recruitment
July – August 2017	Respondent lists finalized; Enumerator training completed; Survey piloted; Data collected in South Ari and Mille (2 weeks at each site)
September 2017	Data collected in Wolliso (1.5 weeks) and initial analysis begun
October 2017	Initial analyses conducted and shared with SWS Ethiopia partners for feedback
November 2017	Results presented and discussed at Learning Alliance kick-off meetings
December 2017 – February 2018	ONA analysis completed, incorporating feedback from Learning Alliance sessions.
February – June 2018 (Anticipated)	ONA follow-up process refined based on feedback from stakeholders and partners.
August – September 2018 (Anticipated)	First iteration of follow-on ONA data collection and analysis completed.

Limitations

Selected Respondents

Any given individual may not know about all of his or her organizations' interactions, and therefore may under-report interactions on the survey. While both respondents and enumerators made a good faith effort to ensure the responses reflected the organization as a whole, we can assume not every potential respondent from a given organization would give an identical response. To mitigate this challenge, LINC worked with local facilitators to identify the point of contact at each organization who is most central to the organization's work coordinating local WASH activities. In some cases, multiple members of the

organization were present for the interview to maximize institutional knowledge. In other cases, the original point of contact recommended a better point of contact given the objectives of the survey.

Recall Bias

Respondents were asked to indicate the organizations with which they have had a relationship within the previous six months. This can lead to bias in recalling, accurately, all interactions. Enumerators were trained to provide prompts to decrease recall bias, and respondents were provided the list of organizations on the roster to help them make selections.

Interpretation

As described previously, LINC worked with the facilitators to select a subset of results to share back with the prospective Learning Alliance members for feedback at the Learning Alliance kick-off meetings. This allowed LINC to better interpret these results in terms of why different relationship patterns exist. However, given time limitations and the many competing information needs during the kick-off meetings, it was only possible to share back two to three results per Learning Alliance to the participants for feedback. In these cases, the results can tell us what the relationship structures are, but not necessarily why these structures exist, limiting the immediate ability to present concrete implications for action for the full set of results. Discussions around interpretations and implications of these results will continue as the Learning Alliances develop and future iterations of the ONA are carried out.

Results

South Ari

The network of prospective Learning Alliance participants in South Ari consisted of 22 organizations[9]: seven woreda government offices; seven zone government offices, five NGOs (local offices of international organizations), two town water utilities, and one academic institution.

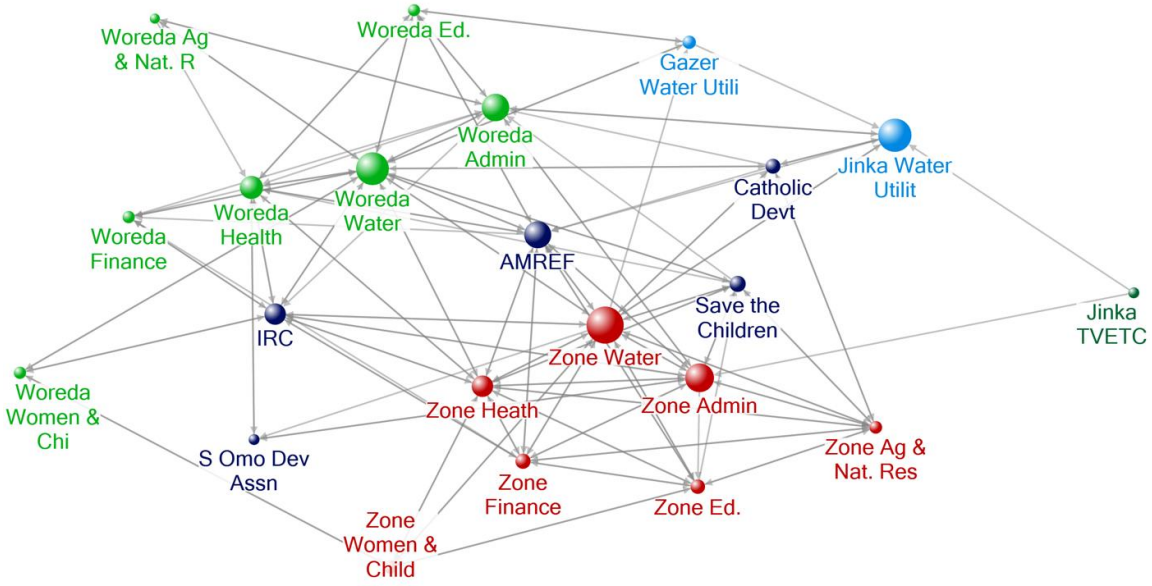
1. Government offices tend to have much greater engagement on WASH issues with other offices at the same geographic level.

In other words, woreda offices tend to engage with other woreda offices, and zone offices tend to engage with other zone offices. The significant clustering of organizational engagement within geographic levels is present across relationship types. For example, a community detection technique that identifies clusters of densely connected actors in a network[10] reveals that the largest cluster in the information-sharing network consists almost entirely of zone government offices, with woreda government offices, NGOs, and town-level government offices creating two other clusters. This can be seen in Figure 1 on page 18, in which the organizations are colored by type (woreda government office, zone government office, etc.), with the clusters shown in the columns below.

[9] One organization on the original list, Jinka University, is not yet operational and thus was not interviewed or included in the analysis. See Annex for full lists of network members.

[10] This analysis uses the Clauset-Newmann-Moore community detection technique in NodeXL.

Information-Sharing Network Coded by Organization Type



Node Color:

- Woreda Gov't Office
- Zone Gov't Office
- Town Water Utility
- NGO
- Academic Institution

Node Size Corresponds to actor centrality

Information-Sharing Network Cluster Membership

Group 1:	Group 2:	Group 3:
• Zone Water Dept • Zone Women/Children's Dept • Zone Health Dept • Zone Edu. Dept • Zone Admin. Dept • Zone Ag. & Nat. Resource Dept • Save the Children • Zone Fin. & Econ Dev. Dept • Woreda Women/Children's Office • South Omo Dev. Assn.	• Woreda Health Office (2) • Woreda Admin. Office (2) • Woreda Ag. Office (2) • IRC Rescue (2) • Woreda Fin. & Econ. Dev. Office (2) • Woreda Water Office (2) • Gazer Water Utility (2) • Woreda Edu. Office (2)	• AMREF (3) • Catholic Dev. (3) • Jinka Water Utility (3) • Jinka TVET (3)

Figure 1: Information Sharing Clusters

This result was highlighted during the Learning Alliance kick-off meeting. During this discussion, stakeholders noted that for government offices engaged on WASH issues, it is logical to have significantly more engagement within rather than between geographic levels. This is particularly notable for coordination, in which the time costs of actively coordinating among all different stakeholders on both geographic levels would be quite inefficient. The zone water department and woreda water office each play an overall coordinating role for WASH issues among the other offices at their respective geographic levels, and it is therefore efficient to have these offices playing a bridging role for WASH issues between the woreda and zone levels.

Based on this discussion, participants recommended the Learning Alliance could therefore take advantage of these geographic clusters to have separate overall engagement points for organizations working at the zone and woreda levels, with a smaller group also coordinating between these levels.

The stakeholders also noted that although the network maps accurately depict the engagement points among government offices at each geographic level, the current engagement points do not lead to sufficiently strong coordination. This is a key point for follow-up analyses, as it implies a greater importance in tracking shifts in the perceived *quality* of relationships within each geographic level rather than the *quantity* of relationships within each geographic level. The baseline did not include a measure for strength of coordination, but this will be considered for future analyses.

2. NGOs engage on WASH issues with both woreda and zone government offices, but there is very little engagement between the NGOs in the network.

In the initial stakeholder interviews conducted during the research design process, NGO representatives stated that WASH coordination mechanisms only exist during emergencies, and there is no standing platform for WASH engagement among NGOs. The network analysis clearly illustrates this point, with NGOs tending to have significant engagement points with government offices across all relationship types, but very few engagement points with one another. For example, there were no coordination relationships reported between any two NGOs in the network, despite overlap in geographical coverage and activities.

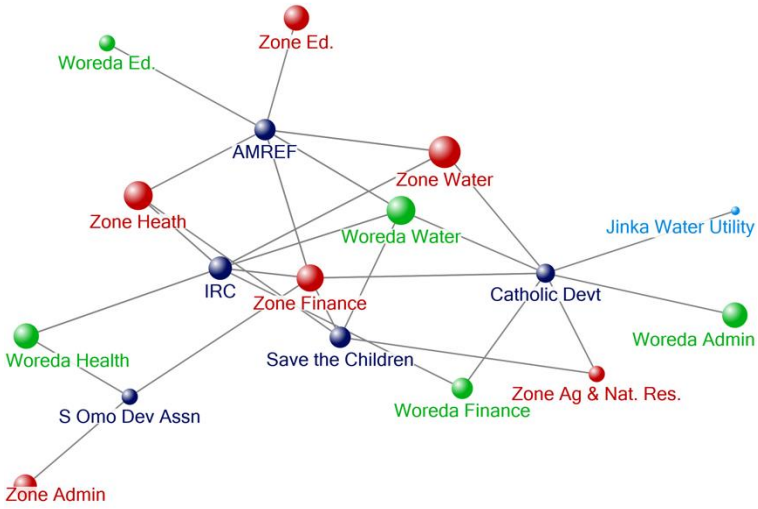


Figure 2: NGO Coordination Relationships

At the same time, NGOs serve as important bridges between the woreda and zone levels, having significant engagement with government offices at both levels. The unique role of NGOs is particularly pronounced in the information-sharing network. For example, AMREF has 10 information-sharing

relationships with a mix of zone, woreda, and town government offices, but only one information-sharing relationship with another NGO.

The lack of engagement among NGOs was discussed during the Learning Alliance kick-off meeting. During the discussion, the participants validated that this finding does indeed reflect their experience and pointed out that the Learning Alliance platform could play a key role in improving this reality. The NGO representatives stressed that the Learning Alliance platform can, if designed and implemented to deliberately allow for engagement between the NGOs in the network, help improve information sharing and coordination as well as increase efficiencies between NGOs to government offices by eliminating redundancies in sharing the same information with various offices.

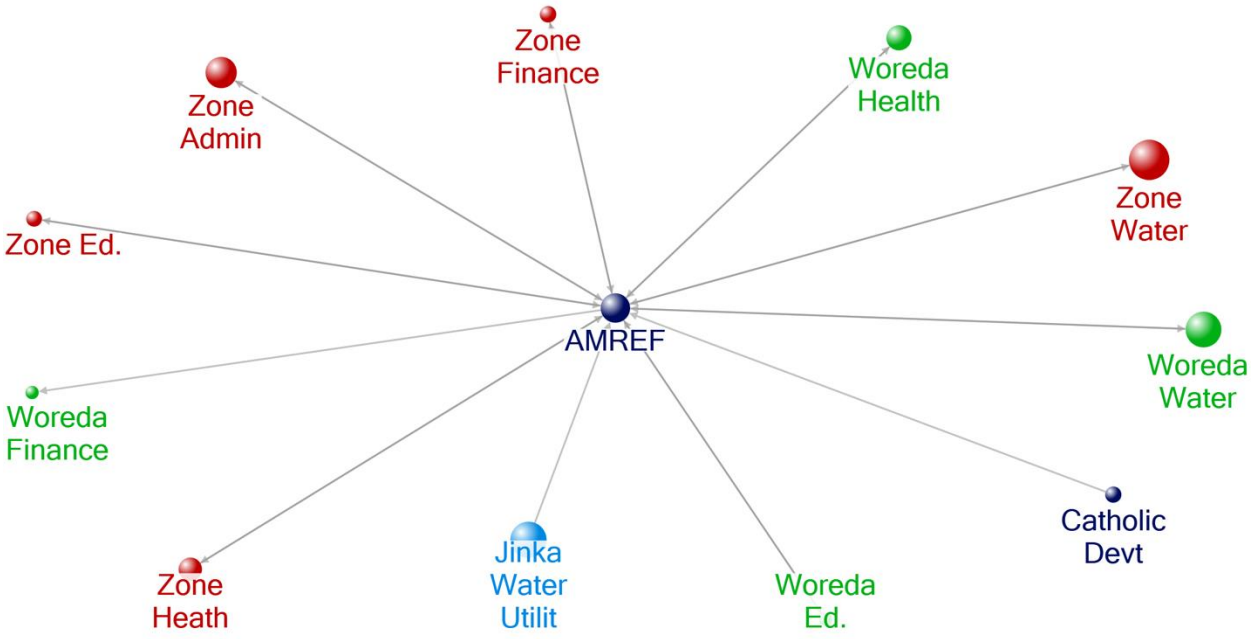


Figure 3: AMREF Information-Sharing Relationships with Organizations Coded by Type

3. Participants' perception of the most influential actors for WASH activity in South Ari aligns closely with influence metrics derived from analyzing the relationships from the survey.

During the survey, respondents were asked to identify the organizations in the water stakeholder network that they consider most influential, most connected, and most disconnected. Comparing these responses to influence scores derived using survey relationship data gives a view of the extent to which stakeholder perceptions of organizational influence match up with influence measures derived from survey responses. To understand this broadly, two simple aggregated scores were calculated for each organization: a Perception Influence Index Score (created by summing the number of mentions of each organization, as laid out in the Table 5 on page 21) and a Derived Influence Index Score (created by summing three different derived measures of influence).

Table 5: Influence Index Calculation Inputs

Index Score	Calculation Inputs
Perceived Influence Index Score	+ Number of mentions as one of the "most influential" organizations + Number of mentions as one of the "most connected" organizations - Number of mentions as one of the "most disconnected" organizations
Derived Influence Index Score[11]	+ Problem-solving network in-degree closeness centrality (normalized) + Information-sharing network betweenness centrality (normalized) + Coordination network closeness centrality (normalized)

A simple scatterplot comparison of these two index scores for the organizations in the South Ari network shows that they are highly correlated ($r^2 = .71$). This suggests that the members of the South Ari network are in fact aware of the most and least influential network members and have a general understanding of each organization's overall place in the network.

The Learning Alliance should build on rather than alter this well-developed understanding of the local water network by incorporating deliberate discussions of influence and power dynamics among participant organizations into strategy planning exercises.

[11] Reporting centrality scores were not included due to the fact that these scores generally reflect the set formal hierarchy, and as such skew much more heavily towards zone-level government offices. The specific centrality measure used for each relationship type is based on the particular salience of that measure's meaning for the corresponding type of interaction: for problem-solving, in-degree closeness centrality indicates an organization's influence in providing support; for information sharing, betweenness centrality indicates an organization's influence in serving as an information bridge between other organizations; and for coordination, closeness centrality indicates an organization's influence in coordinating with other organizations. These were normalized using UCINET's built-in.

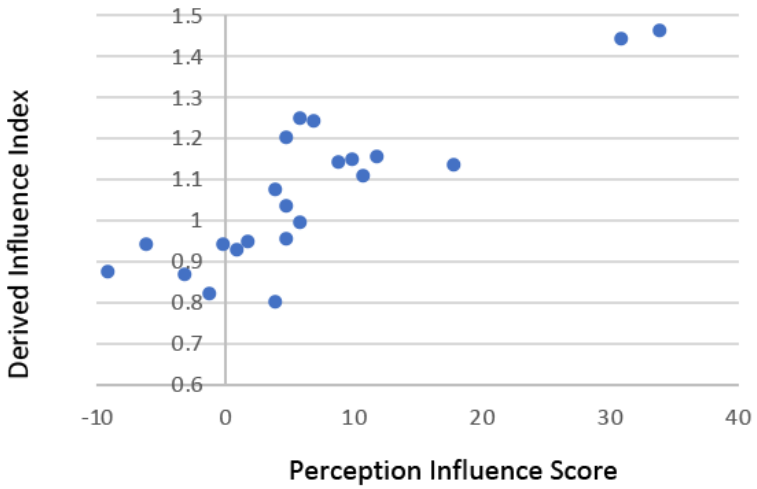


Figure 4: Derived and Perceived Influence Index Scores for South Ari

4. NGOs are particularly active in problem-solving relationships.

During the survey, respondents were asked to identify other organizations to which or from which they had requested or received support to solve problems on WASH issues in the previous six months. NGOs had a particularly robust set of these relationships with other organization types, as seen in Table 6 below, which looks at densities for different types problem-solving relationships by organization types. For example, the fact that requests from NGOs to woreda offices have a density of 0.4 means that 40% of all possible pairs of NGOs and woreda government office resulted in at least one actual problem-solving request.

Table 6: NGO Problem-Solving Relationship Densities

Request *from* Organization Type	Request *to* Organization Type	Density
NGO	Woreda Govt Office	0.400
Woreda Govt Office	NGO	0.314
NGO	Zone Govt Office	0.314
Zone Govt Office	NGO	0.314
NGO	NGO	0.000

5. The most common and most reliable type of problem-solving relationship includes requests for expertise.

Respondents were also asked to clarify what types of problems were being addressed in their problem-solving relationships, as well as whether in general the problems had been reliably addressed (with reliable deliberately left to the respondent to define based on their experience). Expertise, including

technical assistance, was the most cited type of support request. Further, relationships including requests for expertise (along with relationships including requests for studies or assessments) were most likely to be noted as reliable by the respondent. On the other hand, relationships involving requests for spare parts were the least likely to be coded as reliable.

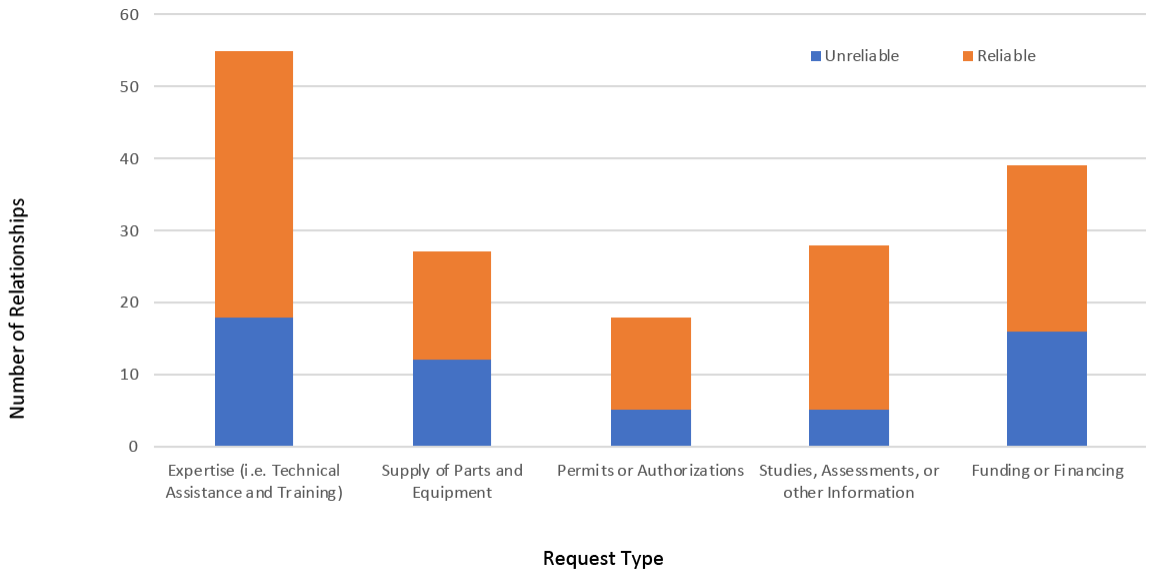
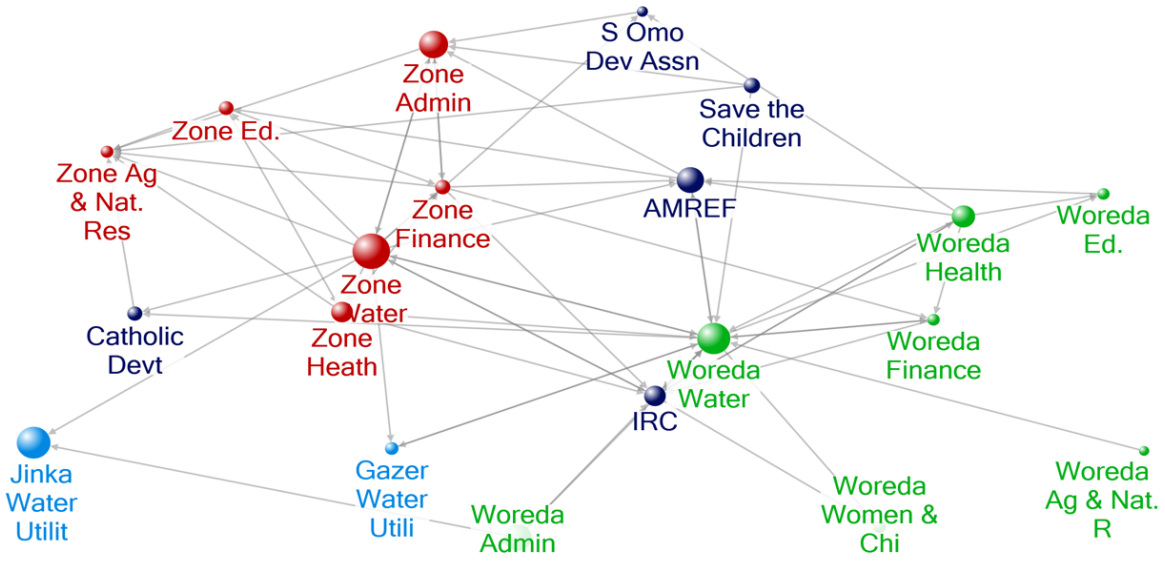


Figure 5: Relationship Reliability by Number of Requests Types

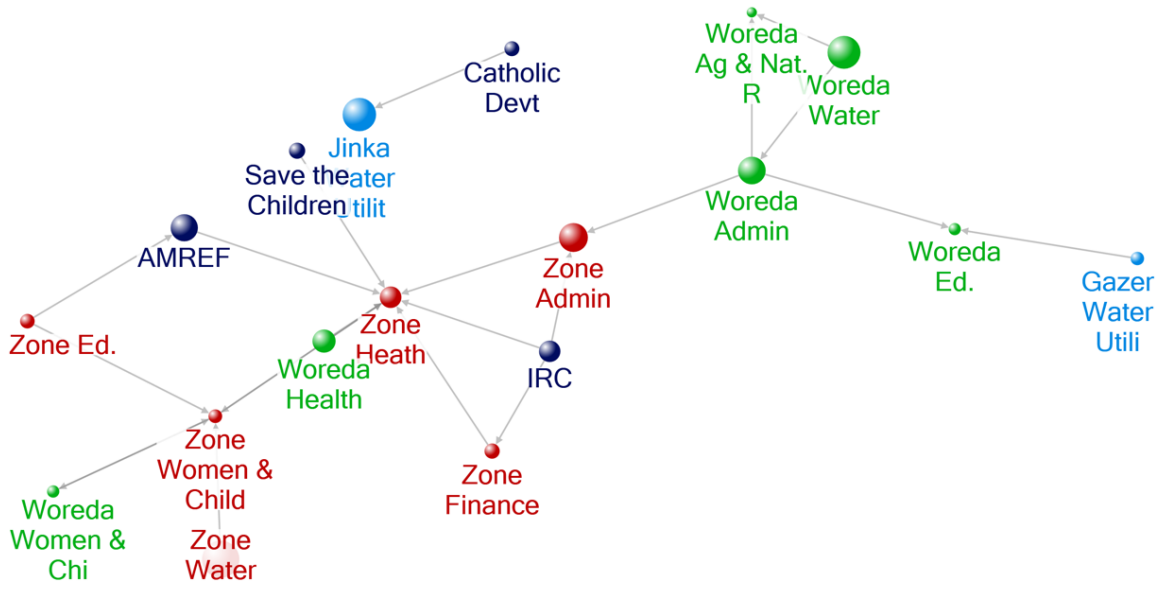
This suggests that overall engagement within the Learning Alliance for expertise is already quite robust and can be built upon, while engagement around spare parts is an area that needs significant attention for improvement.

Table 7: Information-Sharing Network Comparison by Use

Information Coded as "Used"



Information Coded as "Unused"



6. Strong information-sharing relationships tend to be centralized.

During the survey, respondents were asked to note whether they had used the information received through information-sharing relationships. This was used as a proxy for the strength of the information sharing, under the assumption that strong information-sharing relationships will involve information that is useful. Examining the network of information-sharing relationships in which the information is used

and unused shows that the stronger relationships tend to concentrate around a group of highly central actors while weaker relationships tend to be more distributed throughout the network. Most notably, information-sharing relationships involving the zone and woreda water offices, the zone finance office, and the NGOs AMREF and IRC tend to result in information being used. The organizations that are highly central in the strong information-sharing network have potential to be tapped by the Learning Alliance for activities that involve improving the effectiveness of information dissemination in the network.

7. Formal reporting tends to flow up to the zone level.

Formal reporting in the network tends to flow, expectedly, into the zone-level governmental offices responsible for administrative and budgeting matters, most notably the Zone Finance and Economic Development Department (twelve incoming reporting relationships) and the Zone Administration Bureau (eight incoming reporting relationships). One result of this trend is that nearly all NGO reporting relationships with government offices are at the zone rather than woreda level. This contrasts sharply with NGO information sharing, problem solving, and coordination relationships, which are common with government offices at both geographic levels. Although it is likely not in the interest of any Learning Alliance members to increase the amount of formal reporting to woreda government offices, the Learning Alliance platform can be an effective means to ensure that all relevant information currently contained in formal reports is shared widely across offices at both geographic levels. In future iterations of the ONA, this may be examined as part an overall analysis of information sharing effectiveness.

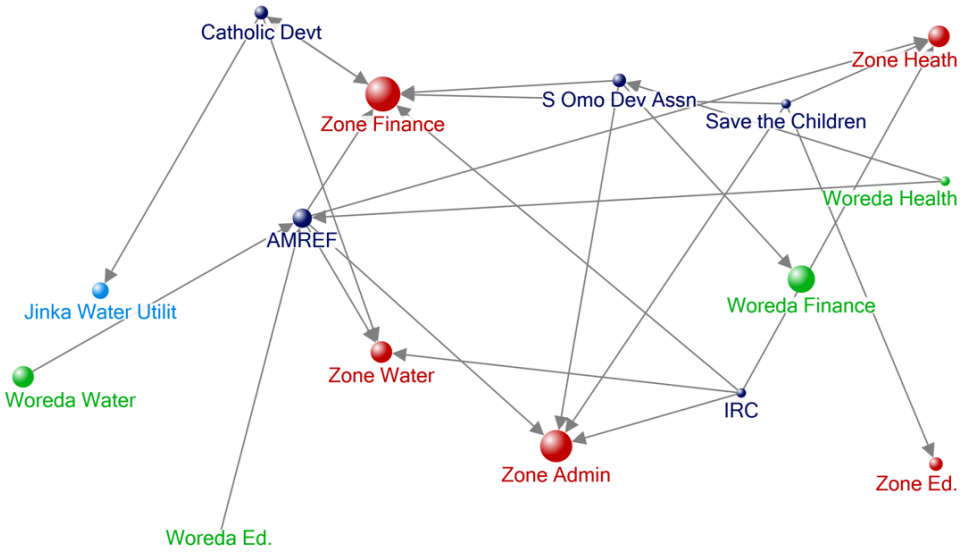


Figure 6: South Ari NGO Reporting Relationships

Mille

The network of prospective Learning Alliance participants included in the analysis consisted of 21 organizations[12]: seven woreda government offices; five Afar regional government offices; six NGOs, including one World Bank-funded project which was categorized as an NGO for the purposes of analysis; one academic institution; and one town water utility.

1. Woreda government offices in Mile are overall less influential than NGOs or regional government offices.

Across all relationship types, every analysis examining influence shows that woreda government offices tend to be less influential in the network than regional government offices or NGOs. For example, looking at the betweenness centrality metric for information-sharing relationships (a normalized measure of the extent to which an organization lies on the shortest information path between any two other organizations) shows that out of the 10 organizations with the highest scores, only two are woreda government offices, while the rest are regional government offices or NGOs.

Table 8: Organizations by Information Sharing Betweenness Centrality

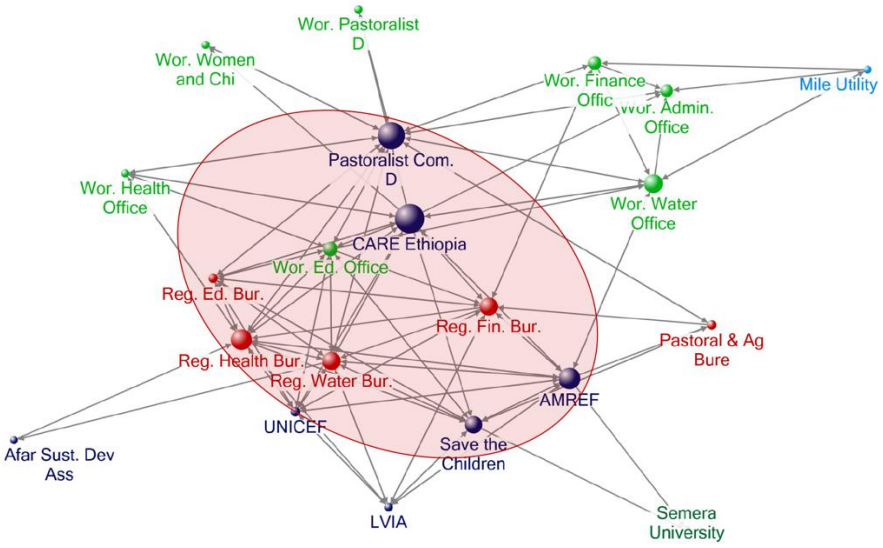
Organization	Info Sharing Betweenness Centrality
Pastoralist Community Development Program	0.288
Regional Health Bureau	0.101
Regional Water Resource Bureau	0.092
Woreda Water Office	0.091
CARE Ethiopia	0.086
AMREF	0.083
Regional Finance and Economic Development Bureau	0.048
Save the Children	0.045
Woreda Education Office	0.043
Regional Education Bureau	0.024

[12] An additional NGO, VSF Germany, was originally included on the list, but their Mille office does not have any WASH activities and thus they were not interviewed and were excluded from the analysis. See the annex for a full list of network members.

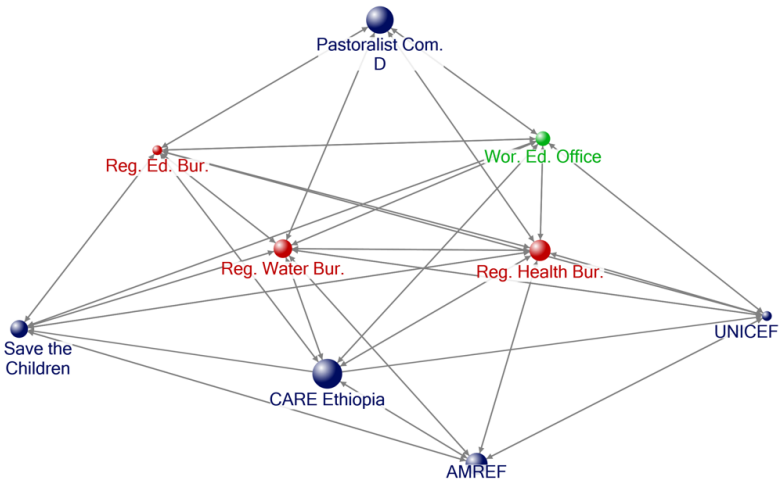
Another way to examine this trend is by examining which sub-group of organizations forms a densely connected core set of relationships within the overall network.[13] Of this core group for information-sharing relationships, all except one are either NGOs or regional government offices. Woreda government offices, on the other hand, are nearly all members of the network periphery with relatively few connections among themselves or with the core group.

Table 9: Mille Information-Sharing Core Network

Information-Sharing Network with Core Group Circled



Information-Sharing Network Core Group



[13] Core relationships are determined using an algorithm that identifies a set of network members with particularly dense relationships among themselves (the core) relative to the rest of the network (the periphery).

Node Color:

- Woreda Gov't Office
- Zone Gov't Office
- Town Water Utility
- NGO
- Academic Institution

Node Size Corresponds to actor centrality

Participants flagged coordination in general during the Learning Alliance kick-off as a major gap that is important for water service sustainability. Given the importance of woreda government offices in day-to-day local water issues, the level of integration of the woreda into the core network will be compared to the baseline level as one important indicator of the extent to which the Learning Alliance contributes to a shift in relationships with implications for the sustainability of water services in Mille.

2. There are particular gaps in information sharing and coordination between NGOs and woreda government offices.

NGOs are more likely to have information-sharing relationships with regional rather than woreda government offices. Furthermore, information-sharing relationships from NGOs to regional government offices are distributed among many organizations, whereas information-sharing relationships from NGOs to woreda government offices are concentrated within just a few organizations. In addition, even though NGOs are active at the woreda level, the woreda water office does not have an active coordination relationship with most of these NGOs and is in fact multiple degrees removed from some NGOs including AMREF and Save the Children.

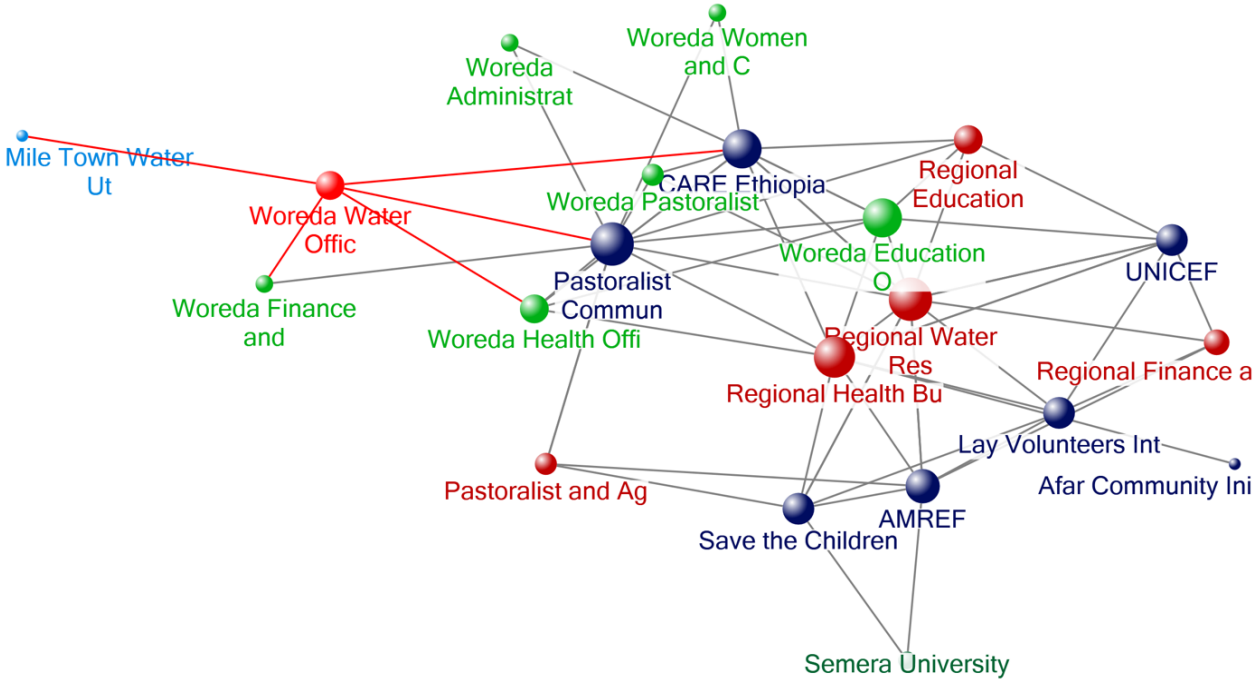
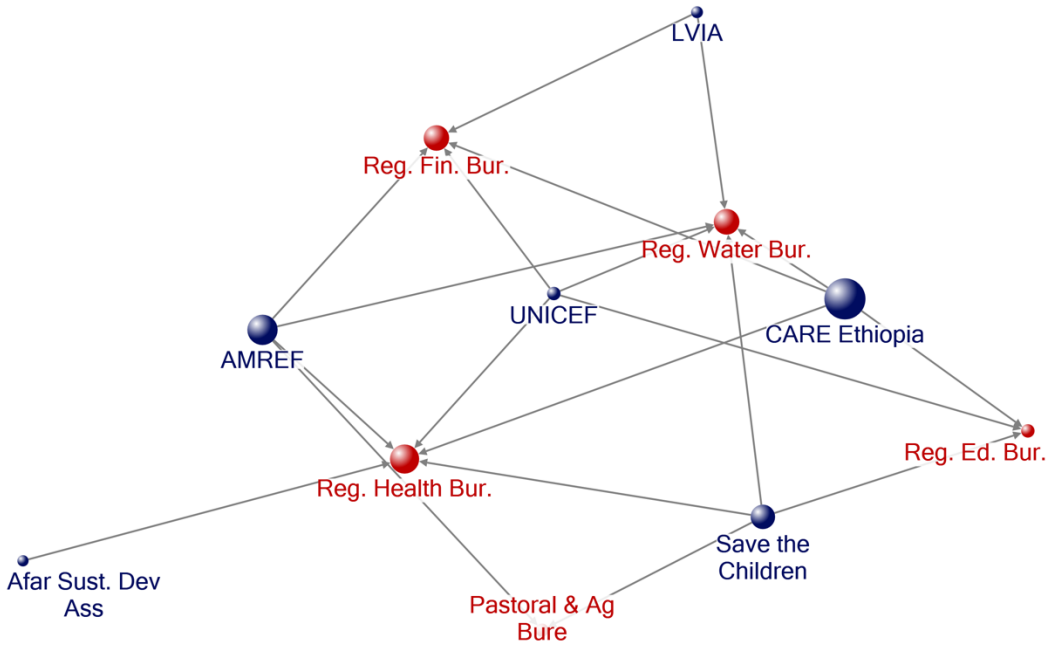


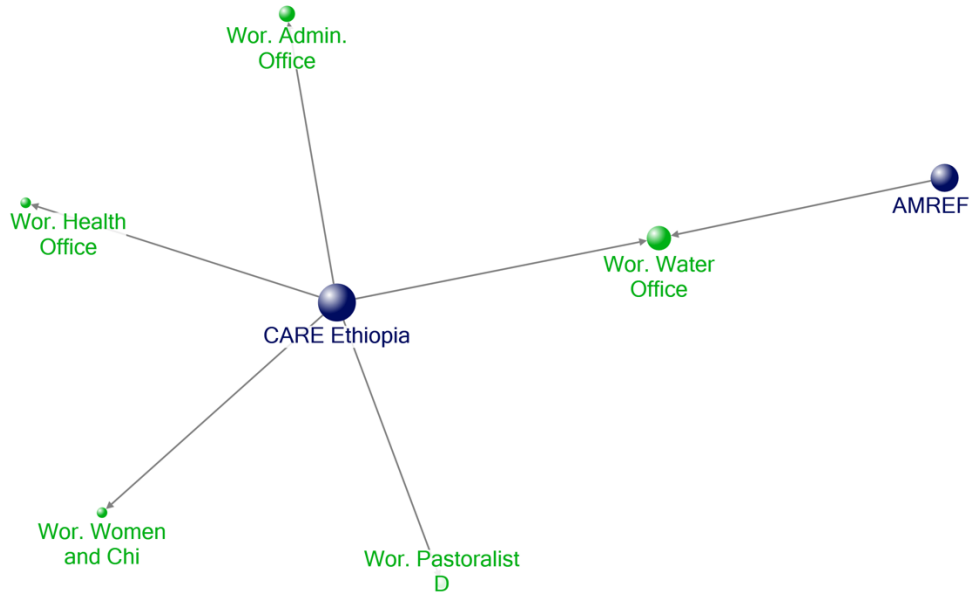
Figure 7: Mille Coordination Network with Woreda Water Office Relationships Highlighted in Red

Table 10: Information-Sharing from NGOs in the Mille Network

Information Sharing from NGOs to Regional Government Offices



Information Sharing from NGOs to Woreda Government Offices



These results were presented back to the participants during the Learning Alliance kick-off meeting, and the discussion around Learning Alliance structure focused on this gap, highlighting the important

consequences for the sustainability of local water services. For example, stakeholders stressed that wells that have been dug by NGOs are often abandoned due to a lack of coordination with the woreda government. If studies are conducted at all, the information is not shared with the woreda government, often resulting in issues maintaining sufficient water quality and quantity after boreholes have been drilled.

These insights from local stakeholders align with the findings of the network analysis and suggest that one clear area of potential beneficial structural change is improved information sharing and coordination from NGOs and regional government offices to woreda government offices. This will be something to strongly consider during the Learning Alliance strategy development process as well as something that is tracked and compared to the baseline in future ONAs.

3. In general, organizations in the Mille Learning Alliance tend to have frequent interactions on WASH issues across organizational types.

In other words, woreda government offices tend to have frequent interactions with organizations from outside the woreda government, NGOs tend to have frequent interactions with non-NGOs, etc. This can be seen when comparing the percentage of in-group information-sharing relationships to out-group information-sharing relationships.

Table 11: Mille and South Ari Information-Sharing Network Connection Comparison

	Mille In-Group Relationships	Mille Out-Group Relationships
Regional/Zonal Government Office	16.42%	83.58%
Woreda Government Office	12.00%	88%
Non-Governmental Organization	17.72%	82.28%

This suggests that there is limited clustering of organizations by geographic level and a more even distribution of relationships across the network. This likely reduces the need to have multiple engagement points for the learning alliance at different geographic levels, since the opportunity seems to exist to build on existing engagement points between geographic levels.

4. Information that is shared tends to be used.

Nearly all (89%) recipients of information in Mille reported using information that was received. This aligns with the Learning Alliance kick-off meeting discussion, during which participants generally cited the lack of information sharing rather than the quality of information shared as a primary issue. This suggests that although there is undoubtedly room for improvement in the quality of WASH information shared, there is a more immediate need for sharing the information that is already being produced.

5. Problem-solving relationships tend to include requests for expertise; however, responses to these requests are often perceived to be unreliable, in particular by woreda government offices.

Expertise, including technical assistance, was the most cited type of support request. Although most responses were perceived as reliable, the responses in 10 out of 28 of these reported relationships (35.7%) were perceived to be unreliable by the requestor. The overall perceived lack of reliability in getting a response to a problem-solving request is most acute among woreda government offices, with nearly half (45.5%) of requests from these offices perceived to have received an unreliable response.

Table 12: Percentage of Problem-Solving Requests Made with a Response Perceived as "Reliable"

	Reliability Percentage
Regional Government Offices	95.5%
NGOs	64.7%
Woreda Government Offices	54.5%

This result further confirms the need for the Learning Alliance to focus on ways to improve connections between woreda government offices and the rest of the network. Given the frequency of expertise needs and the importance of technical assistance in maintaining sustainable water services, it will be critical for these requests to be addressed reliably.

6. Perceptions of organizational influence in Mille generally line up with influence measures derived from the relationship data; however, there are some exceptions, including the woreda water office and the World Bank-funded pastoralist development program.

For the most part, the influence index scores for organizations in the network corresponding to the participants' perceptions generally align with the derived influence index scores. However, there are two notable exceptions: the World Bank-funded pastoralist development program is perceived to be heavily disconnected despite having high centrality measures from reported relationships, while the woreda water office is perceived to be highly connected and influential despite having relatively low influence measures derived from survey data. Apart from these organizations, stakeholder perceptions generally line up with derived influence measures from the survey, with the correlation r^2 increasing from 0.19 to 0.46 when these two organizations are removed.[14]

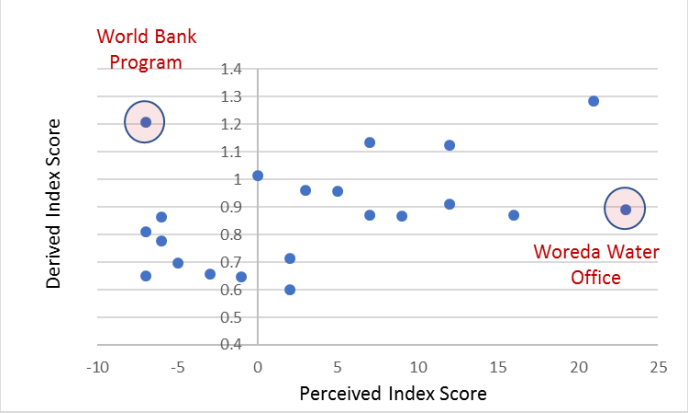


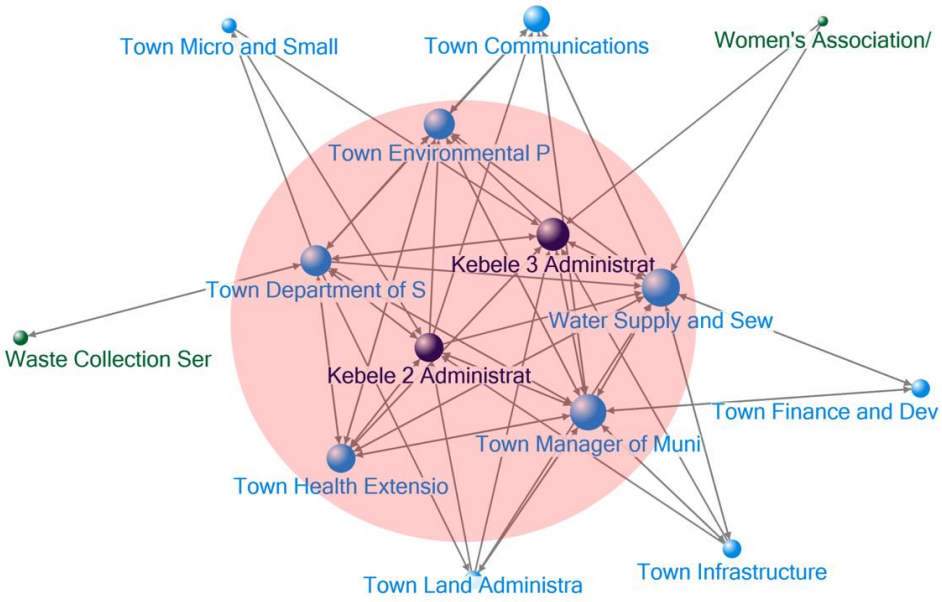
Figure 8: Mille Perceived and Derived Influence Index Scores

[14] Note that this correlation may not seem particularly high; however, there are important differences in what these two scores measure, with the "Derived Index" measuring a combination of different network centrality measures, and the "Perceived

This result was not explicitly discussed during the Learning Alliance kick-off meeting, and so requires further investigation during later Learning Alliance meetings and follow-on analyses to determine the drivers of this disconnect. In particular, the perception that the woreda water office is more connected to the network than the survey data suggests is an indication that the Learning Alliance facilitator may need to explicitly focus on bringing this office into Learning Alliance activities to ensure that beneficial interactions happen with the rest of the network.

Woliso

The network analysis examined each relationship type among the 15 organizations identified by Tetra Tech as likely Learning Alliance participants, consisting almost entirely of town-level government offices, with the exception of two private organizations and two *kebele* (neighborhood) representatives. This is a very different context than the other Learning Alliances, because the organization types are relatively homogenous, the context is a small town rather than a district, and the focus is on sanitation rather than water.



Node Color:

- Town Government Office
- Kebele Government Office
- Private Organization

Figure 9: Problem Solving Network with Core Group Highlighted

Index" simply measuring the number of mentions in open-ended questions. The correlation is a way of testing whether there is a *general* pattern of alignment between the data from the survey of actual relationships and the data from the open-ended questions, as one would not expect there to be a perfect alignment between scores.

1. There is a strong distinction between a "core" group of organizations in the network and a "peripheral" group of organizations in the network, particularly regarding information sharing and problem-solving relationships.

For these relationship types, the analysis indicated a clearly defined group of highly central organizations with strong connections among themselves, with other organizations in the network less closely connected to this group and almost completely disconnected from one another. This can be seen in the dense web of connections among the core group highlighted in the problem-solving relationship network, as well as by looking at the densities of all relationships among core organizations relative to densities for relationships with organizations in the periphery. Among organizations in the core, density is 0.9, meaning that 90% of all possible organizational pairs have some relationship. Among organizations in the periphery, the density is 0.236, meaning that only 23.6% of all possible organizational pairs have any type of relationship.

Table 13: Core/Periphery Densities

	Density
All Relationships Among Core Group Members	0.900
All Relationships Between Core Group and Periphery Group Members	0.463
All Relationships Among Periphery Group Members	0.236

When core/periphery relationships are calculated separately for the three key relationship types (information sharing, problem solving, and coordination), one can see the overlap in certain organizations as members of the core group across the three most common relationship types (see Figure 10 below).

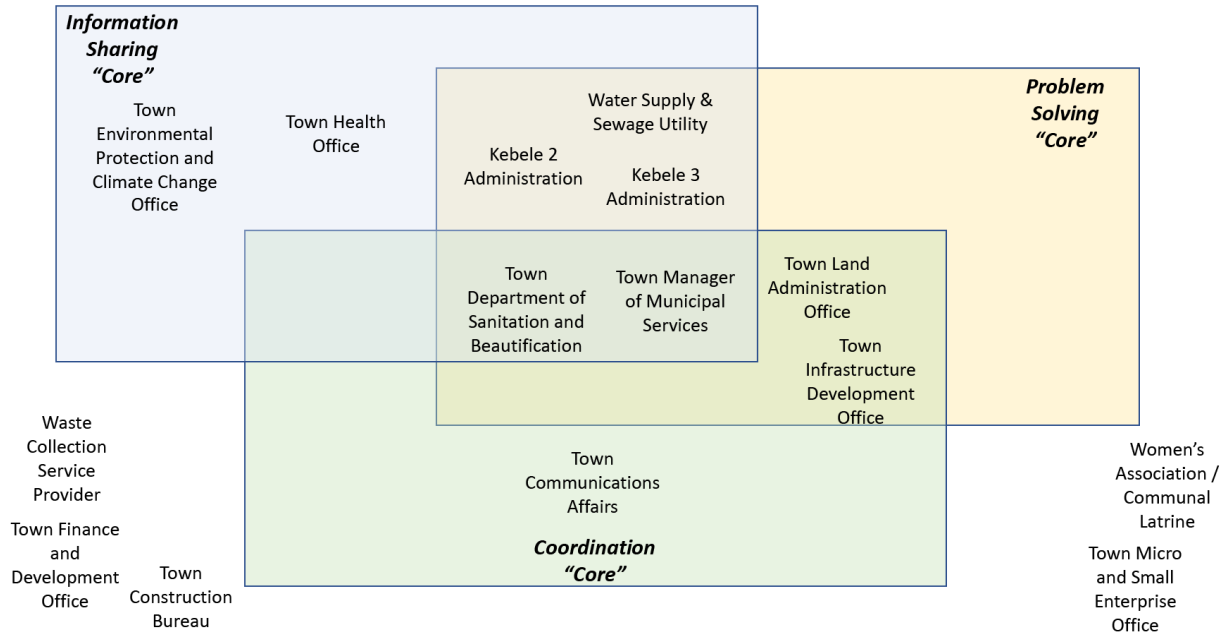


Figure 10: Core/Periphery Group Members by Relationship Type

This shows that although the core group of organizations is different across different relationship types (as would be expected, since a given organization's problem solving requests are going to be different than its information sharing), there are a few organizations including the Department of Sanitation and Beautification, the Manager of Municipal Services, the Land Administration Office, the Infrastructure Development Office, the Water Utility, and the two Kebele representatives that are in the core across multiple types of relationships.

This result was shared back with the participants during the Learning Alliance kick-off meeting. Participants stressed that this structure aligns with their perception of how day-to-day interactions happen around sanitation issues, leading to a suggestion that the Learning Alliance could build on the strong existing relationships with tiered levels of engagements for participants. This core group has the most political capital to effect change in the sanitation system, and so more regular engagement among this group to specifically engage on sustainability issues will yield the most results.

2. Some specific organizations currently in the periphery are particularly important for local sanitation issues.

Discussions with both the local facilitator and the Learning Alliance participants during the kick-off meeting revealed that the women's association in charge of the communal latrine and the town finance office are particularly important local stakeholders to understand and overcome sanitation challenges. However, these organizations are both on the periphery of the network, with very few relationships to any other organizations, as seen in Figure 11 (with their relationships highlighted in red).

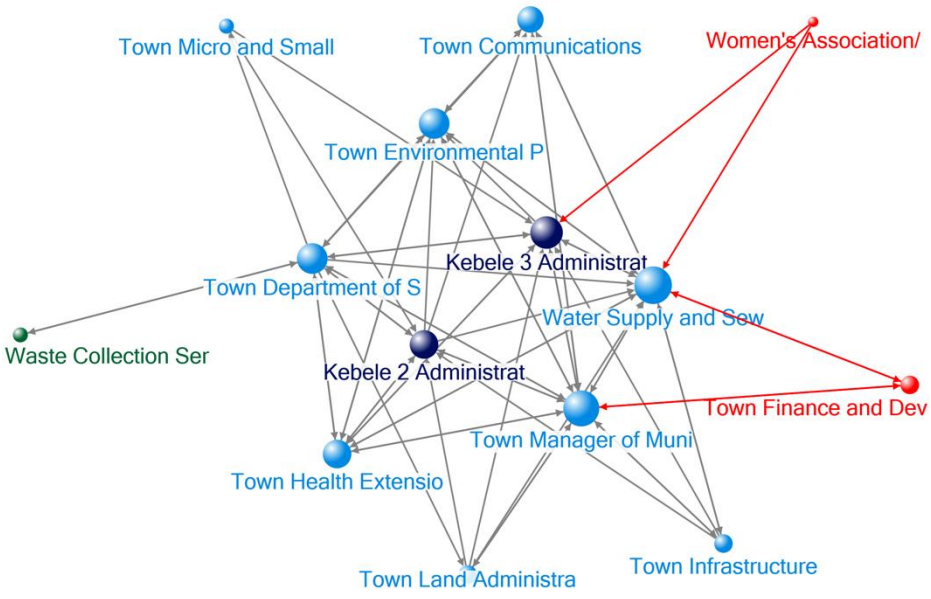


Figure 11: Information Sharing Network with Women's Association and Finance & Development Office Highlighted

This result was discussed during the Learning Alliance kick-off meeting. This led to some debate over the role of the finance office, which is kept deliberately out of day-to-day information sharing or coordination with most organizations to avoid conflicts over favoritism. Participants generally agreed that this is a good thing, and that the Learning Alliance should not try to bring the finance office more into the core group.

The discussion around the women's association, however, led to agreement that the Learning Alliance should deliberately try to increase engagement between the overall core group of participants and the women's association. This organization has a deep understanding of how sustainability issues are playing out in the community, and thus integrating it more into the core network will help ensure the core group's activities reflect the reality on the ground.

3. The coordination relationship network is relatively sparse and has two distinct clusters of organizations.

It is not surprising that there is a gap between the level of information sharing and coordination, as one would not expect all instances of information sharing to also include active coordination on activities. However, there is a particularly steep drop-off in relationships, with 68 information-sharing relationships and 31 coordination relationships.

In addition, the structure of the network for coordination is distinct from other relationship types. Whereas problem-solving and information-sharing relationships both exhibit a clear core/periphery structure, coordination relationships show clear clusters, with each cluster representing a set of closely connected organization.

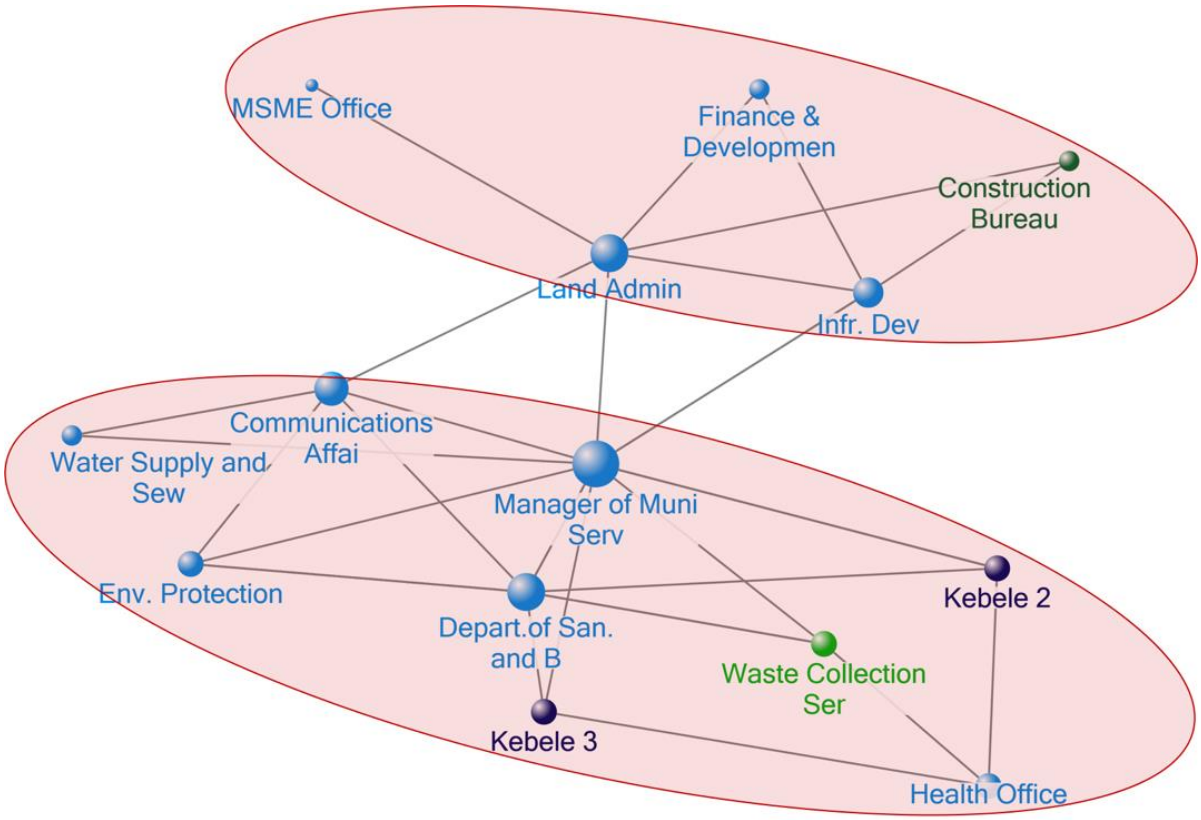


Figure 12: Coordination Network with Clusters Circled

This result was shared back with participants during the Learning Alliance kick-off meeting. This discussion led to an overall agreement by Learning Alliance members that coordination is currently lacking within the sector. More importantly, though, this discussion served as a way for the facilitator to move the focus of the meeting away from the formal roles and responsibilities of members and towards a discussion on how actual relationship between organizations have important implications for sustainability. As the Learning Alliance facilitator later put it, "If we didn't have the network diagram to guide us, we would have started with a focus on each organizations' formal mandate, and probably just discussed who has more of a mandate when it comes to sanitation." Because the Learning Alliance will be designing activities that are supposed to take into account the actual realities of local systems dynamics rather than just the existing formal hierarchical structures, this shift was an important first step in moving towards an effective strategic design process.

"If we didn't have the network diagram to guide us, we would have started with a focus on each organization's formal mandate, and probably just discussed who has more of a mandate when it comes to sanitation."

– Woliso Learning Alliance Facilitator

4**. Kebele representatives have influential network positions.**

Although the two Kebele representatives do not have the same level of formal authority as the town-level offices, their relatively high betweenness centrality scores in terms of information sharing represent their relative importance as information brokers in the network. This finding points to the importance of including Kebele representatives as part of the core Learning Alliance group to ensure that information from the Learning Alliance is widely disseminated among stakeholders. This also further drives home the importance of considering the local dynamics outside of formal authority roles, since the Kebele representatives seem to be far more influential in their actual network position than their formal responsibility would suggest.

Table 14: Information Sharing Betweenness Centrality

Organization	Information Sharing Betweenness Centrality
Town Department of Sanitation and Beautification	0.258
Town Manager of Municipal Services	0.194
Water Supply and Sewage Utility	0.132
Kebele 3 Administration	0.088
Kebele 2 Administration	0.06
Town Health Extension Office	0.016
Town Environmental Protection and Climate Change Authority Office	0.008
Town Communications Affairs Office	0.004
Town Infrastructure Development Office	0.003

5. Perceptions of organizational influence generally line up with influence measures derived from the analysis, though there are exceptions.

For most organizations in the network, the perception of organizational influence among the stakeholders in Woliso lines up with the influence measures derived from the ONA survey. Using the same index scoring methodology described previously, there is a moderate correlation between the aggregated perception of an organization's influence and the aggregated influence measures from the survey (r^2=.46). The most significant deviations from this pattern are the Town Land Administration Office, which stakeholders perceive to be highly disconnected, but which has relatively high influence scores derived from the survey, and the town utility, which stakeholders perceive to be highly connected and influential, but which has relatively low influence scores derived from the survey; when these actors are removed, the r^2 value increases to .67.

Although this result was not specifically discussed at the Learning Alliance kick-off meeting due to time constraints, the gap between the perception of the town utility's connectedness and the utility's actual set of relationships based on the survey is something that merits consideration during the Learning Alliance strategy development process. The Learning Alliance platform could be a mechanism to close this gap by providing more opportunities for direct engagement between the utility and other participants.

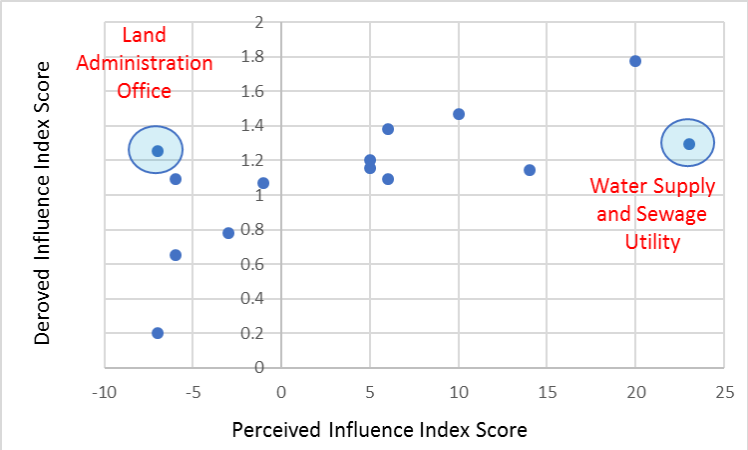
Conclusions

Taken together, the ONA findings suggest several overall recommendations for the Learning Alliances as well as lessons learned for future network analyses.

The role of NGOs varies between Learning Alliances, and it will be important to engage them in ways that build on their specific position in each network.

In South Ari, the ONA revealed significant engagement points between NGOs and both zone and woreda government offices, but very few engagement points among the different NGOs. This finding has two implications: (1) NGOs appear to serve as important information bridges between zone and woreda government offices, a role that can be capitalized on during Learning Alliance activities that require coordination between geographic levels; and (2) there is a need to improve information flows between NGOs in the network. In contrast, in Mille, NGOs occupy a different place in the network: although there is engagement among NGOs, there is a lack of engagement between NGOs and woreda government offices. Qualitative input from other analyses in Mille suggests that this lack of coordination has led to duplication of efforts to develop and maintain water infrastructure in some areas while other areas remain underserved. In Mille, therefore, one way the Learning Alliance can improve water sustainability is by focusing specifically on information and problem-solving relationships between NGOs and woreda government offices.

Figure 13: Woliso Perceived and Derived Influence Index Scores



Learning Alliances can build on existing effective relationship structures, as well as work to actively close important existing relationship gaps.

The structures of the local stakeholder networks vary considerably between the different sites, presenting distinct opportunities and challenges. In South Ari, there are strong existing clusters of relationships among organizations at the woreda and zone levels, suggesting that a strong Learning Alliance structure could incorporate these natural clusters into the overall design through engagement points specifically targeted at each geographic level. On the other hand, in Mille there is a set of existing relationships among NGOs and regional government offices, with woreda government offices being much more disconnected. The Learning Alliance can deliberately target this disconnect by working to increase information flows and coordination between woreda government offices and the rest of the network. In Woliso, it will be important to focus on how and to what extent peripheral network members are engaged in the Learning Alliance. The most salient feature of the Woliso network is the presence of a strong core of organizations that already have significant interaction. This group does not include some critical local

organizations, such as the Women's Association responsible for the communal latrine. Given that these peripheral organizations have the most direct day-to-day engagement with shared sanitation facilities and close to real-time information on facility needs and trends, greater information sharing and coordination between decision-makers and the organizations responsible for shared sanitation facilities represents a gap that could be improved through the Learning Alliance.

Participatory engagement in design and analysis improves the usefulness of results.

The way in which network analysis research is designed and implemented determines the extent to which the results are applicable to the network members. By engaging various Learning Alliance members and facilitators in Ethiopia to better identify areas of interest, LINC was able to generate and communicate findings with actionable implications, such as the findings outlined above with direct implications for Learning Alliance membership structures. Despite this process, there were certain parts of the survey and analysis that proved less useful and took considerable time to collect and analyze. For instance, the survey and analysis included a detailed breakdown of the specific types of problem solving requests being made in the network; however, the nature of these requests was largely a function of each organization's mandate (e.g., finance requests tend to go to the finance office). Since these mandates are generally not something that can be changed, the local facilitators and stakeholders considered these findings less actionable than those around information sharing and coordination. An up-front engagement process that included more in-depth discussions of potential results and their implications with a broader set of the Learning Alliance members may have allowed for more targeted analysis.

In addition, greater opportunities to feed results back to participants would have allowed for a more comprehensive understanding of why certain relationship patterns exist. Given the time constraints of the kick-off meetings, a full discussion of all results was not possible. As the Learning Alliances develop, it will be useful to continue to engage participants with the results to better understand underlying causes for future analyses.

It is better to focus with greater depth on fewer relationship types.

Participants noted that that although the overall quantity of engagement for some relationship types appears to indicate a high degree of network connectivity, these connections are not actually indicative of meaningful collaboration. In follow-up analyses, it will be beneficial to dive more deeply into the strength of relationships, in particular around information sharing and coordination relationships, with regards to how these relationships impact WASH sustainability. For example, for coordination, it will be helpful to analyze not only whether coordination happened, but also whether that coordination resulted in any specific actions being taken to contribute to improved sustainability. For information sharing, in addition to asking whether the information was used, it will be useful to understand if and how this information related specifically to one of the factors identified by the Learning Alliance as a key driver of WASH sustainability.

ONAs can be best used in concert with other analysis methods to give a complete understanding of a local system.

ONA is an important tool for designing and targeting more effective technical assistance but is best used in complement with other analytical methods. By identifying how actors are placed, with whom, and to

what extend they interact with others in the network, resources can be more accurately and effectively allocated through the system. However, relationships are just one piece of the systems puzzle, and can only be fully interpreted alongside a deep understanding of other factors. LINC will explore ways to better integrate future network analyses with other analyses being undertaken by the SWS team.

Annex 1: Overall Network Metrics and Centrality Tables

Selected Network Metrics

South Ari Network Metrics

	Information Sharing	Problem Solving	Coordination	Reporting
Density	0.31	0.201	0.281	0.129
Avg. Degree	6.5	4.227	5.909	2.571
Avg. Distance	1.778	2.156	1.879	2.632
Reciprocity	0.867	0.559	N/A	0.148

Mille Network Metrics

	Information Sharing	Problem Solving	Coordination	Reporting
Density	0.29	0.16	0.257	0.092
Avg. Degree	5.81	3.19	5.143	1.471
Avg. Distance	1.908	2.491	2.076	2.184
Reciprocity	0.756	0.448	N/A	0.08

Woliso Network Metrics

	Information Sharing	Problem Solving	Coordination	Reporting
Density	0.374	0.305	0.286	0.141
Avg. Degree	4.857	4.267	3.714	1.692
Avg. Distance	1.704	1.793	2.033	2.014
Reciprocity	0.765	0.375	N/A	0.182

Selected Centrality Metrics – South Ari

Organization	Problem Solving In-Degree Closeness Centrality	Information Sharing Betweenness Centrality	Coordination Closeness Centrality
AMREF	0.568	0.058	0.568
Catholic Development	0.457	0.011	0.6
Gazer Town Water Utility	0.368	0.004	0.42
International Rescue Committee	0.618	0.053	0.568
Jinka Town Water Utility	0.477	0.053	0.412
Jinka TVETC	0.42	0	0.438
Save the Children	0.488	0.015	0.525
South Omo Development Association	0.429	0.002	0.488
Woreda Administration Office	0.477	0.054	0.568
Woreda Agriculture and Natural Resource office	0.368	0	0.447
Woreda Education Office	0.447	0.011	0.525
Woreda Finance and Economic Development Office	0.568	0.005	0.568
Woreda Health Office	0.525	0.049	0.553
Woreda Water, Mine, and Energy office	0.568	0.189	0.7
Woreda Women and Children Affairs office	0.389	0.008	0.467
Zone Administration Office	0.457	0.093	0.583
Zone Agriculture and Natural Resource Department	0.382	0.012	0.538

Zone Education Department	0.382	0.012	0.553
Zone Finance and Economic Development Department	0.568	0.013	0.656
Zone Health Department	0.488	0.058	0.6
Zone Water, Mine, and Energy Department	0.618	0.137	0.677
Zone Women and Children Affairs Department	0.42	0.01	0.5

Selected Centrality Metrics – Mille

Organization	Problem Solving In-Degree Closeness Centrality	Information Sharing Betweenness Centrality	Coordination Closeness Centrality
Pastoralist Community Development Program	0.253	0.288	0.667
Regional Health Bureau	0.377	0.101	0.645
Regional Water Resource Bureau	0.526	0.092	0.667
Woreda Water Office	0.333	0.091	0.465
CARE Ethiopia	0.444	0.086	0.606
AMREF	0.417	0.083	0.513
Regional Finance and Economic Development Bureau	0.455	0.048	0.455
Save the Children	0.417	0.045	0.5
Woreda Education Office	0.256	0.043	0.571
Regional Education Bureau	0.317	0.024	0.526
Woreda Finance and Economic Development Office	0.143	0.023	0.435
Pastoralist and Agriculture Bureau	0.313	0.009	0.488
UNICEF	0.426	0.008	0.476
Woreda Administration Office	0.282	0.006	0.426
Lay Volunteers International Association (LVIA)	0.143	0.004	0.5
Woreda Health Office	0.328	0.002	0.541
Mile Town Water Utility	0.333	0.001	0.323
Woreda Pastoralist Development Office	0.364	0	0.5
Woreda Women and Children Affairs Office	0.351	0	0.426
Afar Community Initiative Sustainable Development Association	0.25	0	0.4
Semera University	0.345	0	0.351

Selected Centrality Metrics – Woliso

Organization	Problem Solving In-Degree Closeness Centrality	Information Sharing Betweenness Centrality	Coordination Closeness Centrality
Town Department of Sanitation and Beautification	0.519	0.258	0.692
Women's Association/Communal Latrine	0.2	0	0
Waste Collection Service Provider	0.2	0	0.577
Town Land Administration Office	0.538	0	0.718
Town Manager of Municipal Services	0.737	0.194	0.846
Town Finance and Development Office	0.609	0	0.481
Town Environmental Protection and Climate Change Authority Office	0.5	0.008	0.564
Water Supply and Sewage Utility	0.636	0.132	0.526
Kebele 3 Administration	0.538	0.088	0.577
Town Health Extension Office	0.636	0.016	0.494
Town Infrastructure Development Office	0.737	0.003	0.641
Town Communications Affairs Office	0.412	0.004	0.679
Town Micro and Small Enterprise Office	0.212	0	0.442
Kebele 2 Administration	0.519	0.06	0.577

Annex 2: Interview Guide

Please read to respondent before starting survey:

My name is [NAME]. I am working with a consortium including IRC WASH, Tetra Tech, LINC, and the University of Colorado Boulder, conducting a survey of organizations involved in water and sanitation service delivery in [TOWN OR WOREDA NAME]. The results from this survey will support the development of a local Learning Alliance to help facilitate improved sustainability of local WASH services. Your organization has been identified as a key local stakeholder for this local Learning Alliance.

There are two parts to this interview. For the first part, we are interested in learning about your perspective on how to make water services more sustainable in [TOWN OR WOREDA NAME]. I will ask you five questions that should take about 15 minutes. These questions are about your opinion of challenges to achieving sustainable water and sanitation services, solutions to these challenges, and how you think they can be overcome. The second part of the survey will include questions on how your organization interacts with other organizations in the WASH sector.

Your participation in this survey is entirely voluntary. I am going to record the first part of this interview, but the recording will only be shared with IRC WASH, Tetra Tech, and the University of Colorado Boulder for this project. They may use your responses to advise the visioning activities for the Learning Alliance, but your responses will not be connected to your name, and so your information will be protected. Knowing this, do I have your permission to record this interview? Do you have any questions before we begin? I will start the recording now [HIT RECORD].

Pre-survey: Factor Analysis Questions

Read: Can you please state your name, the organization and your role there, and today's date?

1) In your opinion, what do you think are the main problems to water service sustainability in your woreda? [Note to enumerators: If shallow response, such as "limited capacity", follow-up to make this clear, "limited capacity of what?" One way to also get more information is to ask this is "Why is that challenging to sustainability?"]
2) What ideas or recommendations do you have about solutions to these problems?
3) Of the solutions you listed, which is the most important? Can you walk me through what next steps would happen if the solution occurs?
4) In your opinion, how effective is coordination in your woreda for sustainable water services? What could be improved?
5) Can you walk me through how do you see improved coordination leading to more sustainable water services in the woreda? For example, how could it solve some of the problems you mentioned before?

Read: Thank you for sharing your perspective on this. I will now stop the recording and begin the second part of the interview. [STOP RECORDING]

For the second part of this interview, you will not be recorded. This section will help the project team map organizations working in this area and identify their relationships with other organizations. This data

will be used as part of IRC WASH and Tetra Tech's Learning Alliance development to help ensure that all activities are taking into account the complex relationships between key stakeholders such as [ORGANIZATION NAME.] This should take about 30 minutes to complete.

The analysis based on this survey will be presented as part of the initiation of the Learning Alliance, which you have already heard about from our partners at IRC or Tetra Tech. Because the analysis will be looking at relationships between organizations, there will be parts of the analysis which include looking at specific organizations, and therefore your responses to this section should not be considered as fully anonymous. In presenting the information, however, we will always refer to the organization names rather than specific respondent names; for example, we would refer to the answer from the "Woreda Water Office" rather than the person who responded on behalf of that office. Do you have any questions before we begin?

Section 1: Respondent and Organizational Information

Read:
First, I would like to get some information on you and your organization. Your personal information will not be shared outside of the analysis team and will be used for the purposes of being able to contact you for any follow up, as well as to track if the respondent from your organization changes when we repeat the survey in future years. The organizational information will be used to understand how different types of local organizations interact and work together, and where there may be gaps in collaboration among or between different types of organizations that could be addressed through the Learning Alliance. The results will be presented back to the Learning Alliance, and we hope to use them to help the whole WASH sector function more effectively. For each question, I will read a set of potential responses and ask you the response or responses that best match your organization.

Instructions: Read aloud each prompt. Record the response exactly as stated by the respondent. For all names, ask to ensure the spelling is correct.

Prompts (Short Answer):

1. Organization (from pre-populated list):
2. Individual Name:
3. Position:
4. Individual Phone:
5. Individual E-mail:
6. Is anyone else from this organization present?
   a. [IF YES] Please enter the names and positions of all other individuals present from the organization.

Instructions: Read each question to the respondent. After reading the question, read all responses and ask the respondent to name either one or all that apply (this will be noted in the question). If necessary, repeat some or all answer choices.

Questions:

1) What category best describes the nature of your organization? (Select only one; please read all responses before finalizing selection)
    a. Government Office
    b. Public Enterprise (such as water utility)
    c. Non-Governmental Organization
    d. Community-Based Organization
    e. Academic Institution (including TVET)
    f. Private Sector (including formal companies and MSMEs)
    g. Other (Specify)

2) What is the geographic coverage area of your WASH-related activities in this region? (Select only one) Note: If an organization works across multiple woredas, they should indicate "zone" and if they operate across multiple zones in the region, they should indicate "region."
    a. Kebele
    b. Town
    c. Woreda
    d. Zone
    e. Region
    f. Other (Please Specify)

3) In what sector are you implementing or supporting activities in [GEOGRAPHY OF LEARNING ALLIANCE]? (Check all that apply).
    a. Water Supply
    b. Sanitation
    c. Hygiene
    d. Institutional WASH

4) Please indicate your organizational functions or missions with regards to WASH in [GEOGRAPHY OF LEARNING ALLIANCE]. (Check all that apply)
    a. Permitting, Monitoring, and Regulation
    b. Capacity Building
    c. Advocacy
    d. Coordination
    e. Financing
    f. Community Mobilization
    g. Hygiene Promotion
    h. Research
    i. WASH Service Provision (including hygiene extension workers)
    j. WASH Maintenance Support (including spare parts provision, water supply maintenance, and removal of waste)
    k. WASH Infrastructure Development
    l. Other:

Section 2: Organizational Relationships

Read:

Now I will ask you some questions about the nature of the ways in which [ORGANIZATION NAME] interacts with other organizations working in the WASH sector in [LOCATION NAME]. These questions

will be used to understand how different types of local organizations interact and work together, and where there may be gaps and strengths in collaboration among or between different types of organizations that could be addressed or built upon through the Learning Alliance. The results will be presented back to the Learning Alliance, and we hope to use them to help the local WASH sector function more effectively. We understand that you may not know all of the interactions that members of your organization have with other organizations, but please answer to the best of your knowledge. If you feel unable to answer a question on behalf of your organization, please let me know and I will note this, and seek to follow up with another member of your organization. This data will not be used to compare organizations in terms of their effectiveness, but rather to understand the nature of the interactions among WASH sector stakeholders like yourselves, so it is important that your answers honestly reflect the nature of your organizations' interactions.

[Instructions: Share with the respondent a laminated list with all the organizations on the roster]

First, please identify all the organizations on this list with which your organization had a relationship over the past six months in terms of sharing information, reporting, coordinating or problem solving. I will then ask you questions about these relationships. If you forget an organization for now, I can add it as we go through the questions.
[Instructions: Select organizations based on the respondent's response]

Questions:

1) From whom has your organization requested support for a problem in the past six months? For each organization, please indicate the type of support requested, and whether or not the organization was able to reliably provide this support to successfully resolve the issue.

Organization Name	Expertise (i.e. Technical Assistance and Training)	Supply of Parts and Equipment	Permits or Authorizations	Studies, Assessments, or other Information	Funding or Financing	Support was Reliable? (Check if yes)
Organization X						
Organization Y						

2) From whom has your organization received a request for support for a problem in the past six months? For each organization, please indicate the type of support requested, and whether or not your organization was able to reliably respond to these requests to successfully resolve the issue (check if "yes", leave blank if "no").

Organization Name	Expertise (i.e. Technical Assistance and Training)	Supply of Parts and Equipment	Permits or Authorizations	Studies, Assessments, or other Information	Funding or Financing	Able to reliably respond to these requests?
Organization X						
Organization Y						

3) From whom has your organization received a formal report in the past 12 months? For each organization from which you received a formal report, please indicate whether these reports tended

to come on a timely basis (in other words, whether your organization received them in time for them to be used) and whether these reports tended to be of sufficiently high quality for their intended use (check if yes, leave blank if no).

Organization Name	Received Reports?	(If Yes) Timely?	(If Yes) Quality?
Organization X			
Organization Y			

4) With whom, and with what frequency, has your organization provided information on WASH issues in the past six months, outside of the formal reports? This includes face to face meetings, phone calls, emails, and any other method of providing information outside of the formal reports; however, please do not include instances in which this information was shared with a broad group rather than directly with the other organization (for example, a general presentation at a steering committee meeting).

Organization Name	Provided information?	(If Yes) Rarely (less than once per month)	(If Yes) Frequently (more than once per month)
Organization X			
Organization Y			

5) From whom did your organization receive information in the past six months, and, if so did your organization directly use this information in your WASH work? For example, information that your organization used in making decisions around budgets, strategy, or planning.

Organization Name	Received Information?	(If Yes) Did Not Directly Use Information	(If Yes) Directly Used Information
Organization X			
Organization Y			

6) With whom did your organization directly coordinate planning or activities in the past six months? This includes planning your own activities with significant input and communication with one another, as well as planning joint activities.

Organization Name	Coordinated Planning or Activities?
Organization X	
Organization Y	

7) Did your organization engage directly with WASHCos in any way in the past six months?
   a. Yes
   b. No

   [IF YES] 7a) In which ways did your organization engage WASHCos in the past six months? Check all that apply.
   a. Supplying spare parts
   b. Providing technical support or training
   c. Oversight of WASHCo activities through reports

d. Oversight of WASHCo activities through site visits
e. Other (Please specify)

8) Are there any organizations outside of this list at any geographic level with which you had significant information exchange, problem solving, or coordination of activities over the past six months? (Open-Ended)

9) Are there any organizations outside of this list who you think should be considered for inclusion in the Learning Alliance? (Open-Ended)

Section 3: Stakeholder Understanding of Network Structure

Read: I will now ask you a few more questions about the network, but instead of representing your organization we would like you to answer from your perspective. These responses will be kept anonymous and will not be shared with the Learning Alliance. IRC WASH, Tetra Tech, and the University of Colorado Boulder will use these questions to make sure they are receiving perspectives on how this group of actors works together, what is most challenging, and how this changes over time.

[Instructions: Share with the respondent the same laminated list with all the organizations on the roster]

Read: For these questions, you can use this list to indicate which actors answer the questions in your opinion. If there are actors that are not listed, I can write their names in.

1) Of the actors listed, which actor(s) in your opinion is/are most connected (share information/ collaborate) to all of the other actor groups that are involved in the Woreda's WASH sector?

2) Which actor(s) or organization(s) which have been mentioned above, play the most important role(s) in WASH service sustainability

3) Which actors are currently disconnected (for example, don't share information/collaborate) with others in the WASH sector, but if they became more involved they could most influence sustained service delivery within the Woreda?

Final: Notes

[FOR ENUMERATORS]: Please include any notes and other feedback on the interview, including information on any other members of the organization who provided input into any responses.

Annex 3: Network Membership Rosters

South Ari	Mille	Woliso
1. AMREF 2. Catholic Development 3. Gazer Town Water Utility 4. International Rescue Committee 5. Jinka Town Water Utility 6. Jinka TVETC 7. Save the Children 8. South Omo Development Association 9. Woreda Administration Office 10. Woreda Agriculture and Natural Resource office 11. Woreda Education Office 12. Woreda Finance and Economic Development Office 13. Woreda Health Office 14. Woreda Water, Mine, and Energy office 15. Woreda Women and Children Affairs office 16. Zone Administration Office 17. Zone Agriculture and Natural Resource Department 18. Zone Education Department 19. Zone Finance and Economic Development Department 20. Zone Heath Department 21. Zone Water, Mine, and Energy Department 22. Zone Women and Children Affairs Department	1. Afar Community Initiative Sustainable Development Association 2. AMREF 3. CARE Ethiopia 4. Lay Volunteers International Association (LVIA) 5. Mille Town Water Utility 6. Pastoralist and Agriculture Bureau 7. Pastoralist Community Development Program 8. Regional Education Bureau 9. Regional Finance and Economic Development Bureau 10. Regional Health Bureau 11. Regional Water Resource Bureau 12. Save the Children 13. Semera University 14. UNICEF 15. Woreda Administration Office 16. Woreda Education Office 17. Woreda Finance and Economic Development Office 18. Woreda Health Office 19. Woreda Pastoralist Development Office 20. Woreda Water Office 21. Woreda Women and Children Affairs Office	1. Town Department of Sanitation and Beautification 2. Women's Association/Communal Latrine 3. Waste Collection Service Provider 4. Town Land Administration Office 5. Town Manager of Municipal Services 6. Town Finance and Development Office 7. Town Environmental Protection and Climate Change Authority Office 8. Water Supply and Sewage Utility 9. Kebele 3 Administration 10. Town Health Extension Office 11. Town Infrastructure Development Office 12. Town Communications Affairs Office 13. Town Micro and Small Enterprise Office 14. Kebele 2 Administration 15. Town Construction Bureau

Glossary

Community	A grouping of households and/or individuals within a specific geo-political boundary that shares resources, management and/or decision-making.
Facilities	The physical infrastructure that collects, treats and distributes water or collects, transports, treats and disposes of waste (e.g. pumps, pipes, wells, tanks).
Local systems (USAID definition)	An interconnected set of actors—governments, civil society the private sector, universities, individual citizens and others—that jointly produce a particular development outcome. The "local" in a local system refers to actors in a partner country. As these actors jointly produce an outcome, they are "local" to it. And as development outcomes may occur at many levels, local systems can be national, provincial or community-wide in scope.
Organizational Network Analysis	A methodology that employs Social Network Analysis for mapping and measuring of connections between organizations.
Stakeholders	Persons or organizations with a vested interest or influence on WASH systems.
Sustainable WASH Services	The state of a WASH system in a given community context wherein a government, utility, private sector and/or community is able to provide, with minimal or no external support, uninterrupted access to water, sanitation and hygiene services that provide sustained public health benefits. The provisioning of WASH services should be economically viable, socially acceptable, and technically & institutionally appropriate, with considerations for the protection of the environment and natural resources.
WASH network	The formal and informal structure of actors and their interconnections (relationships) to one another that influence WASH system sustainability.
WASH services	The outputs of a system that provide affordable access to clean water and safe sanitation, with considerations for monitoring, maintenance and accountability between consumers, operators, and regulators.
WASH system	All of the social, technical, institutional, environmental and financial factors, actors, motivations and interactions that influence WASH service delivery within a given context, institutional or geo-political boundary.

References

Kobayashi, Kiyoshi. (2014). “Community Based Water Management and Social Capital.” IWA Publishing.

Larson, S., Alexander, K. S., Djalante, R. & Kirono, D. G.C. (2013), “The added value of understanding informal social networks in an adaptive capacity assessment: explorations of an urban water management system in Indonesia”, Water Resources Management, vol. 27, no. 13, pp. 4425–4441

LINC, “Organizational Network Analysis – Public Service Governance Network, Goma, Democratic Republic of the Congo Abridged Report.”

Stein, C & Ernstson, Henrik & Barron, Jennie. (2011). “A social network approach to analyzing water governance: The case of the Mkindo catchment, Tanzania”. Physics and Chemistry of the Earth, 36. 1085–1092.

Walters, J. & Javernick-Will, A. (2015), “Management of rural water services in Nicaragua: a systemic network approach to evaluating stakeholder alignment”, International Journal of Sustainable Development & World Ecology

Walters, J. (2016). “Exploring the use of social network analysis to inform exit strategies for rural water and sanitation NGOs.” Engineering Project Organization Journal. 1–12

To learn more about the Sustainable WASH Systems Learning Partnership, visit:
http:/www.globalwaters.org/SWS

LINC
http://linclocal.org

University of Colorado Boulder

Environmental Incentives

IRC Supporting water sanitation and hygiene services for life

LINC

TETRA TECH

UNIVERSITY OF OXFORD

WaterSHED Water, Sanitation & Hygiene Enterprise Development

Whave a fair future