August 2018

Kabarole WASH Sustainability Actor and Factor Analysis

Duncan McNicholl

USAID FROM THE AMERICAN PEOPLE

SUSTAINABLE WASH SYSTEMS
A LEARNING PARTNERSHIP

IRC Uganda

This report is one of the baseline systems assessments (network analysis) carried out by IRC and Aguaconsult for SWS Concept 1 Uganda. The long form report is designed for internal circulation within the consortium and for public dissemination. Additional learning and knowledge products may be developed from this material that focus on either 1) communication and use of the findings in Uganda and 2) further analysis of the value of the approach and methodology used in the assessment.

For questions or clarifications, contact IRC Uganda: **uganda@ircwash.org**

Author: Duncan McNicholl

Reviewer: Peter Magara and Jane Nabunnya

Editor: Lydia Mirembe

Layout designer: Dechan Dalrymple

IRC Uganda
Visiting address
Plot 52A
Ntinda II Road
Naguru
Kampala, Uganda

Postal address
P.O. Box 40398
Kampala, Uganda
Phone : +256 758 200 782
uganda@ircwash.org

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Photo credit: Duncan McNicholl

Abbreviations

ADWO	Assistant District Water Officer
AWMZ	Albert Water Management Zone: a government water resource management institution
CBO	Community-Based Organization
CDO	Community Development Officer: an extension agent based at Sub County level
CSO	Civil Society Organization
DHI	District Health Inspector
DWO	District Water Officer
EI	Environmental Incentives
HEWASA	Health through Water and Sanitation: a local NGO
HPM	Hand Pump Mechanic
HPMA	Hand Pump Mechanic Association
IFML	Iterative Factor Mapping and Learning
IRC	International Water and Sanitation Centre, Kabarole Office
JESE	Joint Effort to Save the Environment: a local NGO
LCII	Local Council 3: an elected Sub County government body
SC	Sub County: the institutional level between district and parish.
SDG	Sustainable Development Goal
Tie	Nodes in a network are connected by ties.
TSU	Technical Support Unit: a regional government office
USAID	United States Agency for International Development
WASH	Water, Sanitation, and Hygiene

Glossary of terms for this report and the SWS Learning Partnership

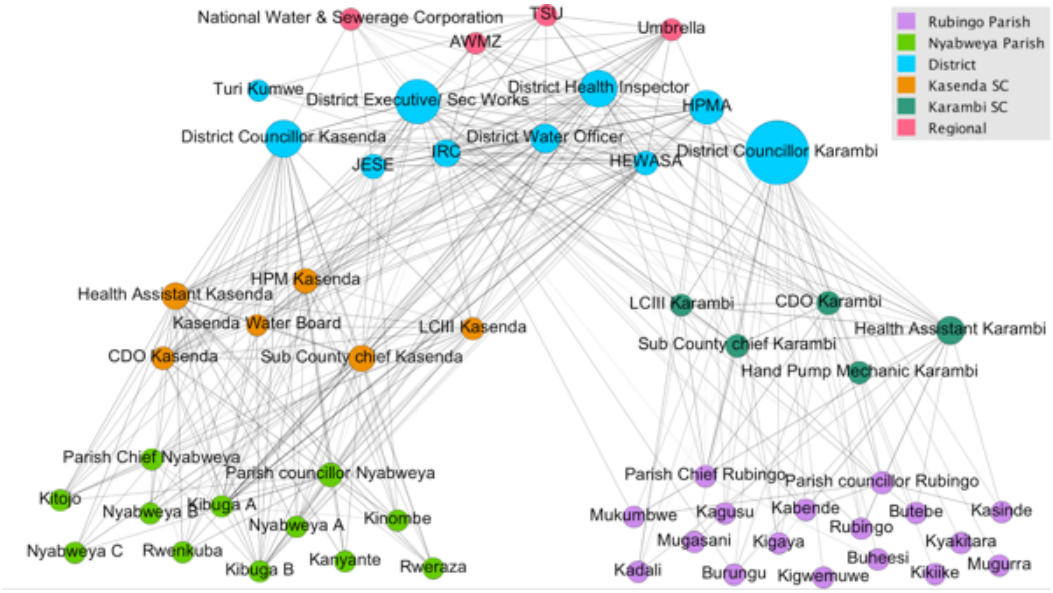
Actions (per indicators)	A specific intervention or sets of tasks undertaken by one or more organisations in order to strengthen the system or test the merits of an approach.
Actors	Stakeholders that directly or indirectly influence the WASH system. This can refer to specific individuals or organisations (e.g. water operators, health extension workers, water committees, non-governmental organisations and government agencies).
Backbone organisation	A separate, neutral, organisation dedicated to planning, managing and supporting a collective action initiative through ongoing facilitation, technology and communications support, data collection and reporting and handling of logistical and administrative details needed for the initiative to function smoothly.
Betweenness Centrality	A measure of the likelihood that a node is on the shortest path between any two other nodes in a network
Coalitions	An alliance of stakeholders and/or organisations formed for combined action and knowledge sharing (e.g. Learning Alliance, sector working group).
Community	A grouping of households and/or individuals within a specific geo-political boundary that shares resources, management and/or decision-making.
Enabling Environment	A set of interrelated sector functions that permit governments and public and private partners to engage in the WASH service delivery development processes in a sustained and effective manner. This includes all the policy, capacity and institutional and financial frameworks necessary for sustaining and replicating WASH schemes. A positive enabling environment builds the attitudes, capacity and practices for effective and efficient functioning of organisations and individuals.
Facilities	The physical infrastructure that collects, treats and distributes water or collects, transports, treats and disposes of waste (e.g. pumps, pipes, wells, tanks).
Factors	Any element, aspect or component of the WASH service system thought to directly or indirectly influence the WASH system (e.g. finances, water resources, policies, management).
Factor Map	A graphical representation of the interaction between the factors hypothesised to influence system outcomes. Factor maps can be derived from various methods including stakeholder diagramming and computational analysis. These maps often include factors from a wide range of influential aspects of the system (e.g. social, institutional, environmental, social, technical).
Factor Mapping	A systems tool for identifying the factors that influence systems, and mapping all possible influences that exist between these factors in systems diagrams.
Global Learning	The process of capturing data and evidence, creating evidence-based knowledge, sharing and effectively using that knowledge.
Iterative Factor Mapping & Learning (IFML)	A participatory, stakeholder-driven approach that uses different computational models for iteratively building and interpreting factor maps to understand systems and potential leverage points where they could be strengthened.
Local Systems (per USAID)	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.
Local Systems Approach	A methodology and set of concepts and associated tools—that seek to understand how local systems behave, interact with their environment and influence each other. Common to all of these approaches is a conviction that particular actions and outcomes are best understood in terms of interactions between elements in the system.
Mental Model Map	A useful way to analyse and interpret learning and action based on mental models is to create a diagram (map) that graphically represents the things a person conceptualises interact to cause a particular outcome. Generally, this takes on the form of a factor map.
Mental Models	A cognitive construct that a person uses to conceptualise the things believed to cause a particular outcome. A person's mental model informs and drives the way in which they interact with and learn about the system they live in; conversely, it provides insight into their potential action
Network	WASH stakeholders and their relationships. Networks can also include factors affecting WASH sustainability to examine how particular stakeholders relate to particular issues.
Network Density	A measure of the proportion of ties that exist out of the total number possible amongst a stakeholder group
Network Properties	Quantitative analysis of networks can identify, for example, who are the most central and the most isolated stakeholders in a network

Node	A point within a network that is connected by ties. Nodes in the context of this research are stakeholders and institutions
Organisational Network Analysis (ONA)	A methodology that employs Social Network Analysis for mapping and measuring of connections between organisations. (See Social Network Analysis)
Outcome Harvesting	An evaluation tool that applies Outcome Mapping principles to identify, verify and formulate outcomes when at the moment of intentional design there was substantial uncertainty about relations of cause and effect. Unlike other evaluation methods, Outcome Harvesting does not measure progress towards predetermined outcomes or objectives, but rather collects evidence (through documents, interviews, surveys, etc.) of what has been achieved and works backward to determine whether and how the project or intervention contributed to the change.
Outcome Mapping (OM)	A USAID-supported methodology for planning and assessing development programming in complex environments. There are three data collection tools: a) an outcome journal monitors boundary partner actions and relationships; b) a strategy journal monitors strategies and activities; and c) a performance journal monitors the organisational practices that keep the program relevant and viable.
Preventative Maintenance	The proactive servicing, repair and replacement of hardware to reduce downtimes and life cycle costs of water and sanitation facilities.
Scalability	The ability of a project or program to be applied in a different context. Vertical scaling includes expanding to new governmental or institutional levels, such as moving from the district to the regional or national level. Horisontal scaling includes spreading at the same level, such as replication of the same model in a new but equivalent geo-political context.
Scheme (Water / Sanitation)	The combined system of facilities and their operation & maintenance management.
Social Network Analysis (SNA)	A methodology of investigating social structures through the use of networks and visualisations using graph theory. SNA characterises network structures based upon nodes (actors/organisations within the network) and connections (relationships or interactions) between those nodes.
Stakeholders	Persons or organisations with a vested interest or influence on WASH systems (See Actors).
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 no external support, uninterrupted access to water, sanitation and hygiene services that provide sustained public health benefits.
System Dynamics Modeling	System dynamics modeling is based upon the principles of systems thinking with the goal of developing conceptual and simulatable insight into the dynamic drivers of a complex problem. System dynamics models can take the form of qualitative diagramming (CLDs), or simulatable Stock Flow models.
Systems thinking	A perspective of seeing and understanding systems as wholes, rather than as a collection of parts, where the outcomes of the system are a result of the complex, dynamic interaction and interdependence of the components (factors) of the system.
Systems Tool	A specific activity or form of analysis for extracting information on system properties (e.g. factors, actors, interconnections, feedbacks) to gain understanding of the causes of system behavior or outputs. Systems tools can include qualitative and/or quantitative approaches to data collection and analysis.
Systems-Based Approach	An adaptive set of multifaceted interventions that support individual, organisational, institutional and broader systems change with consideration for processes, relationships and incentives for performance toward improving effective service delivery.
WASH Building Blocks	A recognisable subset of closely linked actors and factors within the larger WASH system that are widely-accepted to have influence on WASH service sustainability. This generally includes dimensions of finance, monitoring, policy and governance, among others. The precise number and definition of building blocks is subjective and context-specific. The most important aspect of the framework is that it describes a complete set of key functions required for a sustainable and effective WASH system.
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 geopolitical boundary.
Water Governance	The set of rules, practices and processes that determine the allocation of water resources within in a given water scheme or geopolitical boundary.

Executive Summary

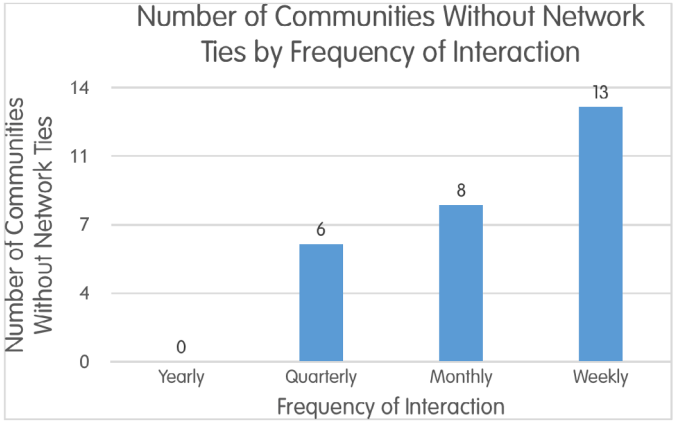
This report presents findings from a study of stakeholder network relationships and factors affecting WASH sustainability in Kabarole District, Uganda as part of the USAID-funded Sustainable WASH Systems Learning Partnership, led by University of Colorado Boulder and implemented in Uganda by IRC and Tetra Tech. This study was carried out by Aguaconsult and IRC. The study aims to support the Learning Alliance in Kabarole to develop intervention strategies for improving WASH services by providing insight into the system of actors and factors that influence the sustainability of services. The study, which focuses on addressing rural water supply, was conducted over a four-day period in September 2017 and the scope included a pre-determined list of stakeholders central to WASH issues in Kabarole District at Regional, District, Sub County and Parish levels. These stakeholders were interviewed to capture data on their networks of interaction with other stakeholders, and to identify perceived factors affecting WASH sustainability. A total of 49 stakeholders were interviewed over a four-day period, and data were analysed to identify stakeholders central to the network, network gaps, key factors perceived to affect WASH sustainability and to understand how stakeholders that identify a factor relate to each other.

Stakeholders most central to networks – District Councillors emerge as stakeholders that are most central to the network studied. 'Centrality' is measured by the likelihood that a stakeholder is on the shortest path between any two stakeholders in a network. District Councillors emerge as central stakeholders because of their connections to both District and local levels. Other stakeholders central to the network include district government officers, such as the District Executive and the District Health Inspector, and the Hand Pump Mechanic Association. Sub County Chiefs become more central when considering higher frequencies of interaction (i.e. weekly) (Table 3). The implication is that the stakeholders most central to the network are ones that can bridge relationships between district level stakeholders and communities.



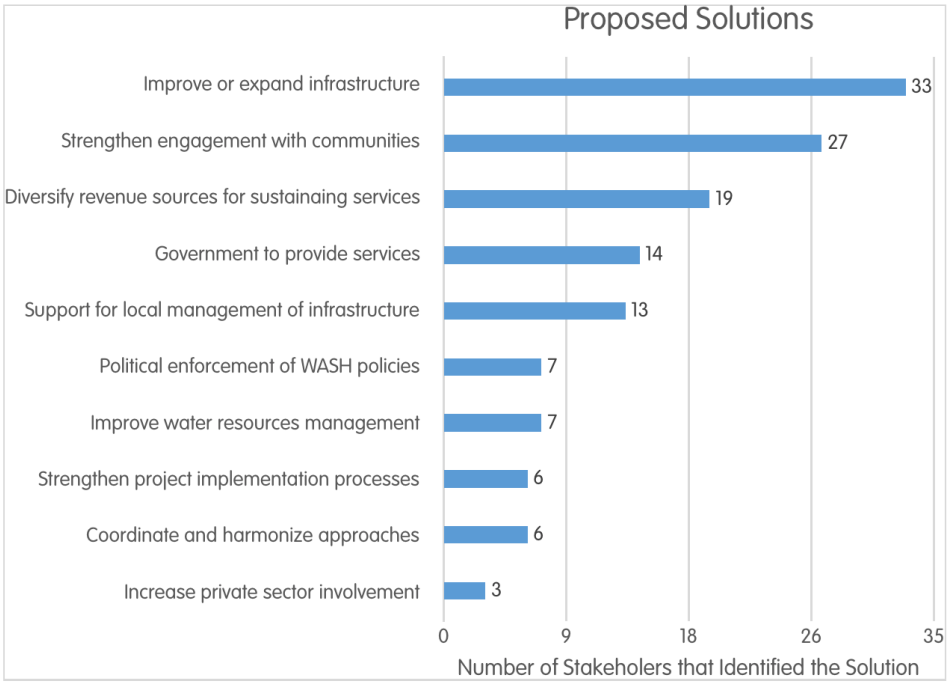
Visualisation of all network nodes and ties. Node sizes are proportional to how central a stakeholder is

Frequency of Interaction network gaps – We found that communities are the most isolated from the network, particularly when considering higher frequencies of interaction such as monthly or weekly. Eight of the twenty-five communities included in the study only interact with other WASH stakeholders once every three months or less. All other network stakeholders except for one retain at least some network ties at all frequencies of interaction. Findings indicate that most stakeholders studied, including those at Sub County levels, have maintained at least some ties with others in the network throughout the past year, but these network relationships have not consistently extended to include communities.



Number of communities without network ties for each frequency of interaction

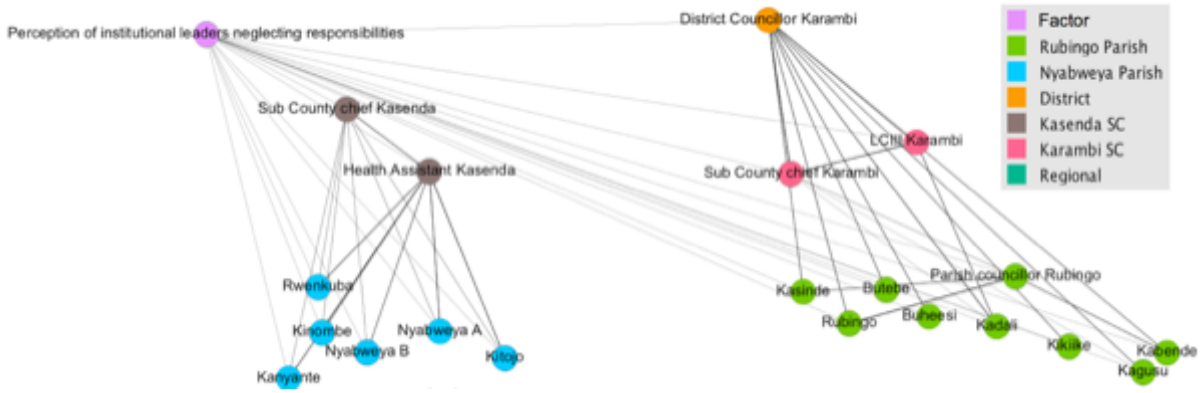
Factors affecting WASH sustainability – Qualitative interviews with stakeholders were used to identify successes, challenges, and possible solutions regarding WASH services and sustainability as perceived by stakeholders. A total of twenty-four factors emerged from iterative qualitative coding of interview responses. Aside from descriptions of service deficiencies and calls to improve these, the most commonly identified challenge and proposed solution addressed the isolation of communities. Many communities described feeling neglected by institutional leadership, and stakeholders interviewed called for strengthening community engagement. Strengthening relationships between the broader WASH network studied and communities themselves is seen as important for supporting behaviour change, providing technical support and reaffirming community understanding of their roles in managing the sustainability of WASH services.



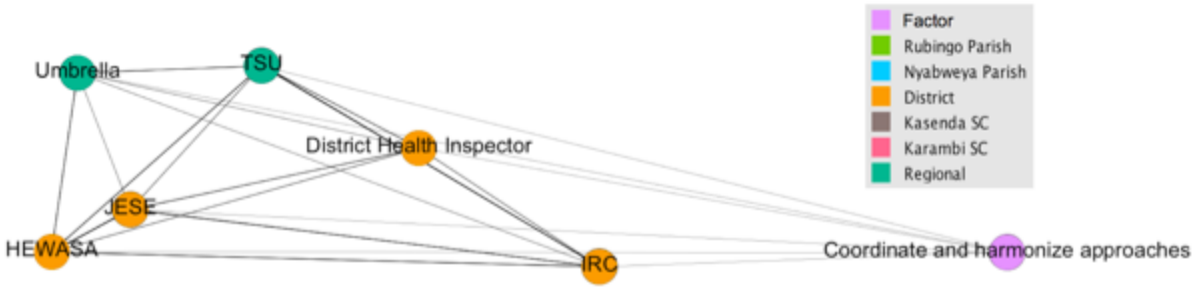
Number of stakeholders proposing different solutions to WASH sustainability in Kabarole District

A range of other successes and challenges were also identified. Some of the factors can be immediately addressed through learning alliance and grassroots activities, such as strengthening engagement with communities. The Learning Alliance might also consider how engaging local leaders and possibly extension staff might help extend the network to include all communities more consistently.

Actor and factor network analysis – Successes, challenges and solutions identified from interviews were added as factors to the network analysis to determine . Actor and factor network analysis shows how different stakeholder groups perceive different issues. In particular, communities and other local stakeholders perceive different issues than district level stakeholders do. 'Strengthen engagement with communities' was the second most commonly identified challenge overall and was discussed almost exclusively by communities and sub county stakeholders. In contrast, the importance of coordination was exclusively discussed by stakeholders at district and regional level that are all directly connected to each other. Although all factors identified have the potential to impact the sustainability of WASH services, some issues are more widely perceived than others and findings suggest that stronger coordination and alignment at district level, for example, might have limited potential for impact if other more widespread issues are not also addressed.



Factor and actor network for the challenge 'Perception of institutional leaders neglecting responsibilities'



Factor and actor network for the solution 'Coordinate and harmonise approaches'

From Mapping to Action

Service design questions for the learning alliance – In light of the research findings, this report offers questions for the Learning Alliance to consider when designing intervention strategies for improving WASH services. Key considerations include:

- How might political leaders (specifically District Councillors) and other key stakeholders be engaged to efficiently connect with all network stakeholders?
- How might relationships with communities be strengthened to ensure that they understand and are able to play their roles in sustaining WASH services, particularly with regard to financial contribution for operation and maintenance?
- How might other emerging issues be addressed, such as the need for infrastructure upgrades and water resources management, given the limited resources available?
- How should the issues be prioritised, given that different stakeholder groups perceive different issues and possible solutions?

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Study Aims and Objectives

This study was commissioned as part of the USAID Sustainable WASH Systems Learning Partnership to identify stakeholder network interactions and understand factors affecting the sustainability of WASH services in Kabarole District, Uganda. IRC has been working in Kabarole for more than 10 years through a 'Learning Alliance' approach. The learning alliance is a multi-stakeholder platform for knowledge exchange and serves as a basis for assessing the WASH system and testing new ideas and approaches to improving sustainable service delivery. The SWS Concept One activities in Uganda provide a systematic process for understanding how stakeholders view the WASH system and the factors that influence relationships, information and resource flows. The systematic network and factor analysis process of SWS provides an opportunity for identifying and unlocking blockages, learning about and challenging existing strategies and plans, and developing new opportunities for action research activities. The network boundary used here is based on members of the learning alliance but has been extended to include representative users and community members who are not a part of the learning alliance structure but who play a key role in interacting with and understanding how WASH service delivery takes place.

Findings are intended to serve as a baseline snapshot of how stakeholders currently interact, and what factors (successes, challenges, solutions) influence WASH sustainability in Kabarole District. The findings are expected to be used by the Learning Alliance to inform the design of interventions that would strengthen the sustainability and quality of service delivery in Kabarole District over time. This report contains the complete findings and is thus aimed at researchers and programme team members aiming to learn about the WASH system in Kabarole and about the use of network analysis as a diagnostic and programme design tool. A briefing note and key findings will be disseminated and used as a tool for facilitation and planning in the learning alliance and with other stakeholders in Kabarole.

Findings from the study include:

- Assessments of network interactions to identify gaps in coordination and technical support;
- Identifying which stakeholders are most 'central' to the network;
- Identifying perceived successes, challenges and possible solutions to WASH service sustainability;
- Identifying how different stakeholder groups perceive WASH sustainability issues differently; and
- Recommendations in the form of questions, based on the network analysis, that can inform potential priority interventions to consider as part of the forward strategy of the project.

The study and findings therefore aim to present an assessment of the current situation with the expectation that local experts can critically assess findings to develop interventions appropriate for the local context. The report does not provide specific recommendations that assume a 'correct' way that WASH stakeholder networks should interact and instead concludes with a set of design questions that prompt stakeholders to consider how the sustainability of services might be improved in light of the research findings. The findings of the analysis can also inform IRC interventions to strengthen the network of actors and how a strengthened network can work through the learning alliance to address factors that constrain the sustainability of rural water supply.

Methods

Data was collected through a combination of qualitative semi-structured interviews and a one-on-one network drawing exercise. A full summary of the research protocol is available in the document: Uganda WASH Network Mapping Protocol (Appendix A).

A complete list of stakeholders central to WASH service delivery in Kabarole District was identified with support from IRC prior to the beginning of data collection (Appendix A). The intent was to ensure that all key stakeholders were included in the study. Interviewing all communities and Sub County stakeholders in the District was not feasible, however, the study was therefore scoped to include all communities in two Parishes and the associated stakeholders at Sub County levels. The sample size from communities therefore provides a complete representation of two Parishes and their relationships to Sub County and District levels, even if the scope is too small to be representative of all communities in the District.

The complete stakeholder list included members of the Learning Alliance in Kabarole District, as well as WASH stakeholders at Sub County and Parish levels that related to two Parishes, Nyabweya and Rubingo, in Kasenda and Karambi Sub Counties, respectively. All communities in these two Parishes were also included in the stakeholder list in order to understand how stakeholder networks at District level are connected to local levels. The final number of stakeholders identified for interview and inclusion in the network analysis was fifty-four (Appendix A).

Four tie types (connections between nodes or stakeholders) were studied to understand relationships between stakeholders: **information, skills, resources** and **authority**. These ties are originally derived from a definition of social power[1] that has been adapted into terminology familiar to most WASH sector stakeholders[2]. Tie types and their sub-types are presented in (Table 1).

Table 1 - Definitions of network tie types and sub-types

Tie Type	Sub-type (weight)	Description
1. Information	1.1 Download	Information sent from one to the other
	1.2 Discussion	Issues are identified, discussed and clarified
	1.3 Dialogue	Exploring assumptions together leads to new understanding between stakeholders
2. Resources	2.1	Resources were not divided into sub-types (e.g. financial, human resources, materials). Instead, an unweighted tie was used to represent a resource flow and the estimated annual value of the relationship was recorded as the tie weight.
3. Authority	3.1 Influence	Ability to influence the interests of others indirectly
	3.2 Authority	Control; the authority able to enforce consequences for non-compliance
4. Skills	4.1 Consulting	Temporary skill provision to complete a task
	4.2 Training	Providing temporary skill building activities
	4.3 Coaching	On-going customised interaction to support participants' ability to overcome challenges
	4.4 Co-Development	Supporting another stakeholder to develop their own way of doing things

The frequency of relationships between stakeholders was also captured at intervals of **yearly, quarterly, monthly** and **weekly**. This dimension might be used to identify specific stakeholder groups that are more consistently engaged than others in case interacting more frequently has some bearing on WASH sustainability issues. It is important to note that frequency of interaction represents the overall relationship, but does not apply to specific ties. For example, a monthly relationship with a resource tie of UGX1000 means that the two stakeholders interact monthly, and the total value of the resource exchange over the course of the past year was UGX1000 despite multiple interactions.

Stakeholder node properties were also applied to the list of stakeholders included in the network to define the type of stakeholder and its level of hierarchy in the network. Defining these node properties was done outside of interviews with support from IRC because stakeholder types and levels of hierarchy are widely accepted and did not require confirmation during interviews. Stakeholder types include:

- District (Kabarole);
- Regional (Western Uganda);
- Sub County (Kasenda);
- Sub County (Karambi);
- Parish (Nyabweya); and
- Parish (Rubingo).

[1] French, J. R. P., & Raven, B. (1959). Bases of Social Power. Control.

[2] McNicholl, D. (2017). Characteristics of Stakeholder Networks Supporting Institutional Development in Rural Water Service Delivery. University of Cambridge.

Levels of hierarchy included in this study include:

- Government Offices;
- Public Enterprises;
- Non-Governmental Organizations;
- Community-Based Organizations;
- Academic Institutions;
- Private Sector; and
- Service Users.

The administrative division in Uganda is as follows (from largest to smallest): Four administrative regions divided into fourteen sub-regions that are further divided into districts, counties, sub-counties, parishes and villages[3].

Actor relationships were assessed through network drawing. Network drawing during interviews proceeded by first presenting participants with the stakeholder list and asking them to identify which stakeholder they interact with. These names were then written on post-it notes and placed in concentric rings on a piece of flip chart paper to indicate the frequency of interaction. The name of the stakeholder represented by the participant was placed in the middle. Stakeholders were then asked to draw ties from themselves to other stakeholders according to the four tie types. Colored makers were used to represent different tie types, arrows were used to indicate direction, and the number of arrow heads was used to indicate tie strength (see figure 2 for an example).

After completing the network drawing, participants were then verbally asked about factors affecting WASH services and sustainability[4]. Responses were captured in two ways. Enumerators took handwritten notes and also captured audio recordings where feasible. This dual recording method was used so that handwritten summaries could be analysed rapidly while still retaining detailed responses that can later be transcribed and coded by the University of Colorado Boulder[5]. Findings in this report result are produced from analysis of the handwritten notes only in order to produce initial findings more quickly.

Combining network and qualitative factor interview data then allowed investigation of network properties, identification of specific issues and whom within the network identified certain factors as important. Each type of analysis is presented separately along with further details of the analytical methods used.

Fieldwork Summary

The original field program was compressed from eight to four working days due to external scheduling constraints. Table 2 summarises the fieldwork activity schedule. A total of 49 of the 54 stakeholders identified for inclusion in the network study were interviewed in the four-day period, representing a 91% response rate. Although not every community and Sub County in Kabarole District was included in the study, the number of responses is sufficient for the chosen scope of the study.

Table 2 - Fieldwork activity schedule

Date	Activity (Number of Interviews)
September 19th	Enumerator training and first stakeholder interview (1)
September 20th	Interviews in Kasenda Sub County (16)
September 21st	Interviews in Fort Portal and Karambi Sub County (15)
September 22nd	Interviews in Fort Portal and Karambi Sub County (17)

Enumerator training was held on the first day at the IRC office in Fort Portal, and was followed by a group visit to interview the NGO HEWASA. One of the newly trained enumerators conducted the interview while others observed and took notes. The experience was then debriefed at the IRC office with all enumerators to learn from and improve on facilitation techniques.

Enumerators were then formed into three field teams of two members each: Muyembe, Matooke and Mucere. Teams Muyembe and Matooke focused on community stakeholder interviews in Karambi and Kasenda Sub Counties; Team Mucere focused on stakeholders at District and Regional levels. The team structures appeared to work well. Team members were able to support each other during interview facilitation while working in pairs, or able to divide and conduct two interviews simultaneously if needed. Figure 1 shows an instance where multiple stakeholders arrived together at a Sub County office and two interviews were conducted in parallel. The complete interview instrument is included in appendix B.

Each interview included a facilitated exercise whereby the participant would draw the network of the stakeholder that he or she represented (Figure 2), followed by a verbal interview about perceived factors affecting WASH sustainability. Verbal responses were typically recorded with the expectation that transcription and coding of these responses will be later handled by the University of Colorado Boulder, although audio recordings were not captured for all interviews. Some community interviews conducted in local dialects were not recorded and handwritten

[3] See SWS Uganda Context Analysis for further insight into the administrative set-up of Uganda.

[4] Questions were developed by UCB and are contained in appendix B

[5] The University of Colorado Boulder is the overall manager for the USAID-funded Sustainable WASH Systems program and is responsible to look across all four of the concept teams currently conducting action research into WASH systems

notes were taken instead. One district official also requested not to be audio recorded during his interview. The output from each interview was a drawn network of interactions for a particular stakeholder and qualitative responses to questions about factors affecting WASH sustainability.

Figure 1 - Interview participants drawing their networks in Kasenda Sub County

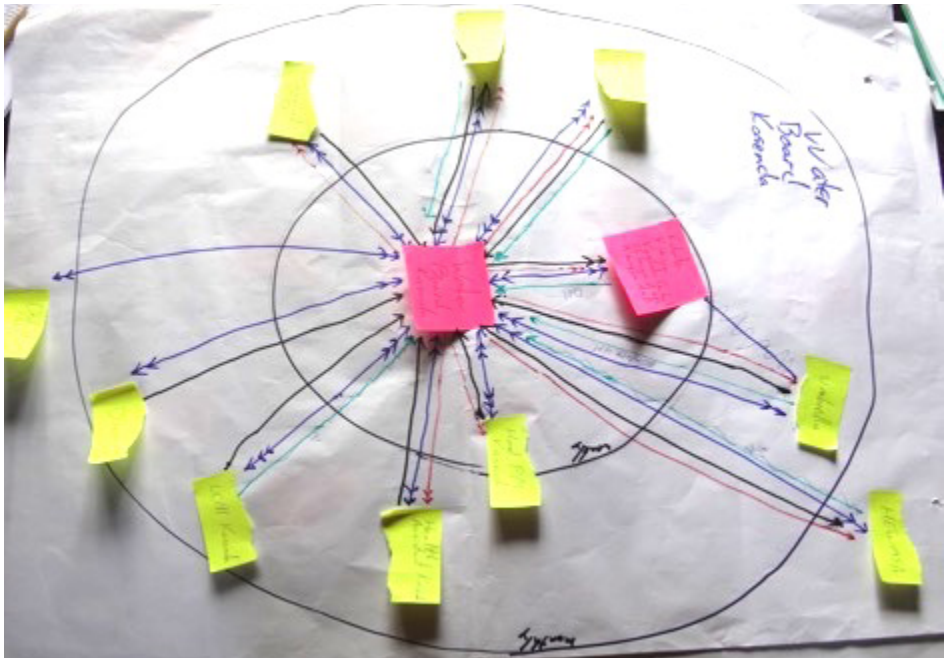

Figure 2 - A completed network drawing after a stakeholder interview

Stakeholders identified in the initial list but not interviewed were either unavailable, or considered no longer active in the network. These stakeholders include:

- **The National Water and Sewerage Company –** This stakeholder was unavailable due to concurrent activities.
- **CDO Kasenda –** This local extension worker recently had an accident and had been unavailable for some time at the time of the visit to Kasenda Sub County.
- **HPM Karambi –** Missing and not able to be reached.
- **Parish Chiefs Kasenda and Karambi –** These stakeholders were deprioritised by IRC because of their reportedly relatively small influence on WASH services at the Parish level.

Omission of these interviews is deemed acceptable from a network analysis perspective because the overall number of network stakeholders interviewed represents a response rate of over 90%.

Daily debriefs were held with the enumeration teams to discuss what happened, what went well, what could improve and what should be learned from these experiences. Several ideas for improving facilitation and fieldwork methods were identified over the course of research that are documented here in case they might be useful for future studies:

- Enumerators can ask for three responses to qualitative questions (e.g. what are three challenges…). This phrasing can encourage respondents to briefly identify a range of issues that enumerators can then probe further. The approach helps to avoid the challenge of a respondent discussing a single issue repeatedly.
- Avoid having participants explain each relationship as they draw the network. This is time consuming, the interview is quicker if they simply draw the ties and relative strengths. Qualitative explanations can be explored in the second part of the interview.
- Capture participant contact data at the end of the interview so that facilitators can move to drawing the network as quickly as possible. Reordering the process helps to engage participants quickly with network drawing so that they become absorbed in the interview.
- Clarify the scope of the network of interest, which was interactions in Kabarole District over the past year in the case of this study. Clarifying scope is especially important for stakeholders that are active outside of the district.
- Having a local guide is extremely helpful for conducting community visits. A knowledgeable local person can help enumerator teams to both locate communities and identify the appropriate persons to interview. Local guides were commonly identified with the help of local extension staff such as Health Assistants or CDOs.
- Plan for long days. All three teams skipped lunch on the first day because of the remoteness of the locations visited. Finding and interviewing stakeholders can make for unpredictable schedules that require flexibility in programs that might not allow set times for breaks.
- Politically involved individuals will sometimes describe resources that are coming into their area instead of resources coming directly into their offices. This distinction between a tie between stakeholders and a tie to a region is a potential source of confusion that may have impacted the identification of some resource ties.
- Interview respondents pushed all enumerator teams to add 'quarterly' to the frequency of stakeholder interactions. This may be linked to the quarterly meetings which occur with all district NGOs and government partners where they discuss how to have interventions, challenges, info sharing and budgets.
- Recognising this proposed change and adapting early on in the fieldwork process allowed teams to capture this additional category that was not originally planned for.
- Interviewing community members about WASH sustainability was challenging in cases where the communities felt frustrated because they experience a complete absence of interactions with government. Individuals in these areas sometimes did not want to participate in interviews, or saw little point in doing so. Some participants expressed a lack of confidence that research on either networks or factors would address the problems that they experience, and even demanded contact details from enumerators in order to follow-up on what action the research will lead to.
- Scheduling specific meetings does not guarantee that interviews can be conducted. Some participants failed to come to meetings despite receiving formal invitations to do so, and these individuals had to be located elsewhere by the enumerator teams.
- The teams had a good working relationship and kept in constant contact through a chat group that allowed updates to communicate successes and challenges. Everyone worked hard to complete a challenging assignment in a short period of time.

Fieldwork seemed to progress more smoothly as enumerators became increasingly familiar with methods and with working with each other. The methods are not especially complicated, but they depend on quality of facilitation and the ability to quickly locate and engage stakeholders for interviews in a variety of contexts. Following this experience, the enumerator teams could likely be employed again to effectively and efficiently collect similar data in the future.

Network Analysis

Combined network data from all interviews can be used to answer two key questions about the stakeholder network:

1. Which stakeholders are most central?
2. Where do gaps exist in stakeholder interactions?

Answering these questions can have useful application for intervening in the network. Identifying the central stakeholders can be useful for targeting key actors that play bridging roles across different parts of the network. For example, disseminating information through central stakeholders can help information to reach all parts of a network more quickly. Identifying gaps, on the other hand, can identify opportunities for creating new network ties that might help information spread more quickly or reach parts of the network that might be otherwise disconnected. Programs can use analysis of centrality and network gaps to prioritise who to engage and where to strengthen network ties.

Stakeholder networks were produced by combining all ties from all stakeholder interviews to produce final networks. Conflicts in data – such as two stakeholders perceiving different strengths of the same relationship – were resolved by taking the average tie weight. Networks were then visualised and quantitatively analysed using Gephi network software. The overall network containing all tie types experienced at least once in the past year is presented first (Figure 3). Stakeholders are arranged by hierarchy on the y-axis and randomly distributed along the x-axis for visual clarity, except for sub counties Kasenda and Karambi and their respective Parishes, which are grouped on the left and right respectively. Color represents the stakeholder level of hierarchy. The network ties show how District level stakeholders connect to each other and then to Sub County and Parish stakeholders, while direct ties between stakeholders in the two Sub Counties are not observed.

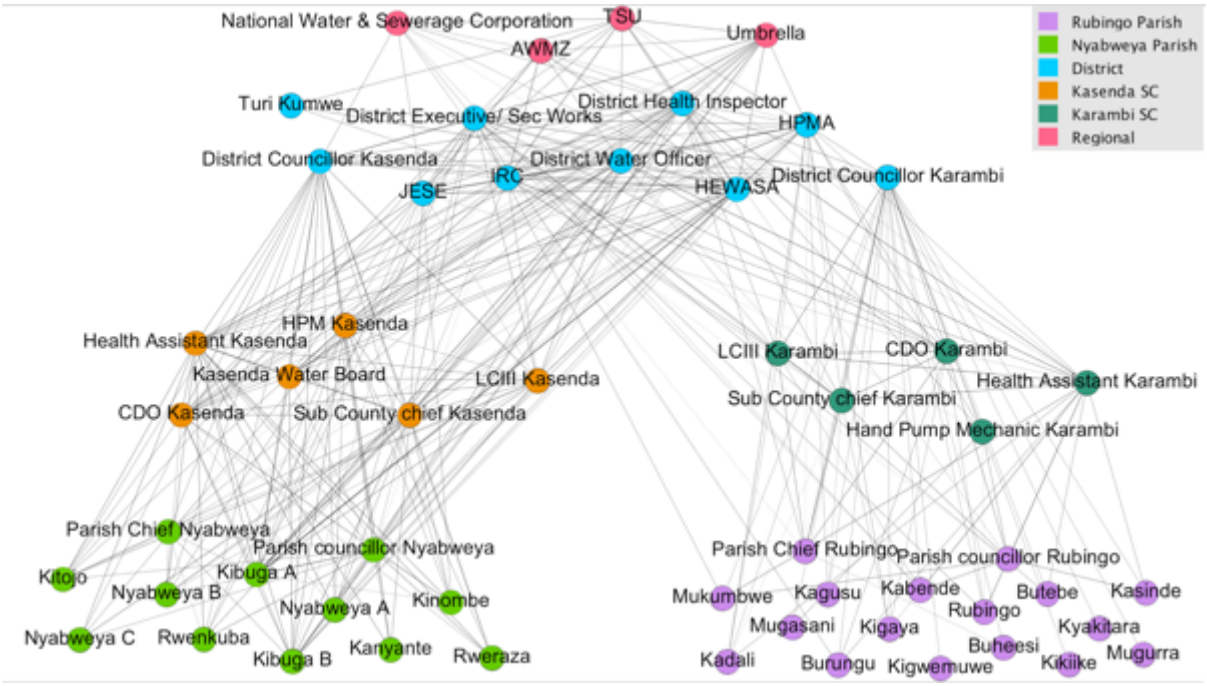

Figure 3 - Visualisation of the Kabarole District stakeholder network including all tie types and frequencies

Identifying Central Stakeholders

The property of betweenness centrality can be used to quantitatively assess which stakeholders are most central to the network. Betweenness centrality measures how frequently a stakeholder appears on the shortest path between any other two nodes in the network. This measure is selected because it is based on analysis of shortest paths and is therefore potentially useful for interventions wanting to target stakeholders that have few degrees of separation between themselves and the rest of the network. Measuring betweenness centrality would quantify, for example, how often a Sub County Chief is found on the most direct chain of network ties connecting communities to District level stakeholders. Betweenness centrality therefore provides an indication of which stakeholders are network gatekeepers by quantifying which stakeholders are most closely linked to all others in the network.

Node sizes in Figure 3 proportionally represent how central nodes are to the overall network. Larger nodes indicate more central stakeholders (Figure 4). District Councillors and other District Government Officials emerge as the most central node in the overall network on a yearly basis[6].

[6] A description of the post/role of involved stakeholders is included in appendix A

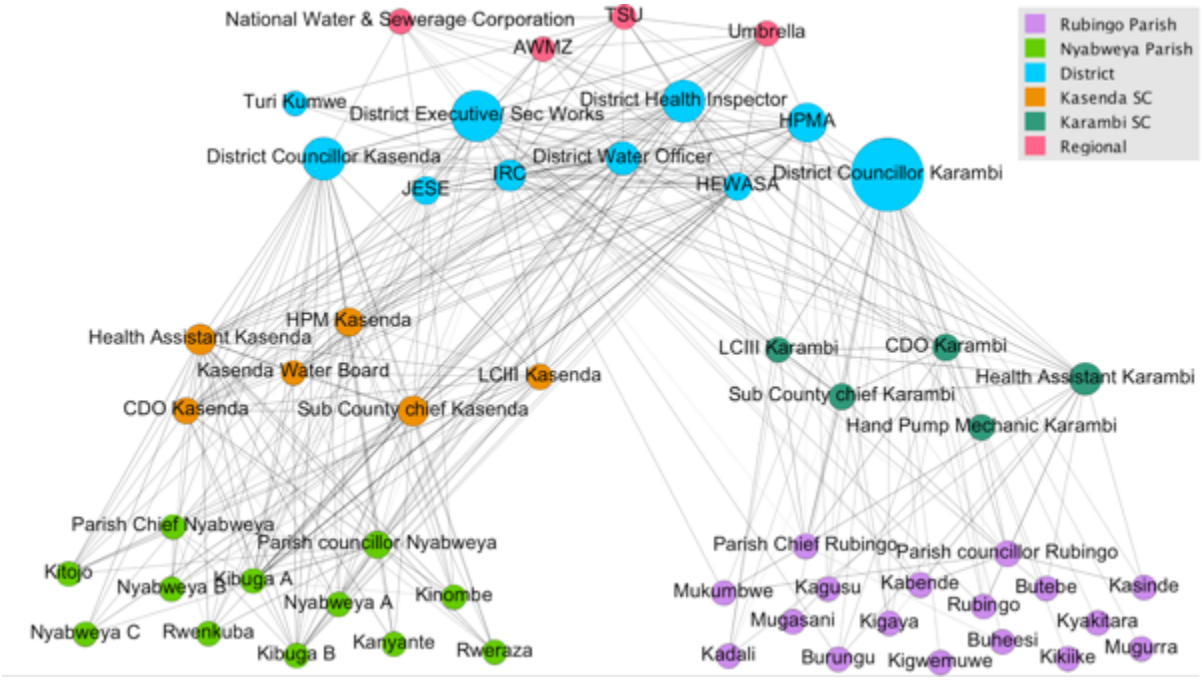

Figure 4 - Visualisation of all network nodes and ties. Node sizes are proportional to how central a stakeholder is

The centrality of nodes can change, however, depending on the **frequency of interaction** considered. Fewer ties are observed at higher frequencies of interaction – there are naturally fewer relationships experienced on a weekly basis than there are relationships experienced at least once per year. Different nodes can therefore become more central as the number of connections and overall structure of the network changes depending on the frequency of interactions considered.

Three frequencies of interaction were originally considered based on the assumed frequencies that service providers and institutions develop workplans: weekly, monthly and yearly. A fourth category, quarterly, was added to accommodate workplans that have specific quarterly events, such as quarterly meetings and to capture interactions that are less common than monthly but more common than yearly. The result is an intuitive set of frequencies that was found to be aligned with how interview participants were able to describe their interactions.

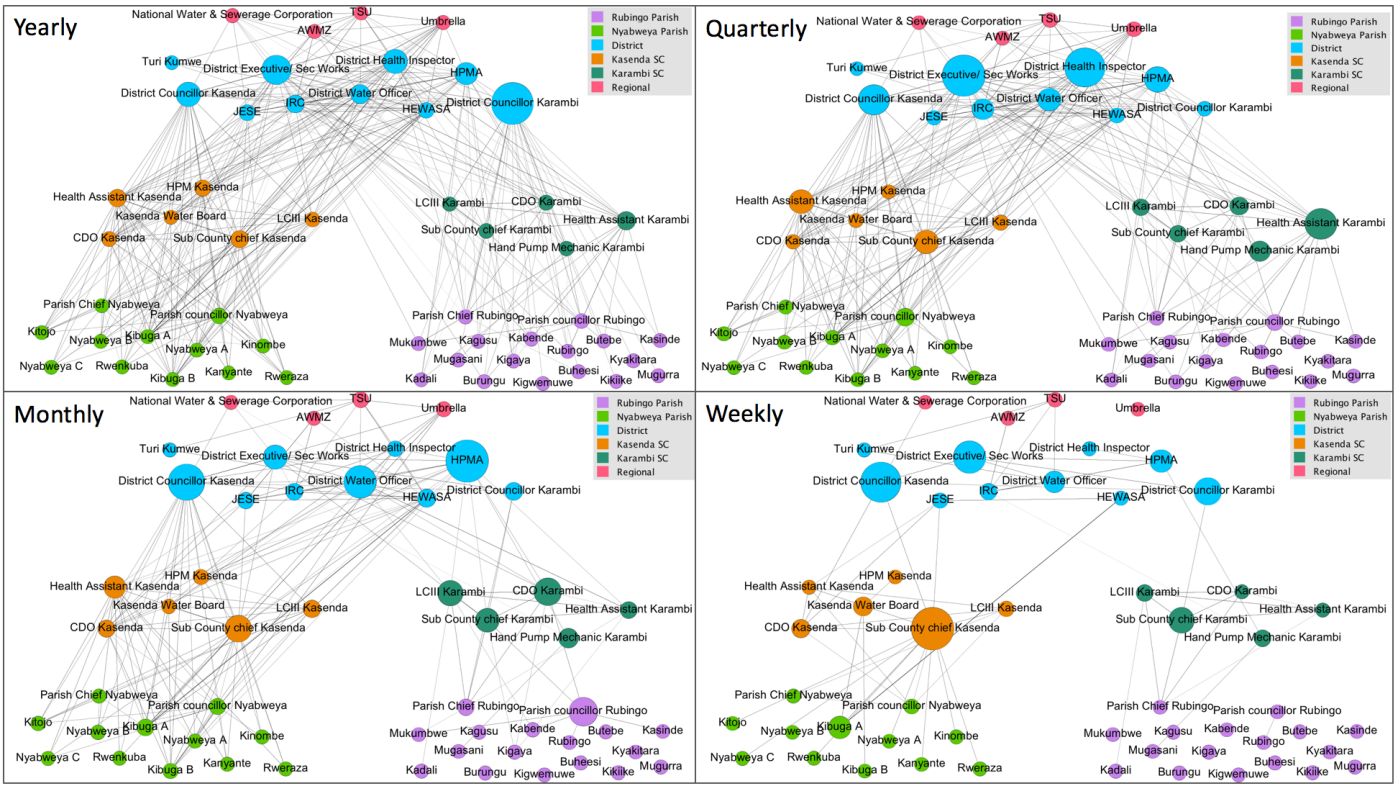

Figure 5 - Stakeholder networks for all tie types by frequency of interaction

There are fewer weekly relationships than there are yearly ones and local stakeholders, such as Sub County Chiefs,[7] become more central to the network when considering networks of higher frequencies of interaction. Table 3 presents rankings of which stakeholders are most central for the four frequencies of interaction based on betweenness centrality. Political leaders emerge as relatively central in all networks, although the precise rankings of who is most central depends on the period of interaction considered. A further break down of betweenness centrality rankings for different frequencies and tie types is presented in Appendix C.

The overall most central network stakeholder is the District Councillor[8] for Karambi Sub County. District Government Offices also appear as central stakeholders. Sub County Chiefs become more central at higher frequencies of interaction. These findings suggest that political leaders such as District Councillors play central roles in the network because of their ties to both district and local stakeholders in their constituencies. The Councillors through the District Council are responsible for endorsing annual budgets for their Local Governments. This coupled with their strategic position in connecting actors at district and Sub county level makes them key allies in influencing and securing commitment towards allocation of adequate financial resources for WASH services.

Table 3 - Ranking of stakeholders most central to the network of all tie types by frequency of interaction

Rank	Yearly	Quarterly	Monthly	Weekly
1	District Councillor Karambi	District Executive/ Secretary for Works	HPMA	Sub County Chief Kasenda
2	District Executive/ Secretary for Works	District Health Inspector	District Councillor Kasenda	District Councillor Kasenda
3	District Councillor Kasenda	Health Assistant Karambi	District Water Officer	District Executive/ Secretary for Works
4	District Health Inspector	District Councillor Kasenda	Parish Councillor Rubingo	District Councillor Karambi
5	HPMA	HPMA	CDO Karambi	Sub County Chief Karambi
6	District Water Officer	Health Assistant Kasenda	Sub County Chief Kasenda	HPMA
7	Health Assistant Karambi	Sub County Chief Kasenda	LCIII Karambi	Kibuga A
8	IRC	District Water Officer	District Executive/ Secretary for Works	District Water Officer
9	Health Assistant Kasenda	IRC	Sub County Chief Karambi	Kasenda Water Board
10	Sub County Chief Kasenda	Hand Pump Mechanic Karambi	Health Assistant Kasenda	CDO Kasenda

Identifying Network Gaps

Network analysis can also be used to quantify the number of stakeholders that are **disconnected** from the network. A stakeholder without any ties for a given frequency of interaction represents a gap in the network that may be an indication of a lack of access to information, skills, resources, or the ability to hold others accountable. Analysis for each frequency of interaction for all tie types was conducted to quantify the number of stakeholders without any network ties. With one exception, all stakeholders without any network ties were communities (Figure 6).

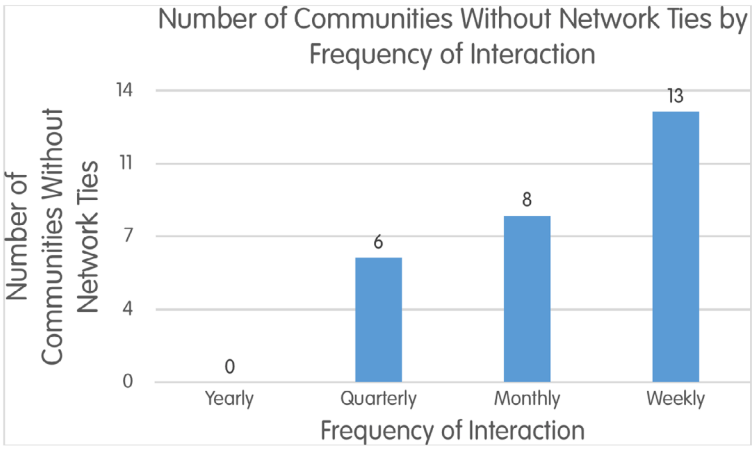

Figure 6 - Number of communities without network ties for each frequency of interaction

[7] Sub county Chiefs manage and coordinate the implementation of policies, programmes, projects and laws at Lower Local Government level (Sub county level). They also supervise collection of local revenue and ensure resources are accounted for.

[8] Recall that role descriptions of stakeholders are contained in appendix A

Figure 6 shows that the overall network does not consistently extend to include all communities. Of the twenty-five communities interviewed, 24% reported interacting with the broader Kabarole WASH network less than once every three months. Despite coordination amongst stakeholders at District level, communities are not always directly or indirectly connected to the broader group of WASH stakeholders in Kabarole District. The lack of ties to or from these communities is visually apparent in the network of stakeholders in Karambi Sub County on a monthly basis of interaction (Figure 7).

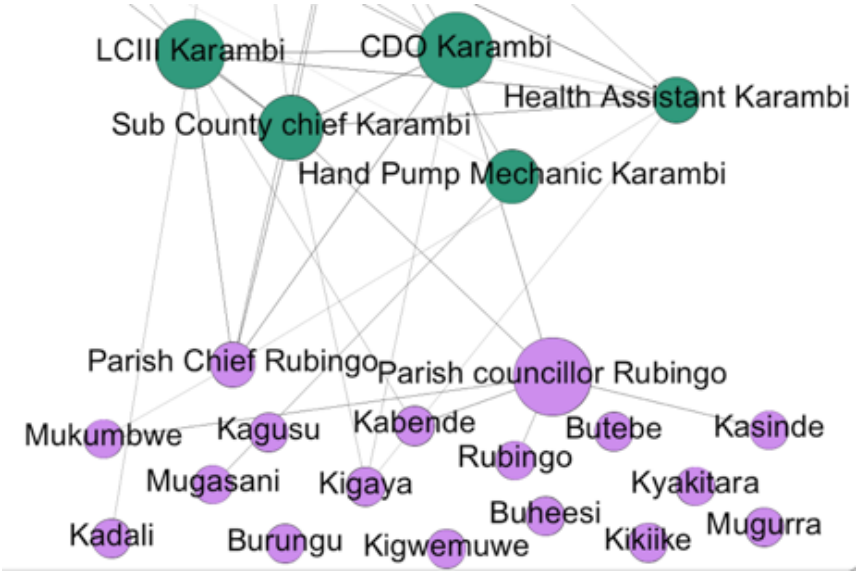

Figure 7 - An excerpt from Fig. 5 showing communities in Karambi Sub County without network ties on a monthly basis

Multiple communities in Figure 7 can be seen to not have any relationships on a monthly basis. The only other stakeholder without any network ties was Umbrella, which reported no relationships on a weekly basis. Other local stakeholders such as Parish Councillors and Sub County political leaders do, however, retain ties to the broader network at all frequencies of interaction. The councillors have many ties because they are democratically elected and often reach out to communities as they fulfil their political representation mandate. On the otherhand the Parish Chief is the lowest planning unit of the lower Local Government but is grossly under resourced to effectively perform its community outreach and mobilisation roles. The Learning Alliance might therefore consider how engaging local leaders and possibly extension staff and parish chiefs might help extend the network to include all communities more consistently.

Tie Combination Analysis

An additional type of network analysis is presented because of its possible utility for making future studies more efficient. Collecting network data on four tie types can be time consuming for interview participants and data collectors. Analysis of how network ties exist in parallel can consider which ties are most common, and how much of overall network interactions can be represented by a single tie type. A possible implication for future studies might be the ability to rapidly capture data on a single tie type as an indicator of overall network interactions.

The combinations of different tie types observed in parallel can be quantified for the Kabarole WASH stakeholder network[9]. Ties were coded using the nomenclature: "I" for information; "S" for skills; "A" for authority; and "R" for resources. Different parallel tie combinations and the number of times each was observed is presented in Figure 8.

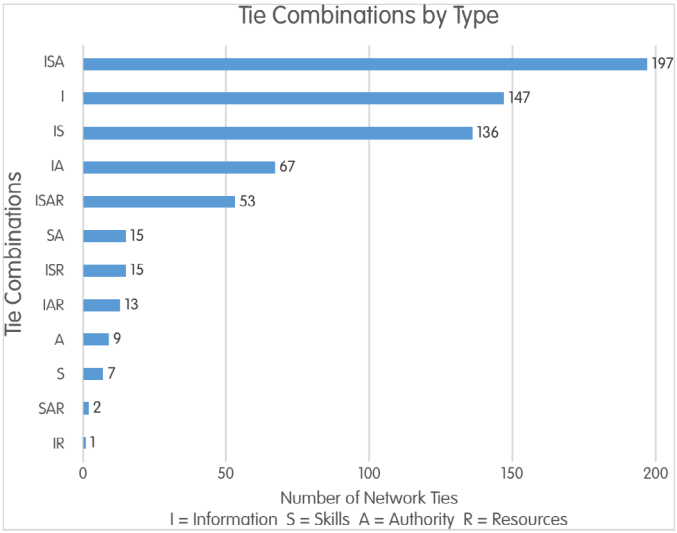

Figure 8 - Number of times different parallel tie combinations were observed in stakeholder relations

[9] Ties are directional as in a set of parallel ties from stakeholder A to stakeholder B.

The combination of information, skills and authority as ties in a relationship were most commonly observed in the network and information ties are the most common overall. Analysis shows that an information tie exists in almost all relationships in the network (Table 4).

Table 4 - Number of network relationships that include an information tie

Network Property	Value
Total Number of Relationships	662
Number of Relationships that Include an Information Tie	629
Percentage of Relationships with an Information Tie	95.0%

The percentage of relationships that include an information tie (95.0%) is precisely equivalent to findings from the value observed in a similar study in 5 countries[10]. These findings suggest that information ties are present in almost all stakeholder relationships in WASH sectors and therefore might be used as a basis for studying overall network properties if more extensive investigation of the other tie types is not feasible. Information ties are not necessarily the most important, but because they are the most common, the absence of information ties might be used as an indication of where there are gaps in stakeholder networks. On the contrary, it may suggest that since information ties are more developed in these context despite challenges faced, that interventions should focus on development of other tie types that are lacking. It is suggested that a further analysis of factors influencing service sustainability are considered when deciding which tie types may be most important to consider for a future study.

New Stakeholders

Interview participants would sometimes identify relationships with other stakeholders that were not included on the list of stakeholders for analysis. Although the study focused on the network of a specific list of stakeholders, it should be recognised that other stakeholders are also interacting with WASH issues and stakeholders in Kabarole District. These stakeholders might be included in future research because of their perceived relevance in the network studied. The Learning Alliance might also consider engaging these stakeholders to ensure alignment with learning agenda and vision for WASH sustainability in Kabarole District.

Additional stakeholders identified during interviews include:

- LEAF 2 – a government project;
- PROTOS – an NGO working on water resources management;
- UNICEF – a multi-lateral that is interested in being active in the area but has reportedly not been very active yet;
- Uganda Wildlife Authority (UWA) – a government authority that is reportedly active in WASH issues in Kasenda Sub County where it manages a nearby wildlife reserve;
- Tooro Botanical Gardens – a stakeholder that reportedly plays a role in water resources management; and
- Mpanga Game Club – an NGO active in some parts of the district.

It is also important to note that some decision making and key factors of influence take place outside of the district at the regional or national levels. Learning alliances and systems approaches require understanding this scale, but the scope of this study has been limited by setting meaningful boundaries to simplify the complexity to a manageable level. Because the network analysis is one of many assessment tools engaged in this programme, the decision was made to focus on the district level actors. A future iteration could reconsider this boundary, but currently national and regional network actors are considered only qualitatively and are not discussed in this report.

PROTOS and UWA were the two additional stakeholders identified most commonly. Including these stakeholders in the overall network can highlight the relationships that these two stakeholders have with some of the original list of stakeholders studied (Figure 9 and Figure 10).

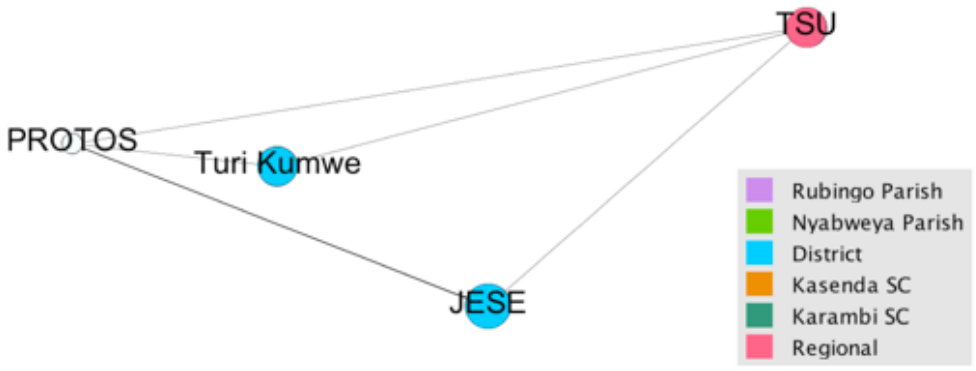

Figure 9 - Ties between PROTOS and other network stakeholders

[10] McNicholl, D. (2017). Characteristics of Stakeholder Networks Supporting Institutional Development in Rural Water Service Delivery. University of Cambridge WASH networks Ghana, Malawi, India, Tajikistan and Bolivia were studied.

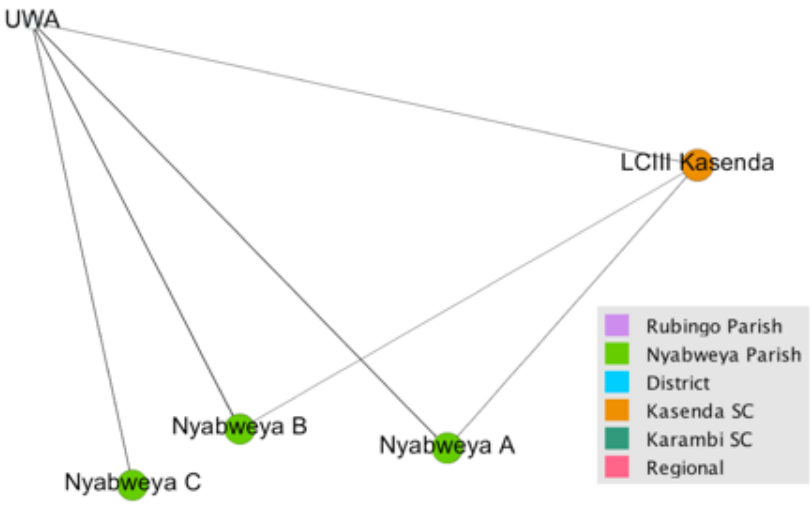

Figure 10 - Ties between UWA and other network stakeholders

The presence of these additional stakeholders and their relationships to the network studied in Kabarole District highlights that other stakeholders beyond the Learning Alliance are influencing WASH. Though Protos is member of the learning alliance, it was not included in the study as their field team was unavailable. UWA on the other hand only invested in a one-off project in one Parish in Kasenda Sub county as a social corporate responsibility initiative. Its core mandate is wildlife Conservation.

Network Analysis Summary

Stakeholders most central to the network – District Councillors are most central to the network, although the ranking of who is most central depends on the tie type and the frequency of interaction considered. **District government stakeholders** also occupy central roles and stakeholders at **Sub County levels** become more central when considering higher frequencies of interaction. The Learning Alliance can consider how to best engage the political leaders that maintain relationships with both District and local level stakeholders in the Kabarole WASH network.

Network gaps – Multiple communities are only connected to the stakeholder network on a yearly basis, and otherwise do not have relationships with other WASH stakeholders. Communities are also the only stakeholder type that report no network relationships on quarterly or monthly frequencies of interaction. Relationships connect District and Sub County stakeholders for all frequencies of interaction, but gaps exist between the broader network and many of the communities studied.

Most common tie types – Information ties are the most common relationships observed in Kabarole District. Ninety-five percent of all relationships include an information tie. Future studies might therefore consider capturing only information ties as a means of rapidly assessing stakeholder interactions to study network properties, however the added value from multiple tie types does not add considerably to the level of effort required for fieldwork.

Additional network stakeholders – Other stakeholders were also identified as interacting with the network studied in Kabarole District. Findings from network analysis should therefore be interpreted with the recognition that this study investigated the network amongst a specific group of stakeholders and that a broader network exists in Kabarole District that might also affect WASH sustainability outcomes.

Factor Analysis – preliminary results

Analysis of factors affecting WASH service delivery sustainability was conducted using the responses to four qualitative interview questions developed by UCB and adapted to the context, about perceived successes, challenges and possible solutions. These questions are aligned with the format of other interviews conducted in Ethiopia under the SWS Learning Partnership to enable comparison of stakeholder inputs between the two contexts. The questions are intentionally open-ended to allow participants to respond with whatever they perceive is most important. Interviews were conducted in English, Rutooro, or Rukiiga languages depending on the respondent. The precise language of the question therefore changed depending on the interview, and all enumerators were trained in methods of inquiry to ensure that the point of each question was answered to the fullest extent in each interview. The four questions were:

- **Successes:** In your opinion, what do you think is working well with water and sanitation service delivery in your district?
- **Challenges:** What do you think are the main problems with the long-term sustainability of water and sanitation services in your district?
- **Proposed Solutions:** What ideas or recommendations do you have about solutions to these problems?
- Of the solutions you listed, which is the most important? Follow-up: Can you walk me through what next steps would happen if this solution occurs, and how this could lead to more long-lasting services?

Audio recordings of responses were also captured for most interviews conducted in English. Initial analysis is therefore presented in this report to provide a thematic grouping of issues that can be completed more quickly than detailed transcription.

Coding of verbal responses occurred in a three-step process. Enumerators first summarised key points during interviews, and these key points were transcribed electronically. Points were then grouped into thematic areas to identify emergent factors related to successes, challenges, and possible solutions. Emergent thematic areas were then re-grouped to reduce the overall number of categories, and key points from interviews were then re-categorised into these new groupings. Grouping names were adjusted through an iterative process until the factors were judged to be an accurate representation of the key points identified by stakeholders during interviews.

The result is a list of successes, challenges and possible solutions that emerged from interviews, and these factors can be quantified to show how many times they were identified. It is important to note that these factors identified by stakeholders are perceptions, and the perspective of any one stakeholder can differ from another depending on their experiences and role in the network. For this reason, some stakeholders identify challenges that seem to contradict successes and some recommended solutions bearing similarities to successes that were identified by others. These differing perspectives do not necessarily represent conflicts; it is instead an indication of multiple factors existing simultaneously in Kabarole District. For example, some community stakeholders described how water access has improved, but remains insufficient. Water access could therefore be described as both as a success and a challenge by the same stakeholder during an interview.

The factors identified during interviews are first described in this section and the number of stakeholders that mentioned each factor is quantified by the 'N' value in heading brackets. Selected quotes that elaborate on the factors are paraphrased from handwritten interviews. Subsequent analysis then incorporates these factors into the stakeholder networks to analyse how specific stakeholders relate to specific issues and expands on their individual perspectives (p.34).

Importantly, the number of stakeholders that identify an issue does not necessarily indicate its significance. A single stakeholder might be able to identify a systemic root cause that others do not perceive. The number of stakeholders identifying an issue (N) therefore indicates which issues are the most obvious and less obvious issues can be both important and potentially highly actionable for the Learning Alliance from a systemic perspective. Expert interpretation by stakeholders in Kabarole District will be essential for identifying which issues should be prioritised and which stakeholders should be involved in developing solutions.

The factors raised here and in the subsequent factor analysis to be led by UCB will then be analysed with respect to findings from other analysis, namely the context analysis, building blocks assessment, service level assessment, in the baseline report to provide a more comprehensive inquiry into the state of and factors affecting WASH service provision in Kabarole.

Successes

Descriptions of successes relate to the first qualitative interview question about what is working well with WASH service delivery in Kabarole. Responses identify positive efforts that could be strengthened or continued by the Learning Alliance in the future. Although the overall interview focused on sustainability, commentary on service levels themselves were often referenced as part of stakeholder responses. Descriptions of how WASH services are improving were the most common theme identified.

A description of a success does not mean that a stakeholder believes that everything is working perfectly well. Successes can also exist alongside challenges. For example, services might be improving in some areas while challenges remain in others and the fact that a relatively large number of stakeholders indicated that WASH services are improving does not mean that WASH services are accessible or sustainable throughout the district.

WASH Services Are Improving (N= 26; N = The number of stakeholders identifying an issue)

Multiple stakeholders described how WASH services have improved in Kabarole District in specific cases with under-served areas reportedly being prioritised. Even if coverage is not complete, growing numbers seem to have access to safe water and sanitation and hygiene is reportedly improving.

About 30% of the households that have been served have access to safe water. This has reduced instances of bilharzia among these households.

– Nyabweya A Community

Kabarole District also has abundant water resource potential, and combining water resource management with WASH activities is also reportedly helping services to improve. The improvement in services is perceived to be having an impact; both stakeholders at District and community levels described reductions in waterborne diseases in particular areas, specifically declines in bilharzia and typhoid.

Encouraging Community Management of Services (N=18)

Communities have important roles in waterpoint management, and 18 out of 49 stakeholders interviewed report that this is working well. This theme relates both to the community management of services and the support provided to communities that support these management practices to continue.

People at the local level have the spirit team work to maintain their own water facilities like hand pumps. The water user committees are in place and easy to mobilise and talk to.

– District Councillor Karambi

Local management includes collecting payments for water services, which is important for operating and maintaining infrastructure. Some perceive this system as working well in certain areas. Technical support to these local stakeholders from government or other service authorities is also perceived as helping communities to perform their management roles. These support relationships are described as helping community management leaders to access support as needed.

Communities are also responding to sanitation and hygiene sensitisation and becoming more aware of WASH issues. Sanitation and hygiene requires management at the community level because it pertains to individual behavior change. Some report that local management of sanitation, such as activity by Village Health Teams, is helping sanitation and hygiene to improve.

Complementary Stakeholder Roles (N=12)

A variety of stakeholders working together was described as helping WASH services to improve in Kabarole. NGOs are also considered to be playing an important role in supporting the development of WASH services. Their financial resources and activities are helping to fill gaps in what government alone can provide. Cost sharing between stakeholders was another practice mentioned. The combined resources of community revenues from user fees with government support can be used to perform upgrades or repairs that might be out of reach for these stakeholders individually.

The district has involved people in the private sector and NGOs to fill the funding gap for water and sanitation services.

– Sub County Chief Karambi

Private sector involvement is another example of a complementary role and includes contractors that build infrastructure and other for-profit service providers that are starting to become more involved in WASH such as banks and repair services such as Hand Pump Mechanics. The involvement of different types of stakeholders is considered to be achieving results that would be out of reach for any one stakeholder to deliver individually.

Well-functioning Institutions (N=10)

Institutions such as government offices are perceived as having the technical capacity and the human resources to perform well. The policies in place are good, and stronger planning systems are starting to develop at the district level. The institutional structure also reportedly extends down to local levels in order to deliver and sustain WASH services.

Institutional setup of the water sector is good from the district level to the village level.

– Health Assistant Karambi

Strong political leadership is seen to be advocating for and delivering services, and transparency and accountability is perceived to be improving.

Coordination and Learning with the Intent to Improve Services (N=10)

Coordination and learning amongst stakeholders is seen as another successful practice. There is a lot of perceived good will; stakeholders

report that there is genuine intent to improve services.

There is a positive change. The political leaders are trying to understand now what it means to provide water as a service. They used to demand infrastructure to be put in place, they were resisting sustainable measures, but now some of them come out to be advocates for sustainable measures. These are not always popular measures with the constituents, but the leaders know it is the right thing to do.

– IRC

There are also perceptions of stakeholders increasingly thinking of water, sanitation and hygiene in terms of service delivery. Sustaining services is now seen to be a key issue that stakeholders in Kabarole District are collectively trying to solve.

Summary of Successes

The number of stakeholders that mentioned each theme is quantified in Figure 11. The perception that WASH services are improving in some areas was referenced by over half of the stakeholders interviewed, and is the most common perception of success even if it does not necessarily address the question of sustainability. Encouraging community management of services is the next most commonly perceived successful practice, followed by complementary stakeholder roles and then well-functioning institutions, and coordination and learning.

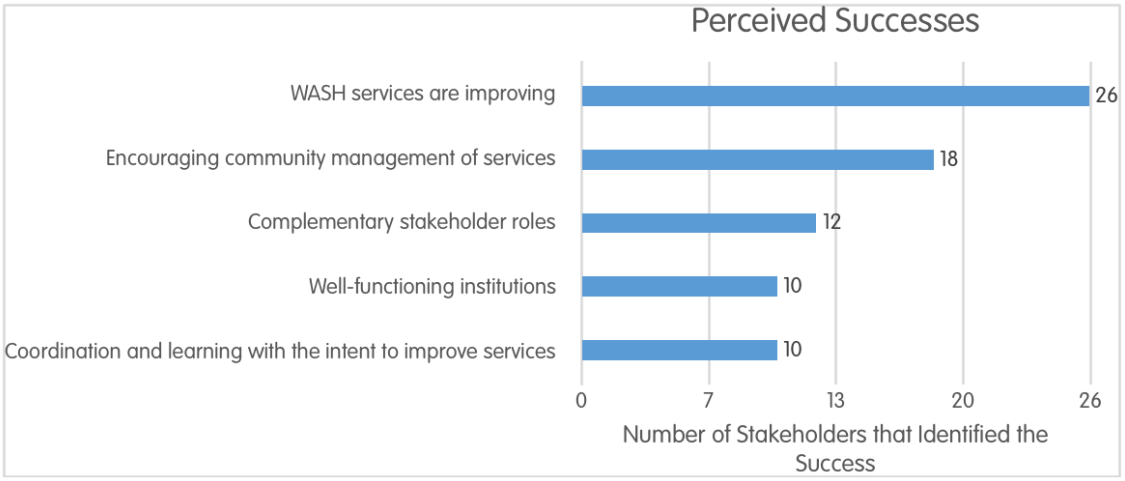

Figure 11 - Number of stakeholders perceiving different success with WASH services in Kabarole District

Challenges

The second interview question pertained to challenges affecting the sustainability of WASH services. All stakeholders identified challenges. Some challenges appear to contradict the successes identified, indicating that challenges remain even if some things are working well. It is important to emphasise that the themes identified are perceptions, and therefore can be influenced by lack of or inaccurate information. Different stakeholders perceive the systemic nature of WASH issues differently, and therefore offer different characterisations of the problems affecting sustainability.

Inadequate WASH Services (N=27)

Stakeholders interviewed commonly described deficiencies in the quality of service experienced by end users. This theme is distinct from commentary on the insufficiency of water infrastructure itself because the comments describe the experiences or effects of inadequate services. Some commentary also discussed issues of sanitation and hygiene behaviours that are not directly tied to infrastructure availability. The community that described improvements in WASH services (p.24) also identified inadequate services as a challenge during the same interview:

Bilharzia and typhoid are rampant due to consumption of contaminated water.

– Nyabweya A Community

Although the emphasis of the question focused on sustainability issues, descriptions of service shortcomings were the most commonly identified theme by stakeholders.

Perception of Institutional Leaders Neglecting Responsibilities (N=20)

Many local stakeholders, and communities in particular, feel neglected by political leaders. They are waiting for support, and they feel isolated. Some communities also lack knowledge of who to contact for information on WASH services, further leading to a feeling of isolation. They sometimes have challenges coordinating with local leaders and are expecting stronger leadership to address WASH service and sustainability issues.

"There is poor leadership from the district. You see, our President is good, but the people he sends to help us, they get lost somewhere there, and even the district people do not mind about delivering services to us."

– Kinombe Community

Communities seem to expect that institutions have resources that could be used to deliver better services, but that these resources are being withheld. Failure to meet expectations, even if they are unreasonable, can undermine trust. Some stakeholders interviewed also perceive a lack of institutional transparency because is a lack of clarity around where financial resources are available and what they can be used for.

Unwillingness to Play Voluntary Roles (N=16)

Multiple stakeholders interviewed reported the mismanagement of waterpoints by local stakeholders. Water User Committees, for example, might exist in a particular community, yet not be performing adequately to sustain service levels. There is a reported lack of motivation amongst stakeholders that are required to play voluntary roles in the management of WASH services. Some communities doubt that they should actually be responsible for the management of operation and maintenance issues.

"Many people are resistant to change or to accept that the water user committee should be responsible for the services provided. That is, the communities think that they are doing it for someone coming to supervise."

– CDO Karambi

"The water user committees are inactive on their roles and responsibilities."

– Sub County Chief Karambi

"Poor turn out for community members to water meetings."

– Rubingo Community

An unwillingness to take voluntary initiatives is also perceived as a challenge to sustaining behavior changes in sanitation and hygiene practices. Ongoing commitment is necessary to sustain and improve practices. A lack of motivation on the part of community members can therefore be a challenge.

Increasing Stresses on Water Resources (N=15)

Stakeholders at both District and community levels identified issues with water resource management and source contamination. Although Kabarole overall has considerable water resource potential, the availability of water resources in specific areas is reducing with negative impacts on water access. Water resource availability is being affected by broad environmental factors such as climate change, and direct impact on specific water resources by human mismanagement.

"Some people go there and buy land around water sources, plant eucalyptus trees, and these are depleting the water resource."

– Kanyante Community

Source contamination was also cited as an issue. In some cases, contamination is perceived to be from the construction of pit latrines or open defecation by children close to waterpoints, and shallow wells in particular. Changing population needs are also expected to further stress water resources in specific areas, especially since the trend towards urbanisation is expected to continue. These combined issues indicate a need to address water resource management issues because of their potential impact on long-term sustainability of safe water access.

Insufficient Infrastructure (N=15)

Commentary on this theme specifically relates to challenges with infrastructure itself. This includes breakdowns, the increased marginal cost of extending infrastructure to harder to reach areas, and poor quality materials used during construction that later result in problems.

"The materials being used (e.g. the pipes) are smaller and do not allow proper water flow. Sub-standard materials were used."

– Sub County Chief Karambi

Insufficient or Inconsistent Resources (N=13)

Available financial resources were described as insufficient for improving or sustaining services. Resource needs pertain to developing new infrastructure, sustaining existing operations, and rehabilitating infrastructure at the end of its service life. Resources are also necessary for sustaining extension work to engage communities.

"Minimal funding for sanitation. The current allotment will cover only 32 of approximately 400 communities over the next quarter. They may only conduct sanitation activities in ¼ of communities in a year."

– District Executive, Secretary for Works

Resource issues also relate to the inconsistency of resources available. There are risks involved with becoming too dependent on external funding sources or projects, particularly since budgets and priorities can change.

"CSOs could change priorities and the district is currently depending on them for financial resources. Maintenance is within range because of CSOs."

– District Water Officer

Insufficient Ongoing Technical Support for Local Management of Services (N=12)

Engagement with communities needs follow up to ensure that communities understand their roles and have the knowledge and skills to play these roles. Ongoing engagement is perceived as important for both the management of safe water access, and the sustainability of sanitation and hygiene behaviours. Behaviour change is gradual, and investment is required to sustain extension services.

Water user committee not present because there is no support system.

– Kigwemuwe Community

Sanitation and hygiene is behaviour change, and this is gradual. Need to keep reminding people, continue interacting. The more you interact, you build a relationship then they can change. But not able to do this. Cannot sustain movements.

– ADWO representing the DHI

Water Boards were referenced in particular as local entities that require continual technical support in order to continue functioning. Extension work and technical support to help local stakeholders play their necessary roles in managing WASH services is viewed as insufficient in Kabarole.

Resistance to Paying for Services (N=10)

In addition to unwillingness to play voluntary roles in sustaining WASH services, community members can be resistant to pay for services. Again, amongst communities, there is a perception of doubt around it really being the responsibility of the community to finance repairs and upkeep of a water point or water system.

"Willingness to pay for water is low and demotivates water user committees that are responsible for management of water supply systems. In the end the systems are not well managed. "

– HPMA

Inadequate or conflicting approaches undermining sustainability (N=9)

Some stakeholders interviewed perceive a lack of plans for the sustainability of service delivery beyond the end of a project. Many projects have been handed over to communities or other stakeholders for management, but the long-term vision for rehabilitation, for example, has not been clearly thought through. There is a perceived lack of genuine asset management.

Some stakeholders also promote differing approaches that can conflict and undermine progress. Misinformation about proper sanitation behaviors has been reported to cause communities that were making progress to revert to worse practices.

"Find contradictions. Different from what others promote. For example, the ADWO went for home visit in a village. A certain organisation advised people to use soft materials for latrine privacy. So community members removed doors. A poor community man removed the door and made a mat instead. The ADWO was disappointed. He has moved backwards. Now she has to go and change the mindset of a man that has been advised poorly by another organisation."

– ADWO representing the DHI

Still other activities by certain stakeholders can be directly harmful to WASH sustainability. Some communities reported vandalism of waterpoints where parts were stolen, and one community reported that unknown individuals masquerading as officials conned the community into contributing money and then left without returning.

Summary of Challenges

Figure 12 summarises the number of stakeholders that mentioned each challenge. Following commentary on the inadequacy of WASH services, the most commonly identified issue was the perceived neglect of responsibilities by institutional leaders. Many communities feel that they have been abandoned, and do not receive the support that they expect from technical and political leaders. Related challenges are the unwillingness of community members to playing voluntary roles in managing WASH services, and the insufficiency of ongoing technical support for local service management. In addition to the other challenges identified, ensuring effective community management and participation in WASH sustainability appears to be a crucial group of issues in Kabarole District.

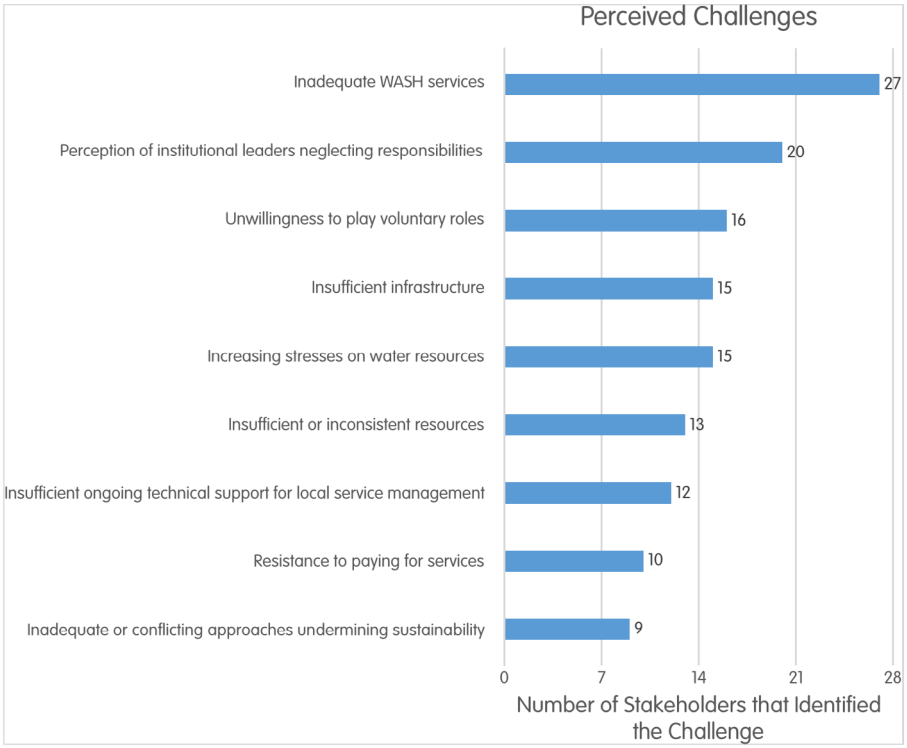

Figure 12 - Number of stakeholders perceiving different challenges to WASH sustainability in Kabarole District

Proposed Solutions

The final part of stakeholder interviews asked about potential solutions to the challenges identified. Participants were encouraged to propose solutions for each of the challenges they had identified earlier in the interview. As with successes and challenges, direct commentary about how services should be improved was the most common theme referenced during interviews. Other proposed solutions are more systemic in nature and have potentially stronger implications for long-term sustainability. All solutions identified are potentially important because certain stakeholders might be able to perceive broader systemic factors that are not recognised by others.

Improve or Expand Infrastructure (N=33)

The most commonly proposed solution was the recommendation to either improve or expand infrastructure. Funding should be secured to finance necessary investments in extending water services to areas of greatest need, and to rehabilitating or replacing infrastructure at the end of its service life.

Address challenges in water stressed areas because the disease burden is high. Money is needed, then the District can do the work. Needs heavy capital investment.

– District Executive, Secretary for Works

Alternative technologies were also recommended for consideration, such as the potential for solar pumps to replace costly systems currently operated by diesel generators.

Strengthen Engagement with Communities (N=27)

Many stakeholders interviewed perceive a need for stronger engagement with communities. This recommendation is in response to the reported challenges with gaps in extension to communities, and community feelings of being neglected. There is also a perceived need to strengthen relationships between communities and their local leaders to improve access to information on WASH issues and understand the processes for how services are expected to evolve in the district.

There should be sensitisation meetings at community levels so that the people should be aware and take responsibility of the services provided.

– LCIII Karambi

Engagement is also seen as necessary to support ongoing behavior change in sanitation and hygiene behaviors, as well as to reinforce messages about roles, responsibilities, and practices for managing safe water access.

Diversify Revenue Sources for Sustaining Services (N=19)

The challenge of resource limitations requires identifying new sources of revenue that can help to sustain WASH services. The need for additional resources includes financing for capital infrastructure investment and revenues for managing operation and maintenance. In particular, community members paying for services is perceived as an essential part of ensuring sustainability.

Savings culture is needed in the schemes to work on the O&M challenges whereby whatever is collected from users is well utilised. They can respond to emergencies.

– Umbrella

Government to Provide Services (N=14)

Some stakeholders believe that District Local Government should play a much stronger role in directly managing WASH service delivery and sustainability. Some communities even call for the free provision of safe drinking water. Others still believe that it is the job of government to either provide better services, or to manage the advocacy effort perceived as necessary to improve and sustain service delivery.

The government should ensure quality water services.

– Rwenkuba Community

Support for Local Management of Infrastructure (N=13)

Local management of infrastructure will continue to be important. There is a need for routine maintenance, and this is seen as being best managed at local levels. Ongoing engagement with local management bodies such as Water User Committees and Water Boards is seen as essential to ensure that these local actors have the sufficient technical ability to perform their work, can access support when they need it, and maintain the motivation necessary to consider playing management roles that are essentially voluntary.

Water source committees should be put in place to maintain the services provided.

– LCIII Karambi

It is also important to identify qualified individuals for local management so that they can handle the responsibilities given to them. This is particularly seen as important for Water Boards where the level of management and technical ability is higher than that required for managing a point source such as a shallow well.

Political Enforcement of WASH Policies (N=7)

Several stakeholders called for stronger political enforcement of WASH policies. Paying for water or services, for example, can be politically unpopular, and leaders might avoid enforcing such policies. Ensuring that policies, roles, and responsibilities are fulfilled is seen as essential, however, and it is perceived that leadership is needed to align stakeholders around such policies. Political will and leadership from authorities is seen as an essential component of improving WASH sustainability in Kabarole.

Sub County to pass a resolution on payment for water to ensure all households pay user fees to the water user committees to ensure water supply facilities are maintained.

– HPM Kasenda

Improve Water Resources Management (N=7)

WASH sustainability is directly related to water resources management, and several stakeholders believe that these two issues need to be addressed simultaneously. The proposal to improve water resources management directly relates to the challenge of increasing stresses on water resources. Managing sources effectively is a critical first step in safe water access.

Catchment management plans that are well researched. Also manage by catchment instead of political boundaries. Need to make catchment management plans, then implement. Need source protection and catchment management guidelines.

– AWMZ

Strengthen Project Implementation Processes (N=6)

Some stakeholders interviewed perceive an ongoing necessity for properly managing project implementation in the first place. Project management includes proper monitoring of infrastructure installation to ensure that quality materials are used and that communities are correctly involved throughout the process. Some also called for the technical capacities of institutions involved in this process to be strengthened.

Recommend conducting an audit exercise by independent projects before it is certified and contractor paid to ensure value for money before projects are completed.

– District Councillor Karambi

Coordinate and harmonise approaches (N=6)

Coordination and harmonisation continues to be seen as important for the future of WASH sustainability by some stakeholders. Proposed solutions include continuing to coordinate to ensure that efforts are aligned behind the same vision, and that limited resources are used efficiently. Information dissemination options such as media outlets might be opportunities for continuing to build and share the vision for WASH services in Kabarole.

Stakeholders can learn from each other. For example, one can conduct a baseline survey, another can design the project.

– TSU

Increase Private Sector Involvement (N=3)

Finally, private sector stakeholders are seen as an opportunity to strengthen WASH sustainability by involving additional capacities and possibly resources in the network. Some see opportunities for financial institutions such as banks to enter the WASH sector to provide services that could support improvements. The proposed solution relates to the need to diversify sources of financing, but is more specific in its recommendation of a particular type of stakeholder that should be increasingly engaged.

Adopt business models for WASH. For example, the HPMA is private, but seeing that it can stand in to provide a form of social entrepreneurship that could support a huge aspect of financing WASH.

– IRC

Summary of Proposed Solutions

Figure 13 presents the summary of the number of stakeholders that identified each proposed solution. Strengthening engagement with communities is the second most commonly proposed solution after the direct recommendation to improve or expand infrastructure. Community engagement also relates to the need to diversify revenue sources because of the perceived need to collect payment for water services from communities. Other solutions were proposed relatively less frequently, but are not necessarily less important because some stakeholders might identify opportunities not perceived by others.

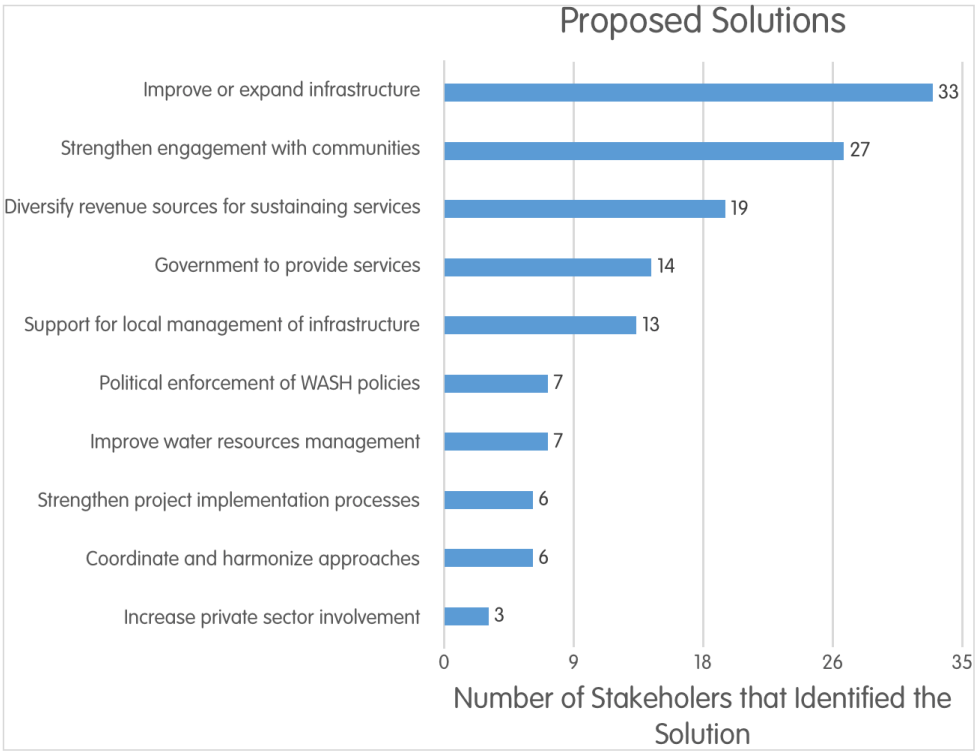

Figure 13 - Number of stakeholders proposing different solutions to WASH sustainability in Kabarole District

Actor and Factor Network Analysis

Network data and qualitative factor analysis can be combined to analyse how stakeholders interact with both issues and each other. Combined analysis is achieved by creating a network that includes both stakeholders, stakeholder relationships, qualitative factors, and ties showing which stakeholders identified which factors. An example of an actor and factor network is presented in Figure 14, although ties between stakeholders have been removed for visual clarity.

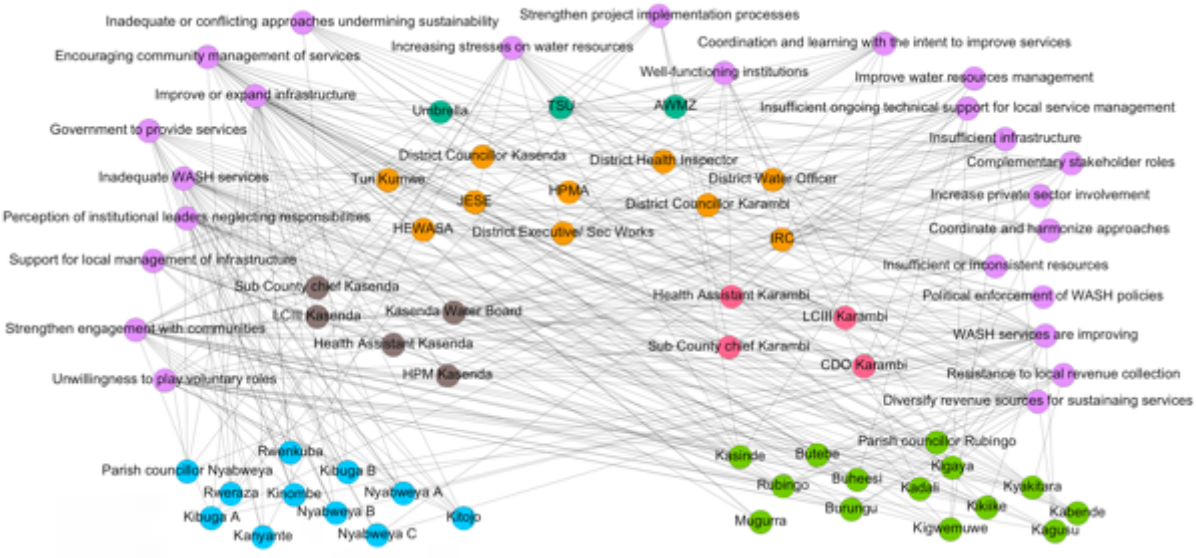

Figure 14 - Network showing relationships between actors and the factors they identified (purple nodes). The complete visual of both actors and factors is difficult to interpret because of the large number of ties, and subsequent figures therefore filter the network to show specific factors and the stakeholders that identified it.

The combined actor and factor network can then be filtered to show the network of a specific factor. The filtered network shows the factor and the stakeholders that identified it as important (Figure 15).

Figure 15 - Actors that identified the potential solution: Political enforcement of WASH policies

Stakeholder ties can be included in these actor and factor networks to show where stakeholders related to the factor are sharing information at least once in the past year. The extent to which all of the stakeholders share information with each other can also be quantified. Density measures the proportion of ties that exist out of the total number of ties possible amongst a stakeholder group[11]. A density of 1.0 indicates that all stakeholders are directly connected to each other. Calculating density in these networks therefore quantifies the extent to which stakeholders perceiving a factor are also sharing information with each other. Figure 16 illustrates how information ties can be analysed for density in the network around the factor 'Political enforcement of WASH policies'.

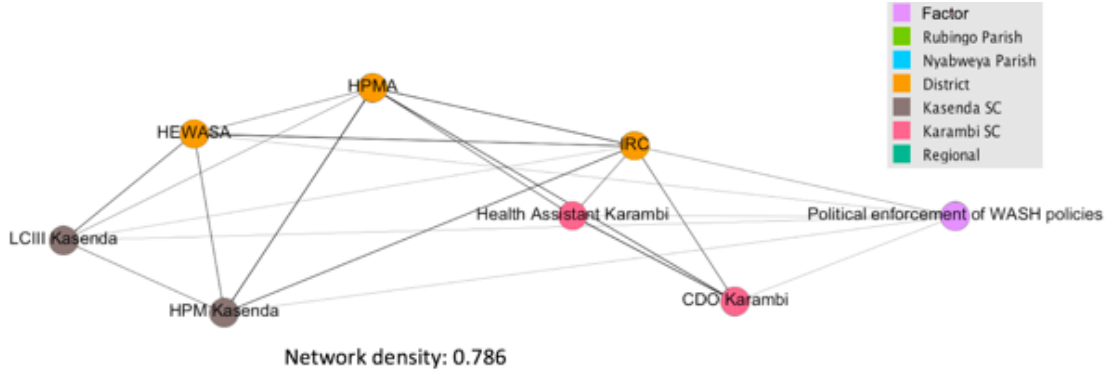

Figure 16 - Network including information ties related to the 'Political enforcement of WASH policies'

[11] Calculations use undirected ties because one-way ties still represent a relationship.

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Adding information ties to the network of stakeholders that identified 'Political enforcement of WASH policies' as a potential solution finds a relatively high network density (0.786). This density means that over 75% of the possible number of ties between these stakeholders are present[12]. The network density value indicates that most of these stakeholders directly share information with each other. A potential implication for the Learning Alliance is understanding where coordinated stakeholder groups exist that might be able to collective address an issue. Conversely, the lack of network density might indicate a diverse range of stakeholders that independently identify an issue, and there might be potential for convening currently disconnected stakeholders around the factor. This section presents analysis of actor and factor network densities for each identified success, challenge, and proposed solution to WASH sustainability in Kabarole District.

Success Factor and Actor Networks

WASH Services Are Improving

Stakeholders interviewed at all levels of hierarchy perceive that some aspects of WASH services are improving (Figure 17). The network density value (0.365) indicates that not all of these stakeholders are directly sharing information with each other.

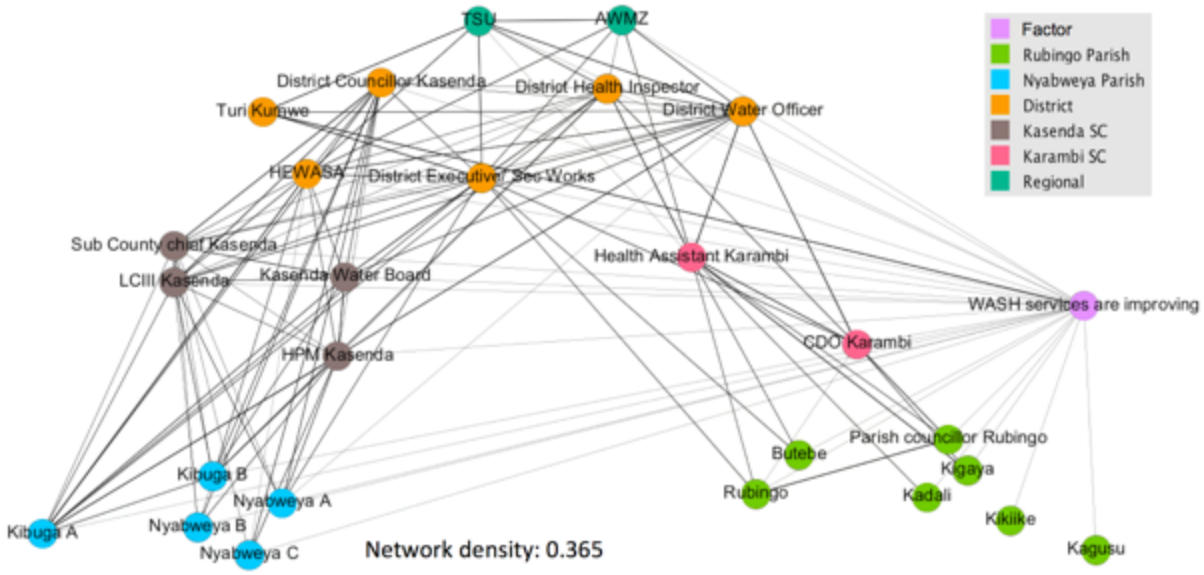

Figure 17 - Factor and actor network for the success 'WASH services are improving'

Some community level stakeholders perceive improvements in WASH services as a success despite reportedly not sharing information with other stakeholders in the network. These findings suggest that there are areas of WASH service improvement perceived in multiple places, and that perceptions of improvement in WASH services might be particular to specific areas that a stakeholder interacts with. Statements from three different stakeholders implicitly reference different geographical scopes in their comments:

Presence of clean water leads to a reduction in waterborne diseases.

– Kikiike Community

The communities have got sanitation services, for example latrines, hand washing facilities on latrines, bathrooms. Much as some complain about having soap on facilities, it is being adopted by the communities.

– CDO Karambi

Information sharing is leading to improved service delivery by identifying unserved areas. This is cascading down.

– TSU

[12] Network density values are between 0 and 1. A network density of 1 means that all stakeholders are directly connected to each other (i.e. 100% of the possible number of ties exists).

Encouraging Community Management of Services

Stakeholders at all levels of hierarchy also perceive encouragement of community management of services as a successful approach (Figure 18). Stakeholders that perceive this success are not all directly connected to each other (Density: 0.368).

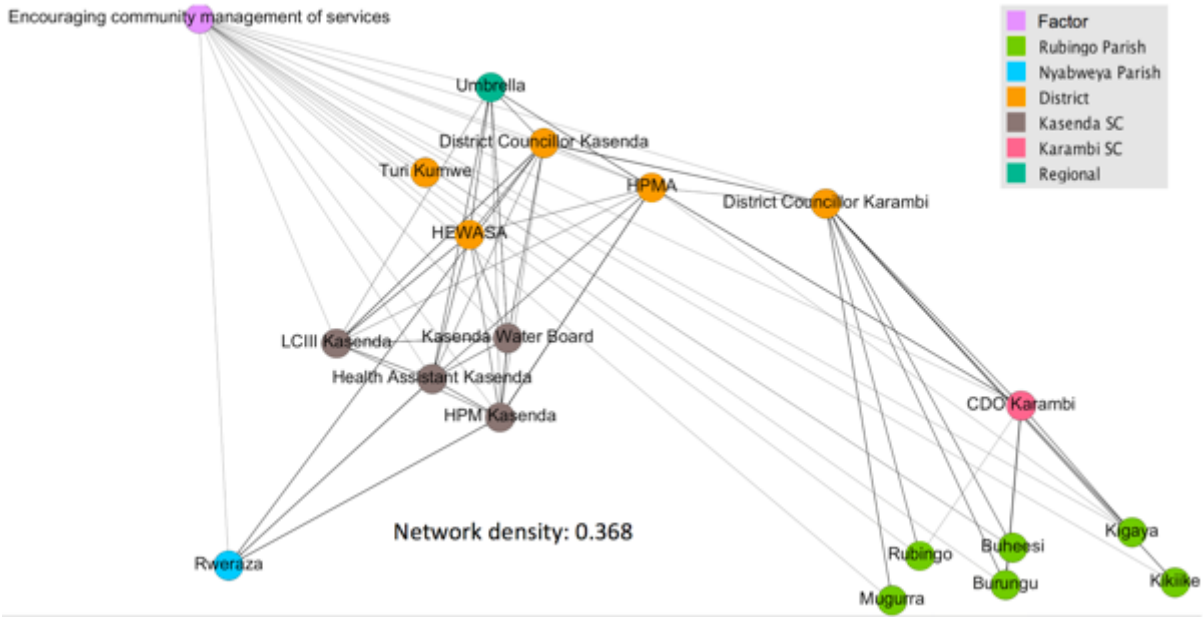

Figure 18 - Factor and actor network for the success 'Encouraging community management of services'

Higher level stakeholders describe how support is encouraging community management, and communities describe some of the positive effects that community management is having. Statements from stakeholders at different levels of hierarchy illustrate these perspectives:

DWO is also supporting effort to establish management by water boards.

– Umbrella

Encouraging the users to support themselves through funding and repairing (maintenance).

– CDO Karambi

Some community members are mobilised by the water user committees to clean the water source. Regulation of communities on water source use. For example, the brick layers are not allowed to fetch water from the water source, nor are people with dirty jerrycans to control contamination.

– Buheesi Community

Complementary Stakeholder Roles

The perception of complementary stakeholder roles as a success has a higher network density (0.692) than the first two successes identified. A higher network density indicates that more of stakeholders are directly connected to each other. Visualisation of this actor and factor network (Figure 19) shows that most stakeholders identifying this success are above the community level of hierarchy, i.e. are active at.

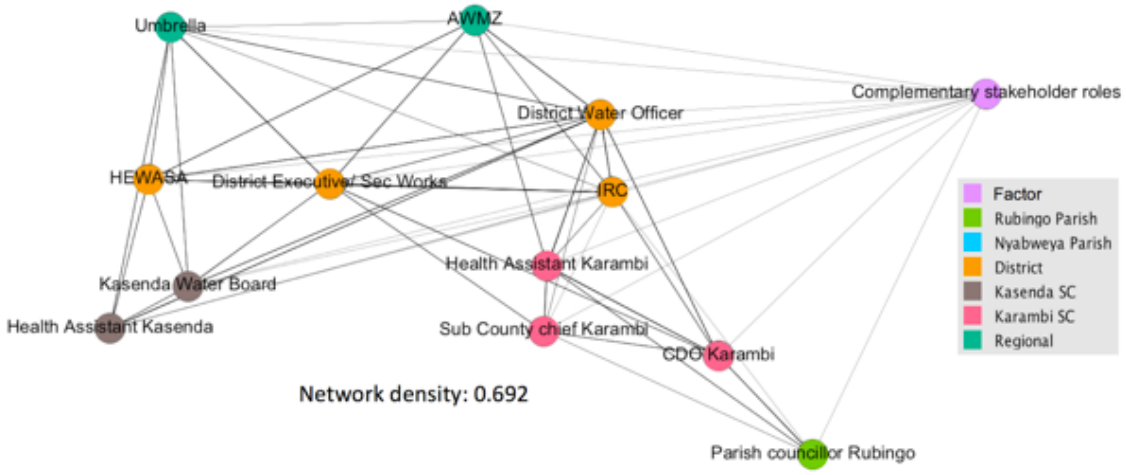

Figure 19 - Factor and actor network for the success 'Complementary stakeholder roles'

These findings suggest that the 'Complementary roles' factor is perceived as more important to stakeholders that are already engaged in collaborative relationships at regional, district, and sub county levels. Communities are absent from this network. Although complementary roles may be an important success factor, it is not equally perceived as such by all stakeholders. Statements from district government offices highlight how this factor is perceived by district officials:

Partners are complementing district efforts to reach communities.

– District Executive, Secretary for Works

Joint implementation between private, CSO, and government.

– District Water Officer

Well-Functioning Institutions

Stakeholders that perceive 'Well-functioning' institutions are mostly at district and regional levels of hierarchy (Figure 20). This network has a relatively high density (0.764). The perception of good institutional performance is mostly held by institutions themselves or stakeholders directly interacting with them.

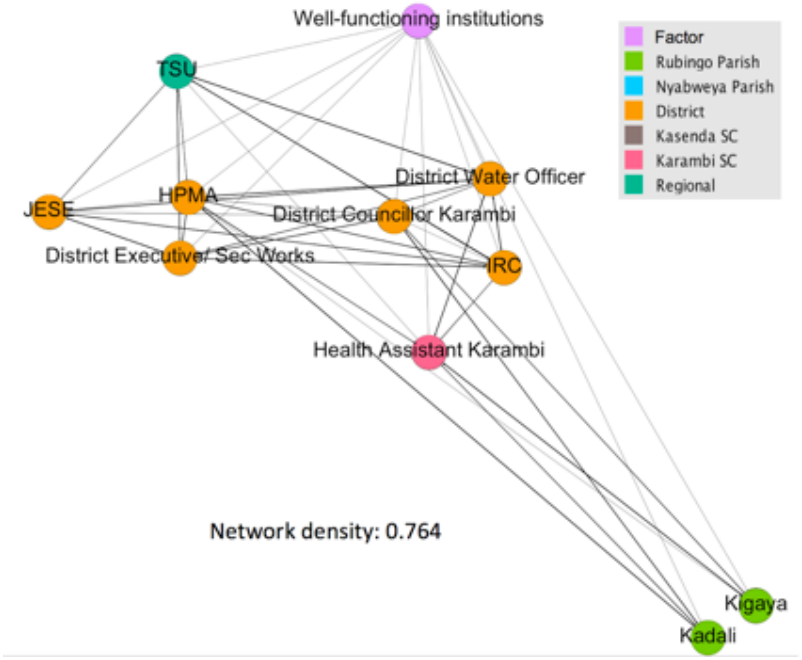

Figure 20 - Factor and actor network for the success 'Well-functioning institutions'

Perceptions of well-functioning institutions at the community level are less common, but were recorded in two instances. Both of these comments relate to local institutions rather than ones at the district level:

The leaders have good relationships in organising and mobilising sensitisation meetings in the area.

– Kadali Community

The parish chief and parish councillors are approachable which helps to ease service delivery.

– Kigaya Community

Coordination and Learning with the Intent to Improve Services

Coordination and learning is exclusively viewed as a success by stakeholders above the Parish level of hierarchy (Figure 21). The network density (0.818) is the highest of all success factors identified. Stakeholders perceiving coordination and learning as a success are mostly directly connected to each other, and are mostly stakeholders based at the District level.

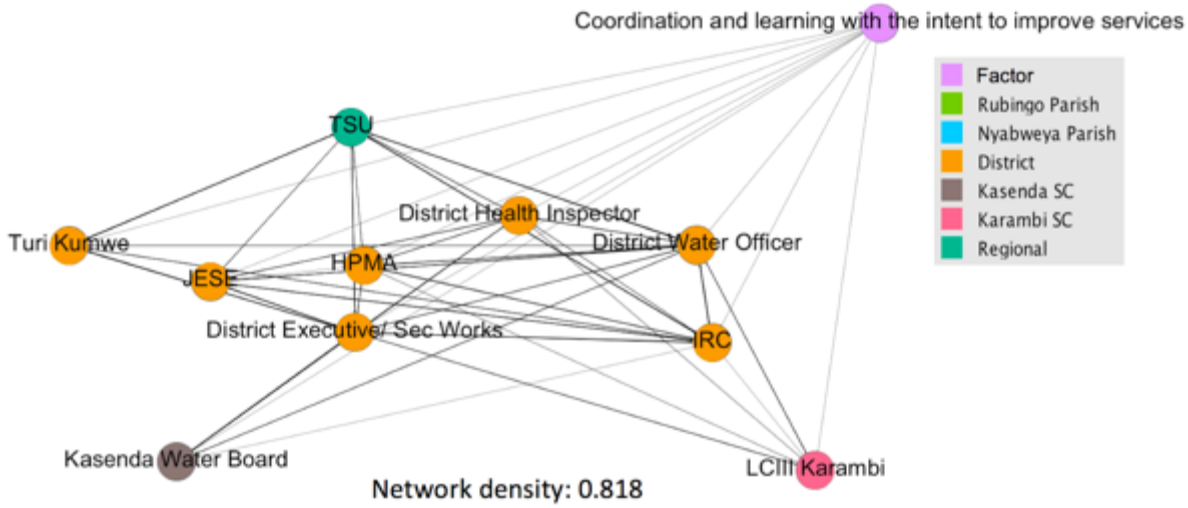

Figure 21 - Factor and actor network for the success 'Coordination and learning with the intent to improve services'

This network suggests the presence of a strongly coordinated learning network amongst specific stakeholders in Kabarole District. Statements from stakeholders at both District and Sub County levels expand on this perception:

Quarterly meetings with all district NGOs and government partners where they discuss how to have interventions, challenges, info sharing and budgets.

– District Executive, Secretary for Works

Coordination has improved. As partners they avoid duplication of work.

– TSU

As leaders they get involved in service delivery where by leaders at all levels take part in planning and participation.

– LCIII Karambi

Success Factor and Actor Network Summary

Figure 22 presents the summary of factor and actor network densities for the different successes identified. The perception of WASH services improving and encouraging community management of services are the two factors identified most commonly, and are also the ones identified by the most diverse set of stakeholders. The other three successes that describe complementary roles, coordination, and institutional functionality, are mostly perceived by fewer stakeholders at higher levels of hierarchy that are directly connected to each other.

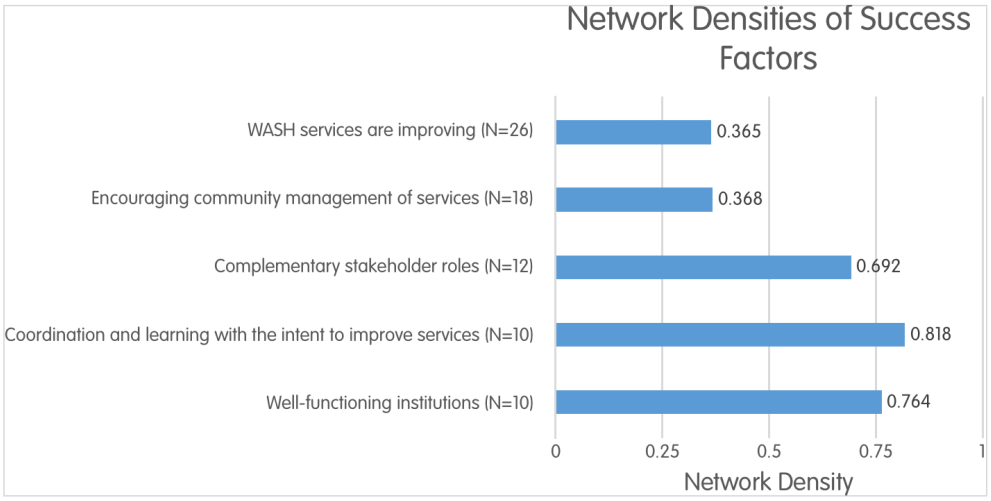

Figure 22 - Summary of success factor and actor network densities

The number of stakeholders at each level of hierarchy that identified each factor can also be quantified (Table 5). The 'N' value indicates the number of stakeholders that were interviewed at each level of hierarchy, and the cells of the table are color coded to highlight the most commonly identified factors (green) and the least commonly identified factors (red) for each level of hierarchy. Analysis can be further extended to quantify the percentage of stakeholders at each level of hierarchy that identified a factor (Figure 23).

Table 5 - Number of times each success factor was identified by level of hierarchy

Success	Regional (N=4)	District (N=10)	Sub County (N=11)	Parish (N=29)	Total
WASH services are improving	2	6	6	12	26
Encouraging community management of services	1	5	5	7	19
Complementary stakeholder roles	2	4	5	1	12
Coordination and learning with the intent to improve services	1	7	2	0	10
Well-functioning institutions	1	6	1	2	10

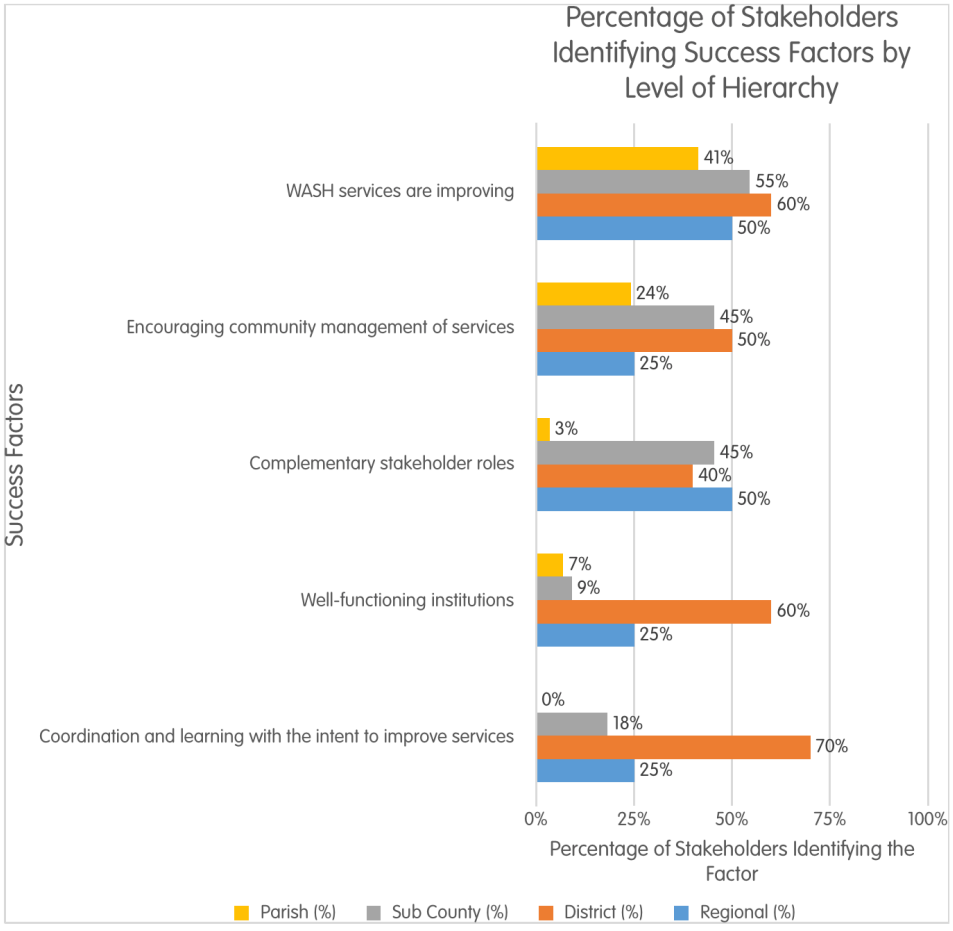

Figure 23 - Percentage of stakeholders identifying success factors by level of hierarchy

Challenge Factor and Actor Networks

Inadequate WASH Services

Inadequate WASH services was the most commonly perceived challenge by stakeholders interviewed. The actor and factor network therefore resembles the overall structure of the Kabarole WASH network, and the overall low network density (0.262) is reflective of the lack of direct ties between stakeholders in the two sub counties and parishes included (Figure 23).

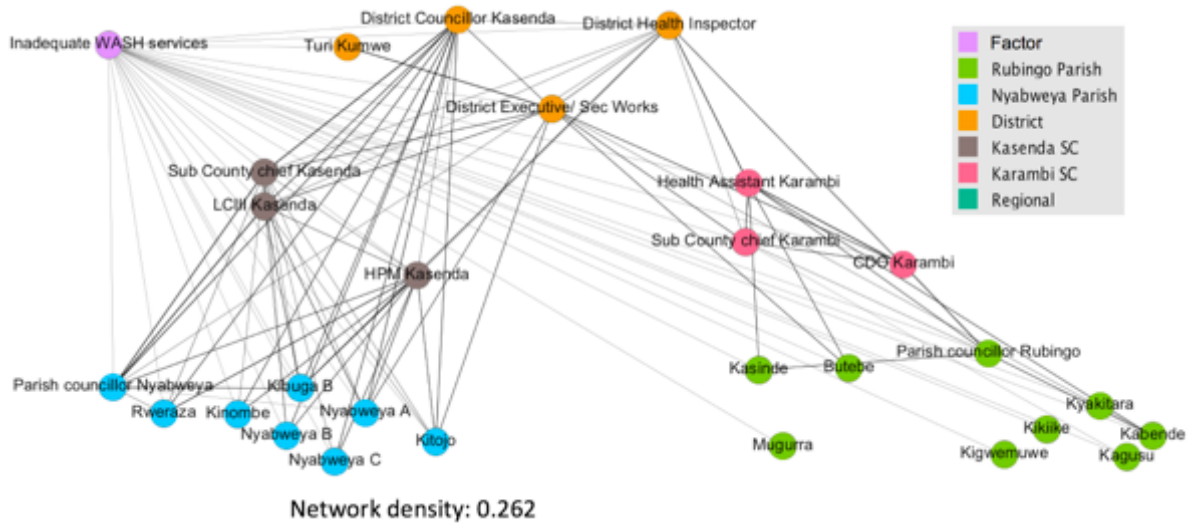

Figure 24 - Factor and actor network for the challenge 'Inadequate WASH services'

Much of the stakeholder commentary describes specific challenges with WASH services that are observed in the stakeholder's area of activity:

Inequitable access to safe water. Up to 4 zones do not have at access and depend on crater lakes that have contaminated water.

– HPM Kasenda

Some people have difficulty to access the water since it is farther from the residences.

– Kibuga B Community

Perceptions of Institutional Leaders Neglecting Responsibilities

This issue is perceived almost exclusively by stakeholders at Sub County and community levels; District and Regional stakeholders are largely absent from the network (Figure 24). The disconnected nature of this actor and factor network that spans two Sub Counties results in the low network density observed (0.243). The network visually highlights how this issue is perceived by many stakeholders at Sub County and local levels.

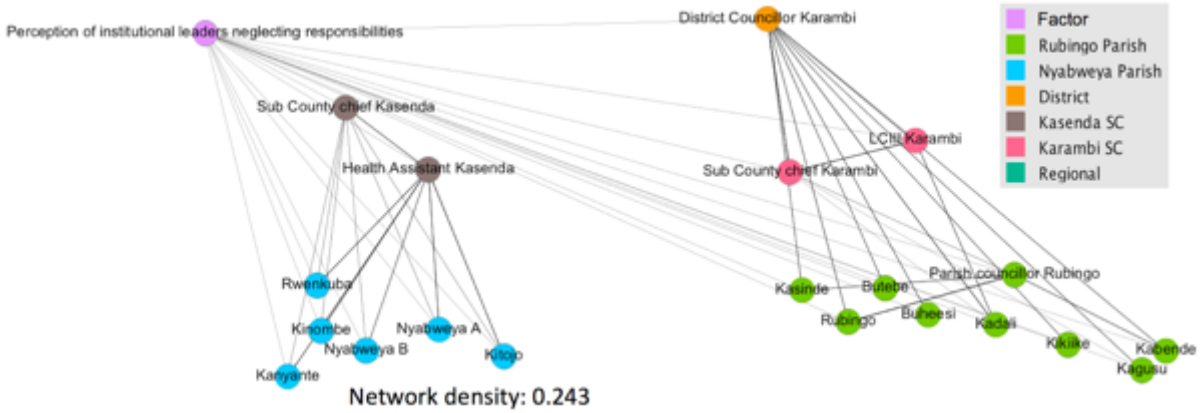

Figure 25 - Factor and actor network for the challenge 'Perception of institutional leaders neglecting responsibilities'

Many communities echoed similar sentiments about a perceived lack of leadership and feelings of neglect:

Neglect from the political leaders towards rehabilitation of water sources.

– Kasinde Community

The government has neglected the community concerning water source rehabilitation and sanitation. The government does not help in funding the services.

– Kadali Community

Lack of information. The community doesn't know what takes place at Sub County or District level.

– Nyabweya B Community

People in the community expect much from their leaders in the form of funds which is not the case since these leaders receive little or no funds.

– LCIII Karambi

Unwillingness to Play Voluntary Roles

Challenges with voluntary roles in the sustainability of WASH services were mostly identified by stakeholders at Sub County and community levels, although a few District and a Regional level stakeholder also identified the issue. This group of stakeholders does not all interact directly, and the network density is therefore relatively low (0.279). The visual representation of the actor and factor network is presented in Figure 25.

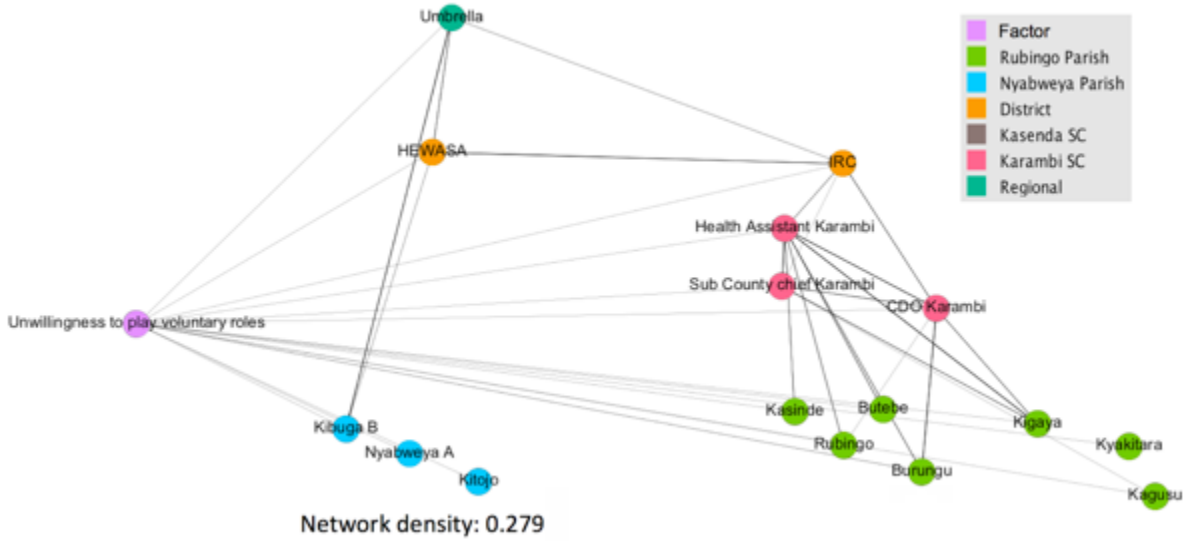

Figure 26 - Factor and actor network for the challenge 'Unwillingness to play voluntary roles'

Different types of stakeholders perceive similar types of issues:

Their facilitation as Water Boards is a challenge. They offer free services – voluntary, so they don't always have time to do everything needed. Need for motivation and spirit of volunteerism.

– Umbrella

Volunteering – without payment some give up on service delivery.

– HEWASA

Less support from the fellow community members in water source rehabilitation.

– Butebe Community

Some people are not cooperative in planning and developing as well as encouraging service delivery i.e. low turn outs to meetings in the community on water and sanitation.

– Kigaya Community

Insufficient Infrastructure

Fifteen of the stakeholders interviewed identified challenges with infrastructure. Challenges could be the cost of extending or replacing infrastructure, operational costs, or descriptions of poorly functioning technologies. Stakeholder that identified the issue were at all levels of hierarchy, and the network contains groups that are closely linked as well as stakeholders that are more isolated (Figure 26). The network density is 0.542.

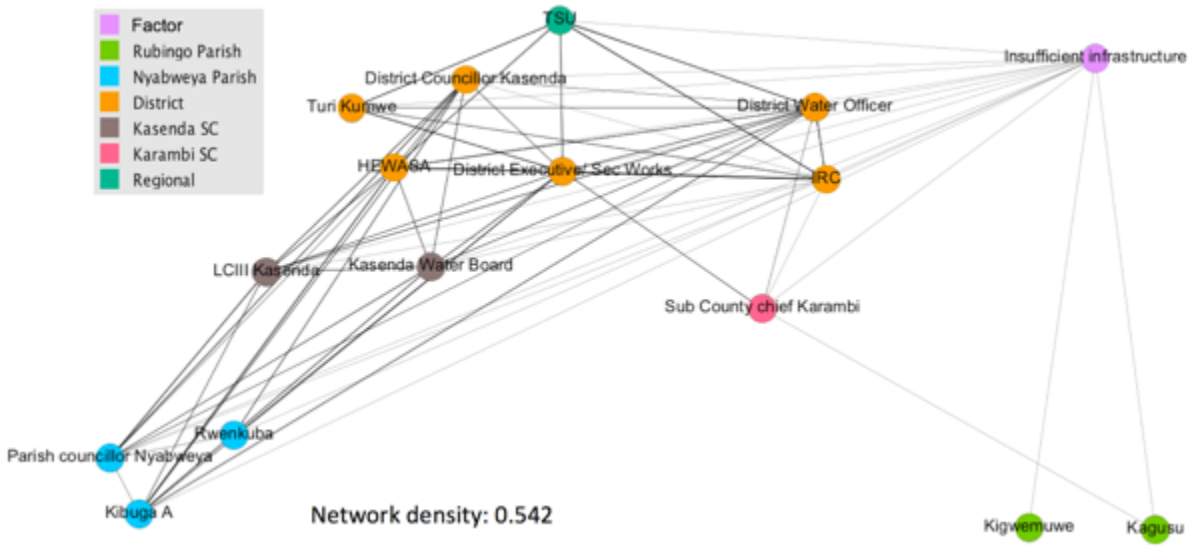

Figure 27 - Factor and actor network for the challenge 'Insufficient infrastructure'

The specific issue identified depended on the stakeholder and the types of infrastructure they commonly interact with:

Terrain in mountainous areas. Not easy to extend piped services.

– District Executive, Secretary for Works

Machine running costs for the system are too high because of fuel consumption.

– Kasenda Water Board

When the borehole breaks it takes time to be repaired and it is still not working well.

– Rwenkuba Community

Increasing Stresses on Water Resources

Challenges with water resource quantity and quality were identified by a diverse group of stakeholders at all levels of hierarchy (Figure 27). Some of these stakeholders are closely linked to each other at District level, and other community level stakeholders perceive this issue independently. The network structure therefore has a relatively low density (0.367).

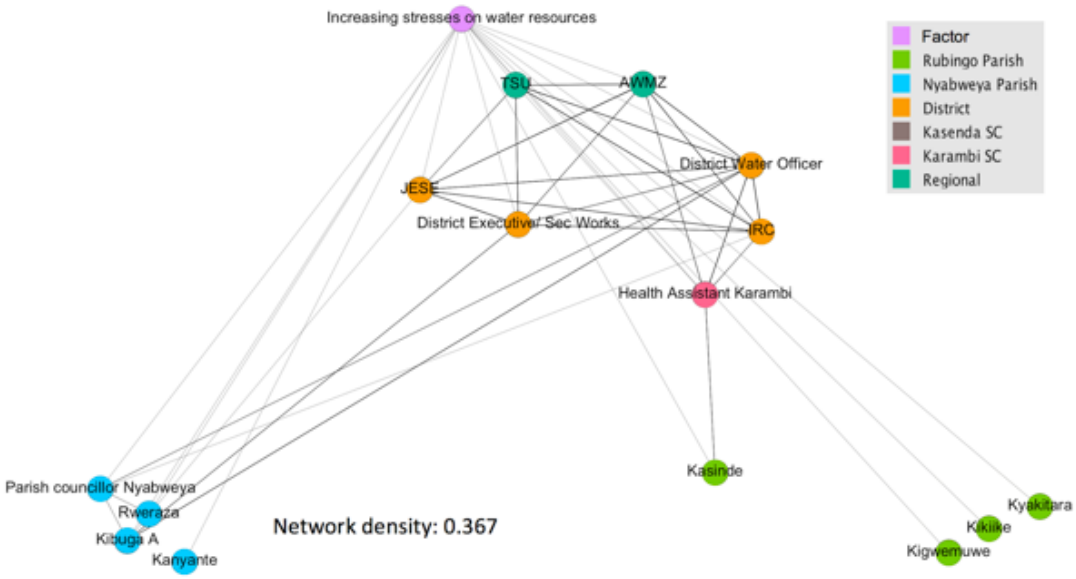

Figure 28 - Factor and actor network for the challenge 'Increasing stresses on water resources'

Although these stakeholders do not necessarily communicate directly, they identify similar types of issues:

Unsustainable use of water supplies without consideration of water resources (e.g. no hydrological assessment or source protection plans).

– AWMZ

Climate change (i.e. drought, shallow wells drying up) is attributed to planting of eucalyptus trees near water sources, leading to scarcity of water.

– Health Assistant Karambi

Less water being accessed, especially during the dry season. The volume of the water reduces. Water is not available constantly.

– Kibuga A Community

Pit latrines contaminate close to water sources are causing contamination.

– AWMZ

Poor, dirty water sources are surrounded by latrines.

– Rweraza Community

Insufficient or Inconsistent Resources

Financial resource issues are mostly identified by a closely related group of stakeholders at the District level. The density of this network is therefore relatively high (0.835). The visualisation of this actor and factor network is presented in Figure 28.

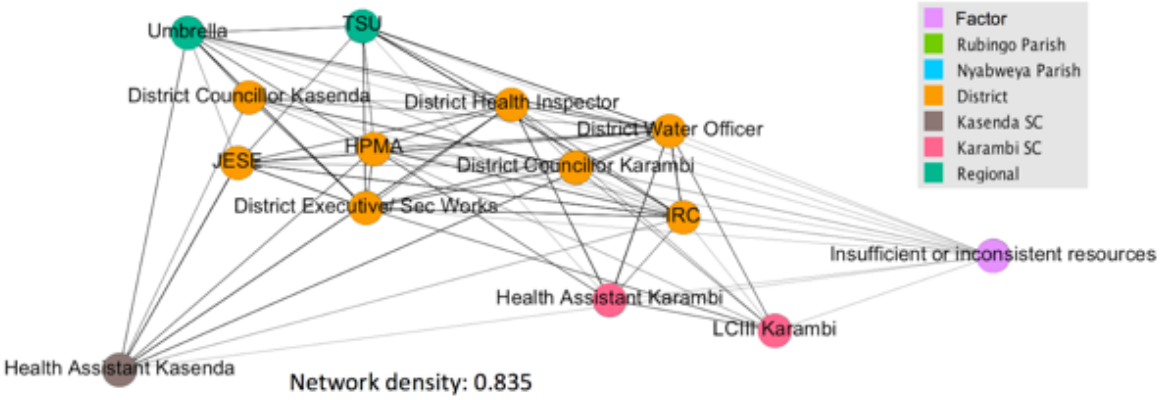

Figure 29 - Factor and actor network for the challenge 'Insufficient or inconsistent resources'

Most commentary therefore comes from District level stakeholders, but some Sub County stakeholders also identified the challenge:

Funding available to the district has reduced from 900M to 372M UGX over 10 years. This is also partly influenced by the division of the district.

– District Water Officer

Water and sanitation in schools is not good; basically it could be attributed to little funding by the government.

– Health Assistant Karambi

Insufficient Ongoing Technical Support for Local Service Management

Insufficient ongoing support was identified as a challenge by stakeholders at all levels of hierarchy (Figure 29). Some of these stakeholders already engage each other directly to share information; others at local levels are less directly connected to the broader network. The network density is 0.500.

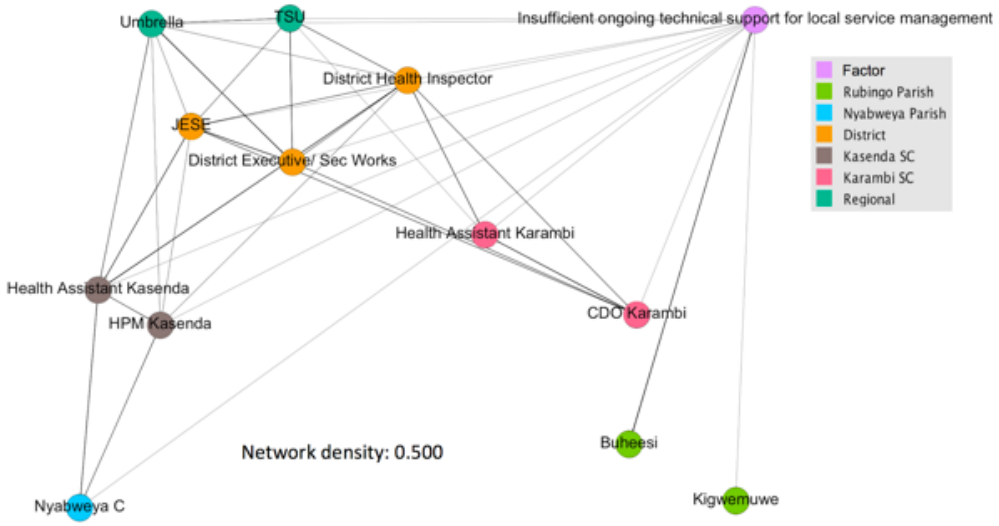

Figure 30 - Factor and actor network for 'Insufficient ongoing technical support for local service management'

The need for ongoing support relates to both the management of water services, and sanitation and hygiene:

Need to build capacity for managing piped systems.

– TSU

Water boards need consistent trainings which might not be provided in time.

– Umbrella

Government officials are reluctant on teaching the community about safe water hygiene.

– Nyabweya C Community

Resistance to Paying for Services

Resistance to paying for services was an issue identified by stakeholders at different levels of hierarchy (Figure 30). Communities, local service providers, and district stakeholders all perceive this as a challenge, even if these stakeholders do not directly communicate with each other. The density of this actor and factor network is 0.327.

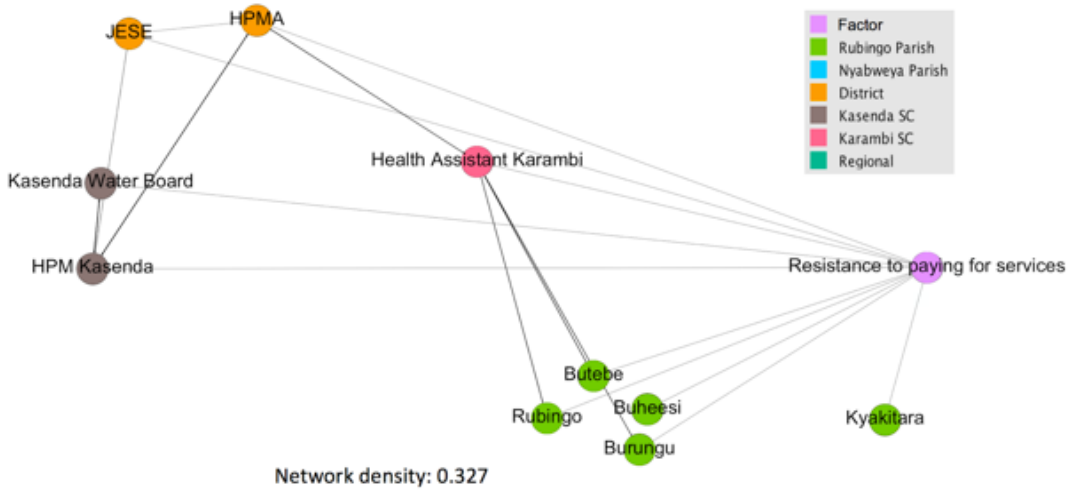

Figure 31 - Factor and actor network for the challenge 'Resistance to paying for services'

Issues are perceived slightly differently depending on the role of the stakeholder that is commenting on the issue:

Most schemes are also not metered making it difficult to efficiently collect tariffs.

– HPMA

Low willingness to pay for water among water users who view the mechanics as volunteers and are unwilling to pay their professional fees for repairs.

– HPM Kasenda

Defaulting in collection of maintenance funds from community members.

– Burungu Community

Inadequate or Conflicting Approaches Undermining Sustainability

Stakeholders at local and district levels of hierarchy perceive inadequate or conflicting approaches undermining sustainability. The network density (0.467) reflects the network structure that includes a strong cluster of interaction amongst stakeholders at the District level, and individual communities that perceive this issue but are not directly connected to the District stakeholders. The factor and actor network for this issue is presented in Figure 31.

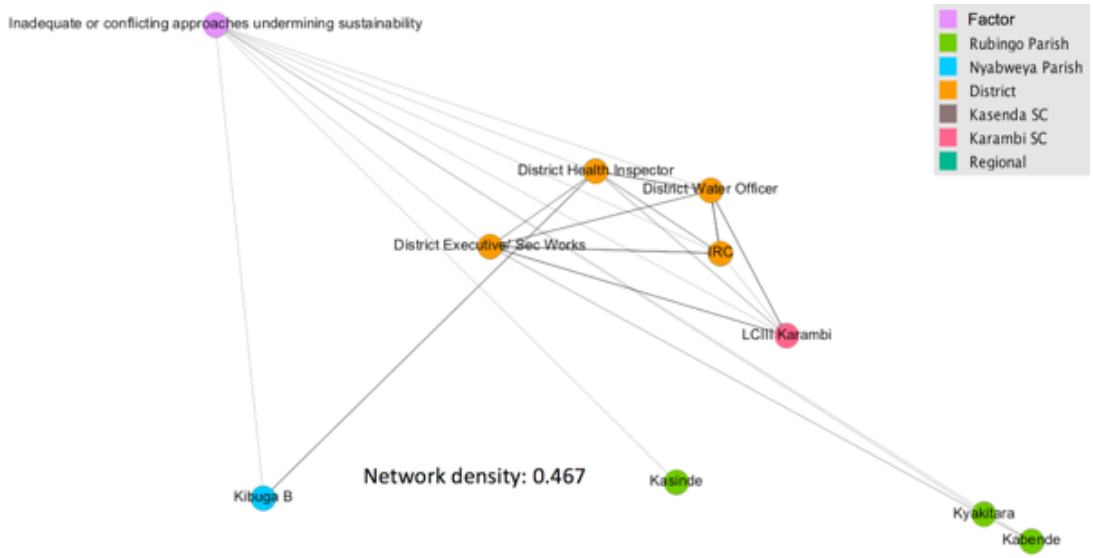

Figure 32 - Factor and actor network for the challenge 'Inadequate or conflicting approaches undermining sustainability'

Statements from stakeholders at different levels of sector hierarchy outline their perspectives on this challenge:

Sustainability challenges, partners come without clear sustainability plans for projects. Handover is not done well. They rush and go. Don't hand over projects.

– ADWO representing the DHI

There were no systematic plans for replacement or rehabilitation. Proper asset management was not put in place.

– IRC

Less follow up from the NGOs (i.e. HEWASA) especially when pipes break down.

– Kibuga B Community

Challenge Actor and Factor Network Summary

The actor and factor network densities for most challenges are relatively low, indicating that a diverse group of stakeholders that are not directly connected to each other identified these issues (Figure 32). The exception is the issue of insufficient or inconsistent resources, which was mostly described by stakeholders at the district level that are closely linked to each other. Analysis of this issue shows that District level stakeholders can identify challenges that are not as apparent to other stakeholders in the network, such as communities.

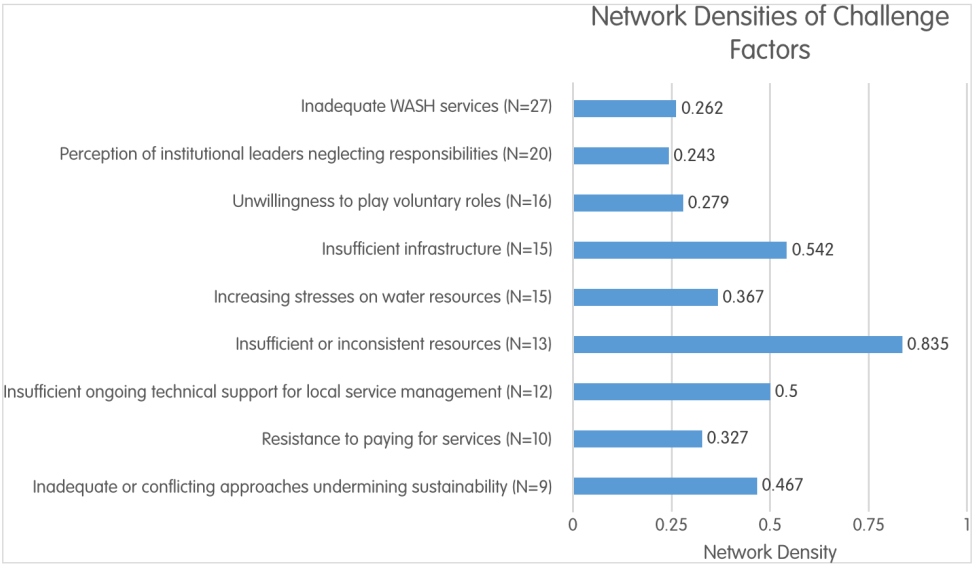

Figure 33 - Summary of challenge factor and actor network densities

Communities also perceive challenges differently. The perception of institutional leaders neglecting responsibilities is one of the most common challenges identified, and this issue has the lowest actor and factor network density. This issue is identified almost exclusively by stakeholders at Sub County and Parish levels of hierarchy. An implication for the Learning Alliance is that different stakeholder groups perceive different issues, and engaging these different parts of the overall Kabarole WASH network might help to strategically address specific issues.

The summary can also be presented by level of hierarchy to show which stakeholder groups identified issues most frequently (Table 6), and what percentage of stakeholders interviewed at that level of hierarchy identified the factor ().

Table 6 - Number of times each challenge factor was identified by level of hierarchy

Challenge	Regional (N=4)	District (N=10)	Sub County (N=11)	Parish (N=29)	Total
Inadequate WASH services	0	4	6	17	27
Neglect of responsibilities by institutional leadership	0	1	4	15	20
Unwillingness to play voluntary roles	1	2	3	10	16
Increasing stresses on water resources	2	4	1	8	15
Insufficient infrastructure	1	6	3	5	15
Insufficient or inconsistent resources	2	8	3	0	13
Insufficient ongoing technical support for local service management	2	3	4	3	12
Resistance to paying for services	0	2	3	5	10
Inadequate or conflicting approaches undermining sustainability	0	4	1	4	9

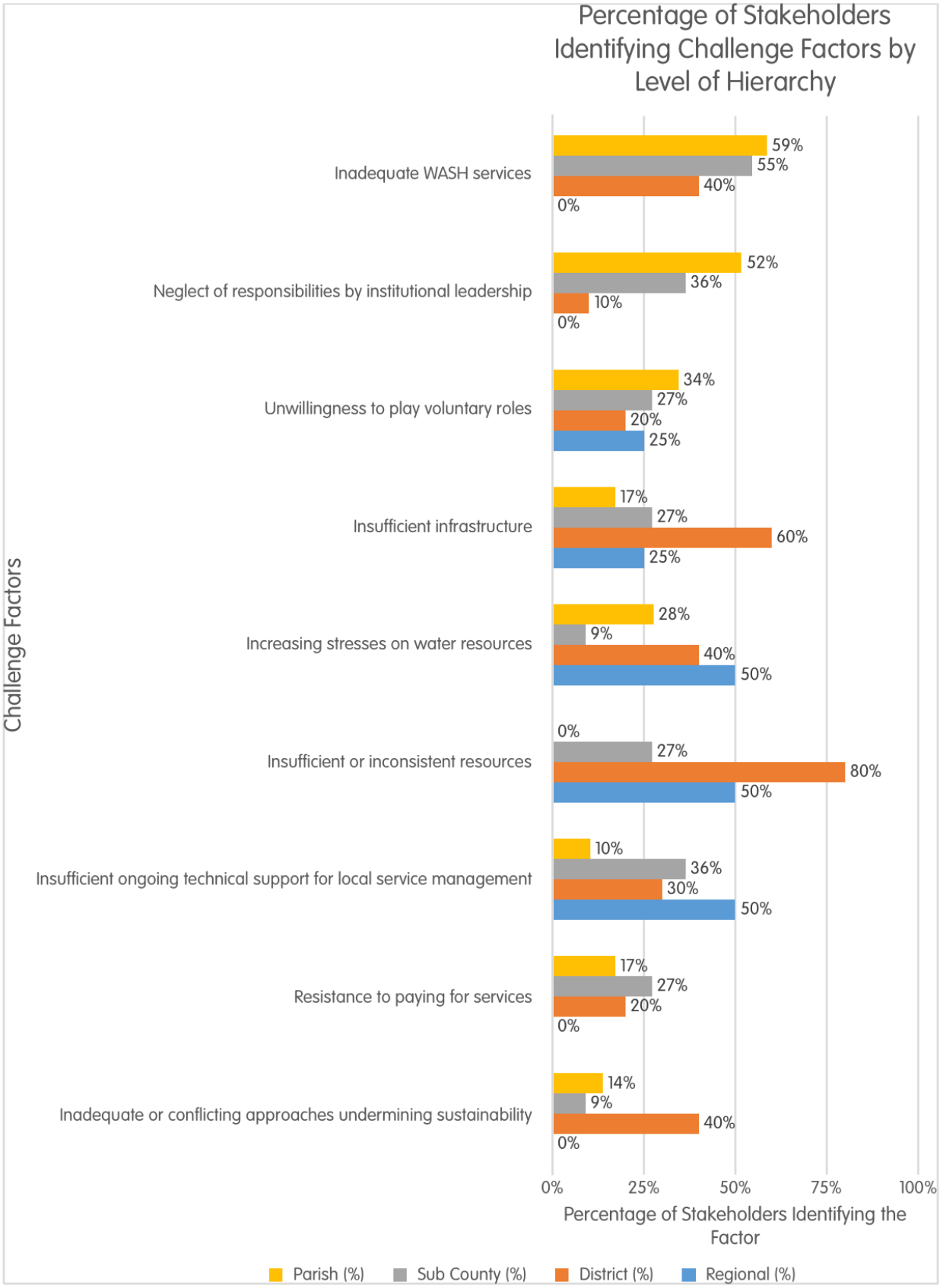

Figure 34 - Percentage of stakeholders identifying challenge factors by level of hierarchy

Solution Factor and Actor Networks

Improve or Expand Infrastructure

Improving or expanding infrastructure availability was the most commonly proposed solution. As with the challenge of inadequate WASH services, this proposed solution includes most of the Kabarole District WASH network studied (Figure 33). The network density (0.292) is relatively low because stakeholders in both sub counties perceive this solution as important and do not have direct ties with each other.

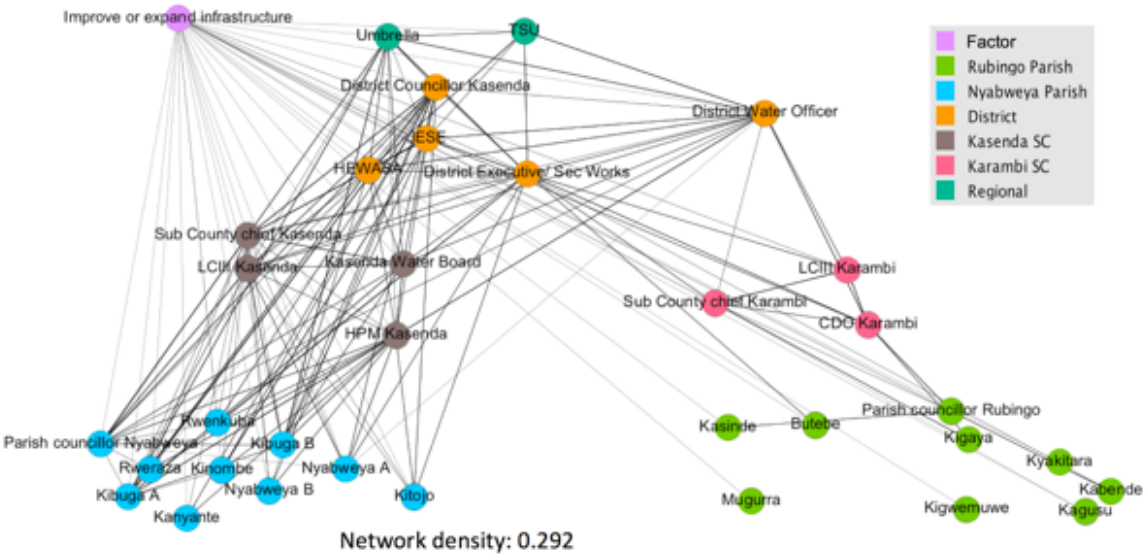

Figure 35 - Factor and actor network for the solution 'Improve or expand infrastructure'

The need for infrastructure improvements is similarly perceived by most stakeholders:

Need to extend the water a bit deeper into the villages.

– District Councillor Kasenda

Reach the unserved. Learn from the past to be more efficient and effective with resources available.

– District Water Officer

They need more water sources.

– Kanyante Community

Strengthen Engagement with Communities

Strengthening engagement with communities was the second most commonly proposed solution. The actor and factor network around this solution spans from District and Regional levels to include both Sub Counties and Parishes studied (Figure 34). The network density is relatively low (0.270), indicating that stakeholders perceiving this as a potential solution do not necessarily directly engage each other.

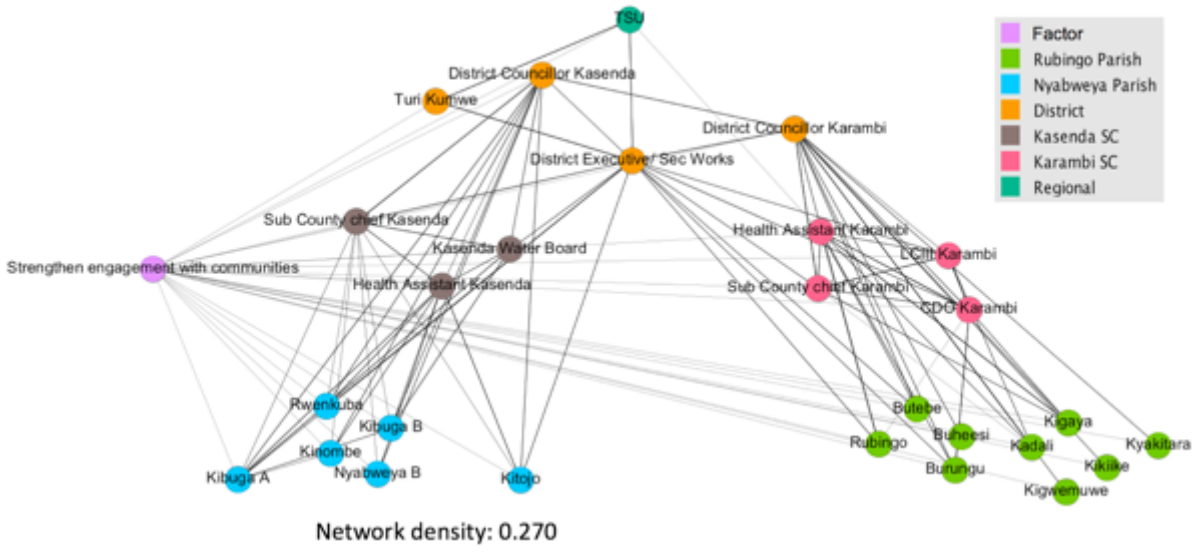

Figure 36 - Factor and actor network for the solution 'Strengthen engagement with communities'

The need for sensitisation was a recurring theme. There is a perceived need for communities to understand their roles in WASH sustainability, and be able to access information and technical support as needed. Engagement is needed to ensure that communities are aligned with the broader district vision for service delivery:

Advocate for community sensitisation by the government officials and other NGOs like HEWASA about water sources.

– Burungu Community

Mobilisation of communities for sensitisation to the importance of WASH issues.

– Health Assistant Karambi

Sensitise the community about water not being free of charge.

– Kibuga B

Diversify Revenue Sources for Sustaining Services

Diversifying revenue sources was identified as a possible solution by a variety of stakeholders at all levels of hierarchy (Figure 35). The actor and factor network includes both closely connected stakeholders at District level, and individual communities in both Sub Counties that are less closely connected. The network density is 0.521.

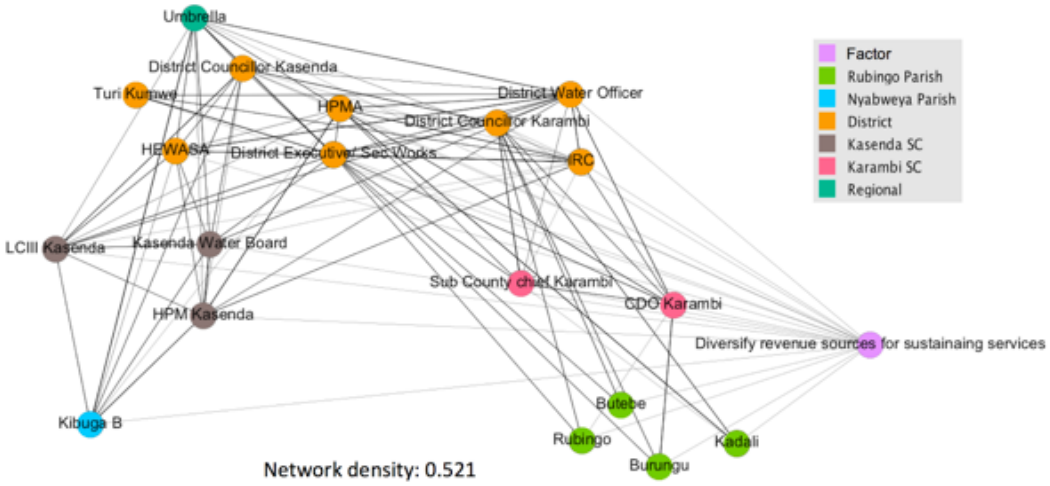

Figure 37 - Factor and actor network for the solution 'Diversify revenue sources for sustaining services'

Many stakeholders similarly see a need to generate more financial resources to sustain services, and many believe that at least part of this resource need should increasingly be met by water users:

Need to ensure that there are resources to sustain services, and we need to get these from the users.

– District Councillor Kasenda

Communal collection of finances that will help with rehabilitation.

– Burungu Community

Consider wide adoption and scale up of pay as you fetch models to ensure users pay for water.

– HPMA

Government to Provide Services

Thirteen of the stakeholders interviewed at community and Sub County levels believe that solutions should come from the government doing more to directly provide services (Figure 36). The actor and factor network density for this issue is relatively low (0.257) because most District level stakeholders did not propose this as a solution, and are therefore not present in the network.

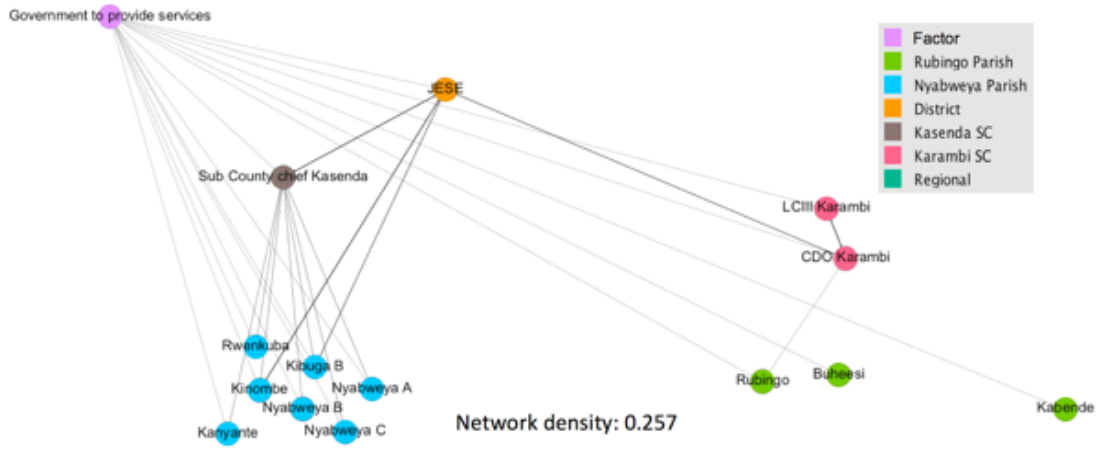

Figure 38 - Factor and actor network for the solution 'Government to provide services'

The precise description of what the government should do differs slightly depending on the stakeholder that proposed the solution, but all

believe that the government will need to play a stronger role in WASH sustainability:

Need to engage the political leaders, maybe at sub county levels (CDO or Chiefs), to get the views of the people on sanitation and hygiene problems. Since they can't access water, maybe the political leaders can do something about it. – Kanyante Community

Lobby government to improve services and treat diseases.

– Sub County Chief Kasenda

The government should increase funding of activities run in the communities to improve sustainability.

– LCIII Karambi

Support for Local Management of Infrastructure

Local management of infrastructure is perceived as part of the solution to WASH sustainability by stakeholders at all levels of hierarchy (Figure 37). Eight communities also perceive this solution as important, even though they do not directly connect to each other or to stakeholders at higher levels of hierarchy on this issue. The actor and factor network density is therefore relatively low (0.242).

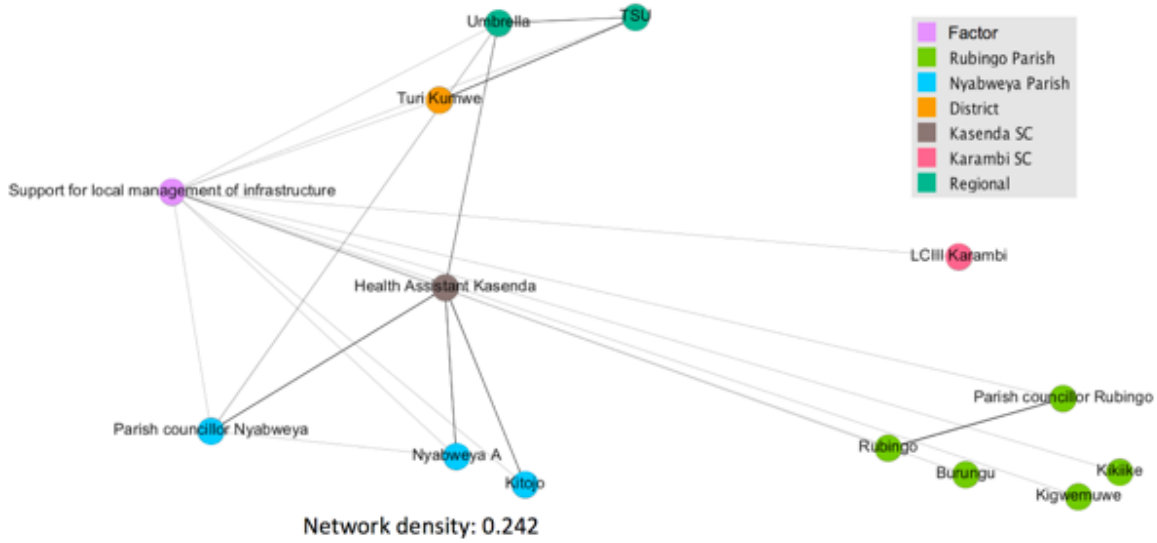

Figure 39 - Factor and actor network for the solution 'Support for local management of infrastructure'

Despite the challenges with the voluntary nature of community management, stakeholder comments indicate that this is still seen as part of the solution to WASH sustainability and should be supported:

Motivation – need to maintain volunteerism to manage the water schemes.

– Umbrella

Formation of water source committees to increase the water sources that are rehabilitated.

– Kikiike Community

Commitment and volunteering to serve the community in the water and sanitation.

– Rubingo Community

Political Enforcement of WASH Policies

Seven stakeholders also proposed that WASH policies should be more strongly enforced. These proposals came from both Sub County and District level stakeholders that are reasonably well connected to each other (Figure 38). The network density is 0.786.

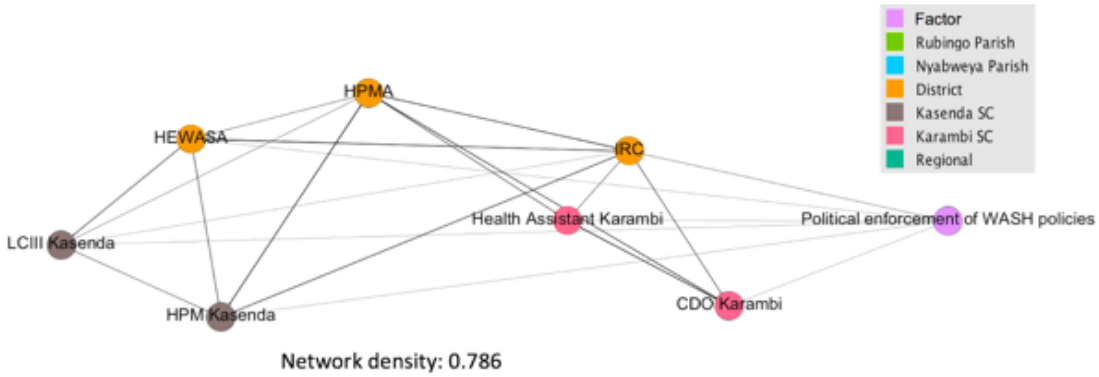

Figure 40 - Factor and actor network for the solution 'Political enforcement of WASH policies'

Stakeholders proposing this solution believe that stronger accountability is a necessary part of WASH sustainability:

Political support towards the technical wing (same voice) towards WASH policy enforcement.

– CDO Karambi

Policies and laws need to be enforced for implementation.

– HEWASA

Sub county to pass by law on payment for water by users to enable maintenance of water supply systems.

– LCIII Kasenda

Improve Water Resources Management

Improving water resources management is a solution chiefly proposed by closely related stakeholders at the District and Regional levels, but two local stakeholders also advocated for the implementation of water resource management (Figure 39). The network density is relatively high (0.857), indicating that most stakeholders at District level that perceive the importance of this issue already have relationships with each other.

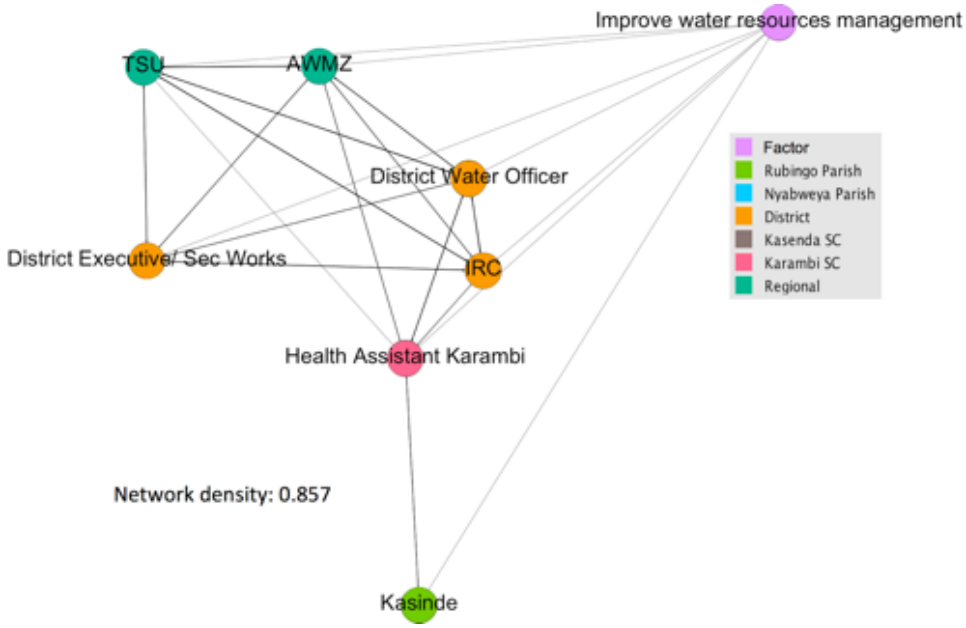

Figure 41 - Factor and actor network for the solution 'Improve water resources management'

Stakeholders that identified this solution called for decisive action to manage water resources:

Catchment management plans that are well researched. Also manage by catchment instead of political boundaries. Need to make catchment management plans, then implement. Need source protection and catchment management guidelines.

– AWMZ

The National Forestry Authority should enforce strong implementation of rules governing the forests to control climate conditions.

– Health Assistant Karambi

Cutting down of trees around water sources (these are drying up the source).

– Kasinde Community

Strengthen Project Implementation Processes

Stakeholders at different levels of hierarchy proposed that the process for how infrastructure is implemented should be strengthened (Figure 40). The actor and factor network density is 0.429, although strong clusters of interaction amongst stakeholders that proposed this solution are not observed. Each stakeholder that proposed this solution is the only one from its level of hierarchy. The actor and factor network structure indicates that specific stakeholders perceive particular issues, but from different vantage points in the levels of hierarchy.

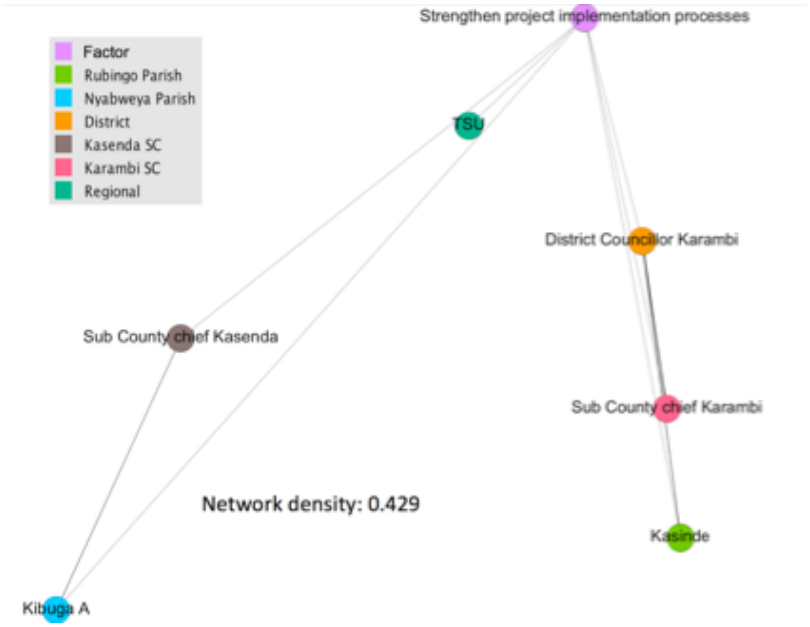

Figure 42 - Factor and actor network for the solution 'Strengthen project implementation processes'

These stakeholders believe that the implementation of projects could be strengthened, even if they have differing views on precisely what needs to change:

Installation using better quality materials.

– Kasinde Community

To implement the district council resolutions. For any project there must be information sharing and site meetings with communities. Statement of work to enable people monitor the projects.

– District Councillor Karambi

Need to build the capacity of actors such as the District Technical Planning Team. Look at the capacity of technical staff to deliver on the investment plan.

– TSU

Coordinate and Harmonise Approaches

Coordination and harmonisation of approaches was identified as a solution only by stakeholders at District and Regional levels (Figure 33). These stakeholders are all already directly connected to each other; the network density is 1.00. This proposed solution may be important to the future of WASH sustainability in Kabarole District, even if other stakeholders do not perceive it as important, but current perception of the importance of this factor is currently limited to a relatively small and closely connected group of District and Regional level stakeholders.

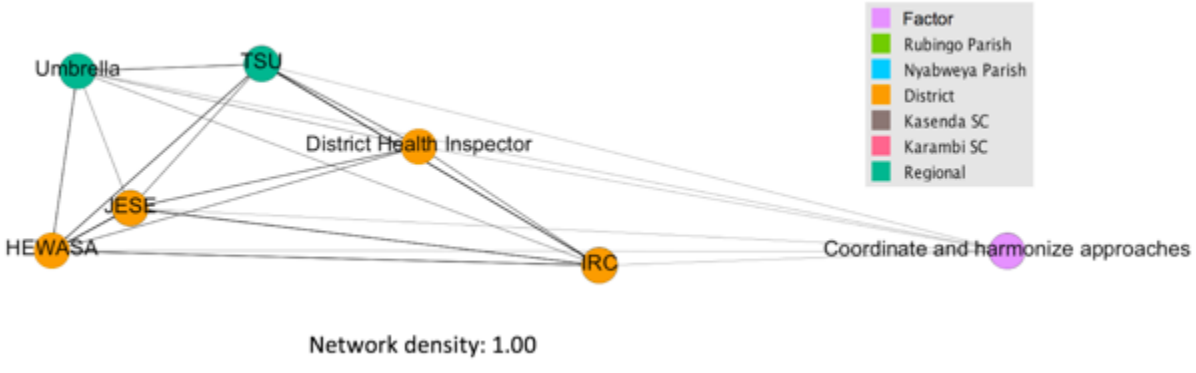

Figure 43 - Factor and actor network for the solution 'Coordinate and harmonise approaches'

Stakeholders in this actor factor network call for the continuation of coordination amongst this stakeholder group:

Continuation of the stakeholder coordination meetings.

– Umbrella

Continue facilitating learning platforms at regional/district level to share information on approaches that are working and those that are not.

– JESE

Increase Private Sector Involvement

The proposal to increase private sector involvement was put forward by a relatively small group of stakeholders that are all directly connected (Figure 38). The network density is 1.00.

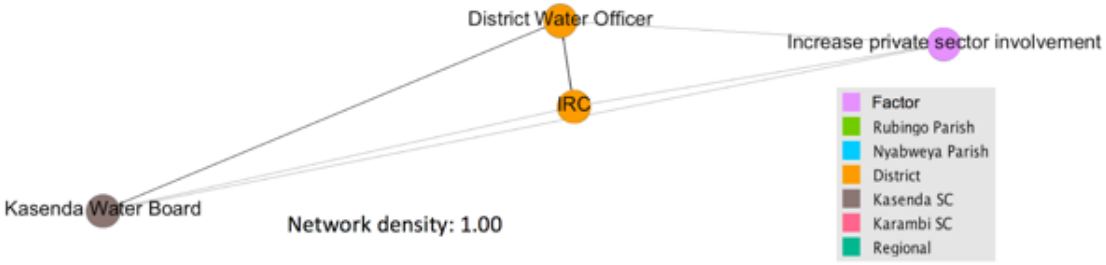

Figure 44 - Factor and actor network for the solution 'Increase private sector involvement'

Statements from stakeholders indicate that the private sector can potentially play a variety of roles to support improvements in WASH sustainability:

Need support from the private sector.

– District Water Officer

Adopt business models for WASH. For example, the HPMA is private, but seeing that it can stand in to provide a form of social entrepreneurship that could support a huge aspect of financing WASH.

– IRC

The treasurer should use a bank instead of storing revenues personally.

– Kasenda Water Board

Solution Factor and Actor Network Summary

Figure 43 presents the summary of actor and factor network densities for each proposed solution. The most commonly proposed solutions have the lowest network densities. These commonly referenced solutions with low network densities indicate that a diverse set of stakeholders that are not directly connected all perceive these solutions as important. Stakeholders independently identifying a similar issue may be a way of verifying its significance, although the most obvious issues are also the most likely to be identified. Conversely, the coordination and harmonisation of approaches is a solution only proposed by a smaller group of stakeholders that is closely connected. This solution may also be important, but the network density suggests that a like-minded group of coordinated stakeholders potentially already has a shared understanding and coordinated approach to pursuing the proposed solution.

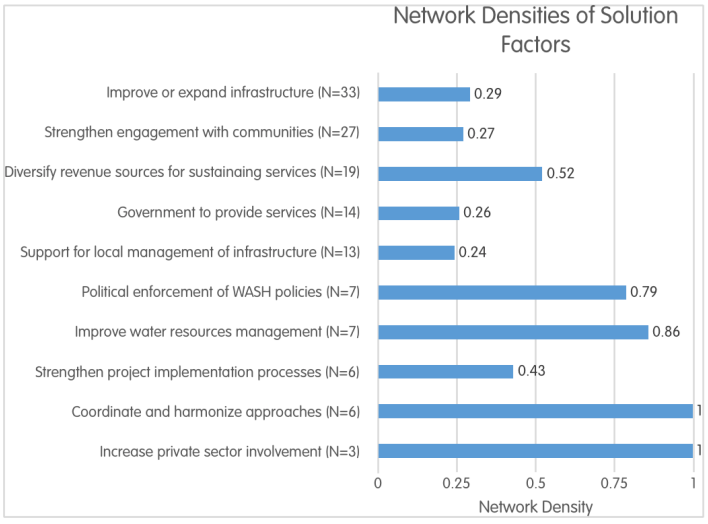

Figure 45 - Summary of solution factor and actor network densities

All solutions are potentially important. A less commonly identified solution or lower network density does not necessarily correspond to the potential significance for impact. The Learning Alliance can therefore use these findings to consider where stakeholder groups are already engaged or could be convened to engage around specific solutions that might help to improve WASH sustainability.

As with the other factors, the solutions identified can also be quantified by the number of times that each solution was identified by stakeholders at each level of hierarchy (Table 7), and the percentage of stakeholders at each level of hierarchy that identified the potential solution (Figure 46).

Table 7 - Number of times each solution factor was identified by level of hierarchy

Solution	Regional (N=4)	District (N=10)	Sub County (N=11)	Parish (N=29)	Total
Improve or expand infrastructure	2	5	7	19	33
Strengthen engagement with communities	1	4	7	15	27
Diversify revenue sources for sustaining services	1	8	5	5	19
Government to provide services	0	1	3	10	14
Support for local management of infrastructure	2	1	2	8	13
Improve water resources management	2	3	1	1	7
Political enforcement of WASH policies	0	3	4	0	7
Coordinate and harmonise approaches	2	4	0	0	6
Strengthen project implementation processes	1	1	2	2	6
Increase private sector involvement	0	2	1	0	3

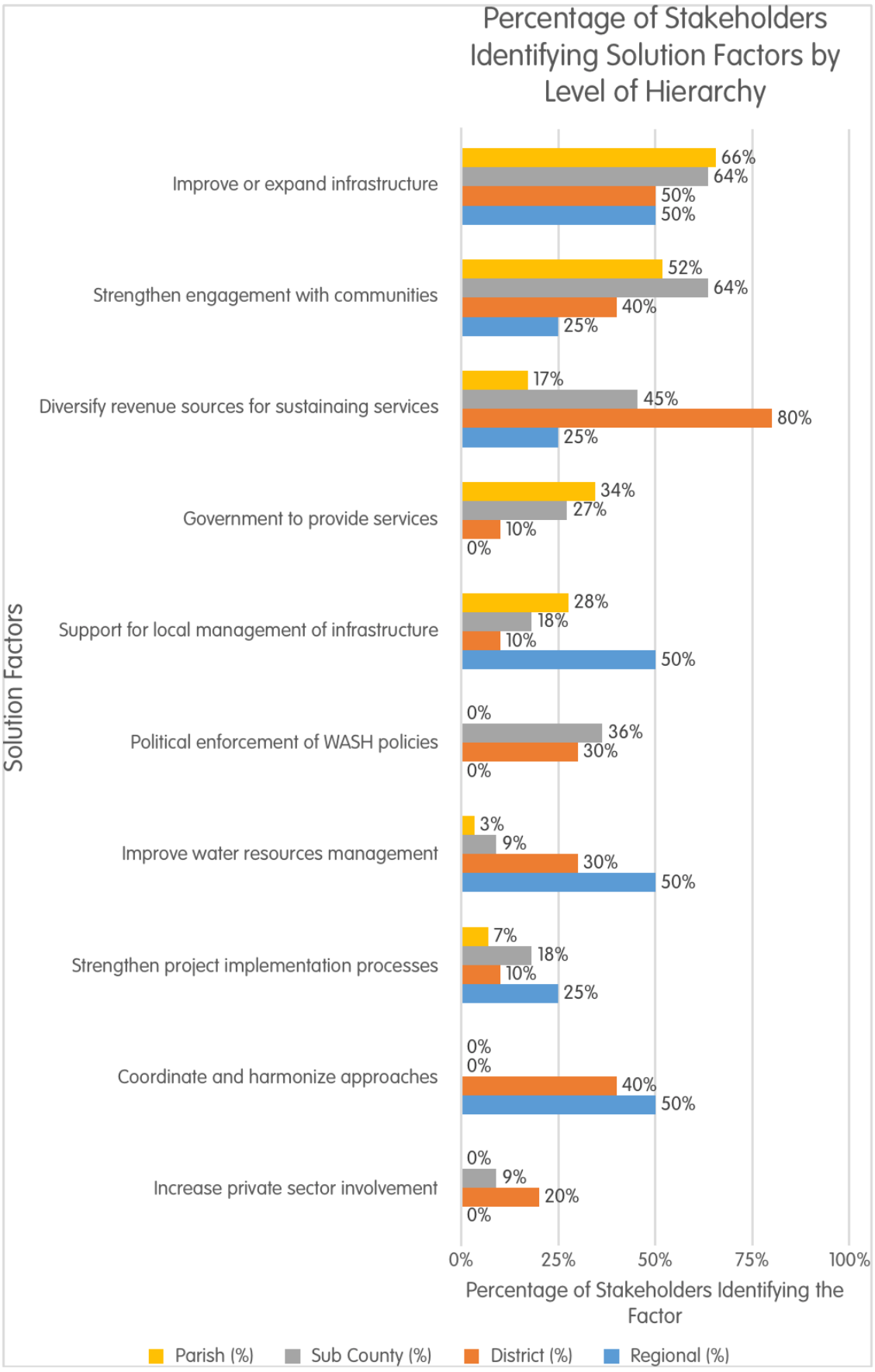

Figure 46 - Percentage of stakeholders identifying solution factors by level of hierarchy

Conclusions and Next Steps

This study of actors and factors affecting WASH sustainability in Kabarole District sought to identify central stakeholders, gaps in network relationships, salient issues affecting sustainability, and how stakeholders relate to specific issues. Data were collected from primary interviews with a pre-determined list of forty-nine stakeholders in Kabarole District that represented Regional, District, Sub County, and community level perspectives.

Analysis of stakeholder networks finds that political leaders, such as District Councillors, are most central to the network. District councillors are the most central at the yearly frequency and Sub County Councillors are most central at the weekly frequency. These stakeholders provide a bridge between communities and District level stakeholders, and therefore are likely to be on the shortest path from one node to another in the network. District Government offices also occupy central roles in the network studied. The Learning Alliance can use findings from network analysis to consider which stakeholders have ties to different parts of the network and how these stakeholders can be engaged to improve coordination and alignment around the vision for WASH services in Kabarole District.

Analysis of network gaps finds that communities are the most disconnected stakeholders. Six of the twenty-five communities studied exhibit no network relationships that occur less than yearly, and the number of isolated communities increases when considering higher frequencies of interaction. Despite the consistent presence of relationships between stakeholders at Regional, District, and Sub County levels, the stakeholder network does not extend to include communities on a regular basis.

The lack of engagement with communities is reflected in the challenges and solutions proposed by stakeholders interviewed. Actor and factor network analysis finds that the isolation of communities in the network and their perception of being neglected is a challenge widely perceived by stakeholders at community and Sub County levels. This challenge was the second most commonly identified issue overall, despite being less recognised by stakeholders at District level.

Other issues also emerged as important. The majority of stakeholders interviewed described challenges with services and the need to invest in infrastructure. There is a perceived challenge with the voluntary nature of WASH services managed by communities. Financial resources were commonly identified as a constraint. Resource constraints will likely continue to be a challenge, and there is need to work creatively with what is consistently available and to diversify the sources of financing for WASH. Issues of water resource management and the ongoing need for coordination also emerged as important. Overall, there are multiple simultaneous challenges and possible solutions to WASH sustainability in Kabarole District, and addressing any one factor might have potential for positive impact.

The gap between communities and the broader WASH network is apparent in both network data and the challenges described during interviews. Communities are expected to play important roles in WASH, and this gap may pose a considerable challenge if communities are not more consistently engaged in the collaborative effort to improve sustainability. Increased coordination at the District level, for example, might have only limited impact on WASH sustainability if communities remain relatively isolated. Political leaders emerge as central to these issues, and engaging political leaders at both District and Sub County levels may provide opportunities for extending the network to engage communities more consistently. Overall, Learning Alliance members will have to consider the significance and interrelationships between the factors identified to develop strategies that can effectively and efficiently address these complex issues.

Service Delivery Design Questions for the Learning Alliance

Some reflective questions are proposed as next steps for the Learning Alliance to consider when designing strategies for improving WASH sustainability in Kabarole District. All will be discussed with learning alliance members, but given other findings emerging in the district from other analyses, it is likely that Political engagement and generating local revenues for O&M will show up as key elements in the action-research.

1. Strengthening community engagement – Given that communities report feeling neglected and lacking information on WASH issues, how might the frequency and strength of interaction with communities be improved to better engage communities despite resource constraints? While the learning alliance does not engage directly at the community level, how might increasing connection help community members be more willing to play voluntary roles or to financially contribute to service maintenance?

2. Political engagement – Given that political leaders emerge as the most central to stakeholder networks, how might the Learning Alliance strengthen specific partnerships to improve overall WASH service delivery and sustainability?

3. Resources for infrastructure development – Given that the availability of funds for infrastructure development and rehabilitation is decreasing despite ongoing need, how might new sources of finance be accessed or existing resources be used more creatively?

4. Generating local revenues for O&M – Given that resources are insufficient to freely provide repair and maintenance services to all communities, how might the Learning Alliance ensure that local revenues are sufficient to manage infrastructure upkeep during its service life?

5. Collaboratively addressing challenges and implementing solutions – Given that different stakeholders perceive different issues, and these stakeholders may not be directly connected to each other, how might the Learning Alliance support the network to collaboratively

address challenges and develop solutions?

6. Addressing water resource issues – Given that water resource pressures and source contamination are issues identified by a diverse group of stakeholders, how might the Learning Alliance better integrate water resource management with WASH to ensure the long-term availability of safe drinking water sources?

Appendix A – Node List

ID	Label	Type	Level	Role
1	TSU	Government Office	Regional	Technical Support and Capacity Building for Local Governments
2	Umbrella Organization for Water and Sanitation	Government Office	Regional	Provides support to Water Supply and Sanitation Boards on Operation and Maintenance of Piped Water Supply
3	National Water & Sewerage Corporation	Public Enterprise	National	Parastatal that operates and provides water and sewerage services for large urban centers across the country
4	AWMZ	Government Office	Regional	Decentralized Structure of Ministry of Water and Environment that provides oversight on Water Resources Management
5	HPMA	Private Sector	District	Coordinate technicians involved in Operation and maintenance of Hand Pumps and Gravity Flow water supply networks
6	District Executive/ Sec Works	Government Office	District	Politician: Oversight on construction works, budgets and plans
7	District Councillor Kasenda	Government Office	District	Political representative for Kasenda Sub county on district Council
8	District Councillor Karambi	Government Office	District	Political representative for Karambi Sub county on district Council
9	District Health Inspector	Government Office	District	Oversees Environmental Health Services
10	District Water Officer	Government Office	District	Planning and overseeing delivery of Water and Sanitation services
13	IRC	Non-Governmental Organisation	District	Capacity Building, Lobby & Advocacy
14	JESE	Non-Governmental Organisation	District	Community Development
15	HEWASA	Non-Governmental Organisation	District	Community Development
17	Turi Kumwe	Community-Based Organisation	District	Community Development
18	Sub County chief Kasenda	Government Office	Kasenda SC	Coordinate the implementation of policies, programmes, projects and laws at Lower Local Government level (Sub county level)
19	Sub County chief Karambi	Government Office	Karambi SC	Coordinate the implementation of policies, programmes, projects and laws at Lower Local Government level (Sub county level)
20	CDO Kasenda	Government Office	Kasenda SC	Coordinate all community-based services in the Kasenda Sub county and community participation in development programmes and projects
21	CDO Karambi	Government Office	Karambi SC	Coordinate all community-based services in the Karambi Sub county and community participation in development programmes and projects
22	Health Assistant Kasenda	Government Office	Kasenda SC	Extension services on Sanitation and Hygiene and Primary Health Care
23	Health Assistant Karambi	Government Office	Karambi SC	Extension services on Sanitation and Hygiene and Primary Health Care

24	Parish councillor Nyabweya	Government Office	Nyabweya Parish	Political representative of Nyabweya on Sub county Council
26	Parish councillor Rubingo	Government Office	Rubingo Parish	Political representative of Nyabweya on Sub county Council
27	LCIII Kasenda	Government Office	Kasenda SC	Political oversight on implementation of government programmes in Kasenda
28	LCIII Karambi	Government Office	Karambi SC	Political oversight on implementation of government programmes in Karambi
29	Parish Chief Nyabweya	Government Office	Nyabweya Parish	Overall administration and management of Parish unit (Nyabweya Parish), Planning, Budgeting, Revenue collection, community mobilisation
31	Parish Chief Rubingo	Government Office	Rubingo Parish	Overall administration and management of Parish unit (Rubingo Parish), Planning, Budgeting, Revenue collection, community mobilisation
32	HPM Kasenda	Private Sector	Kasenda SC	Operation and maintenance of hand pumps
33	Hand Pump Mechanic Karambi	Private Sector	Karambi SC	Operation and maintenance of hand pumps
34	Kasenda Water Board	Public Enterprise	Kasenda SC	Management of Kasenda Piped Water Supply network
36	Kibuga A	Service User	Nyabweya Parish	Service User
37	Kibuga B	Service User	Nyabweya Parish	Service User
38	Rwenkuba	Service User	Nyabweya Parish	Service User
39	Kinombe	Service User	Nyabweya Parish	Service User
40	Nyabweya A	Service User	Nyabweya Parish	Service User
41	Nyabweya B	Service User	Nyabweya Parish	Service User
42	Nyabweya C	Service User	Nyabweya Parish	Service User
43	Kanyante	Service User	Nyabweya Parish	Service User
44	Rweraza	Service User	Nyabweya Parish	Service User
45	Kitojo	Service User	Nyabweya Parish	Service User
57	Buheesi	Service User	Rubingo Parish	Service User
58	Burungu	Service User	Rubingo Parish	Service User
59	Butebe	Service User	Rubingo Parish	Service User
61	Kabende	Service User	Rubingo Parish	Service User
62	Kadali	Service User	Rubingo Parish	Service User
63	Kagusu	Service User	Rubingo Parish	Service User
64	Kikiike	Service User	Rubingo Parish	Service User
65	Kasinde	Service User	Rubingo Parish	Service User
66	Kigaya	Service User	Rubingo Parish	Service User
67	Kigwemuwe	Service User	Rubingo Parish	Service User
68	Kyakitara	Service User	Rubingo Parish	Service User
69	Mugasani	Service User	Rubingo Parish	Service User
70	Mugurra	Service User	Rubingo Parish	Service User
71	Mukumbwe	Service User	Rubingo Parish	Service User
72	Rubingo	Service User	Rubingo Parish	Service User

Appendix B – Research Protocol

UGANDA WASH NETWORK MAPPING PROTOCOL

Summary of aims, objectives, scope, methods, and anticipated analysis for the Sustainable WASH Systems network mapping study of actors and factors in Kabarole District, Uganda. This protocol was last updated immediately prior to data collection on September 13, 2017.

Overview

The USAID Sustainable WASH Systems (SWS) project aims to identify locally-driven solutions to the challenge of sustaining WASH service delivery. The Concept One team in Uganda is contributing to the project by analysing stakeholder networks and factors affecting WASH service sustainability in Kabarole District. Data collected are also expected to contribute to broader research interests of the SWS consortium in partnership with the University of Colorado Boulder. This document presents the aims, objectives, scope, methods, and intended analysis that the study will perform, and further identifies possible implications and opportunities for follow up. This protocol has been developed in partnership with IRC Uganda and builds on research methods originally developed at Cambridge University. It is authored by Duncan McNicholl with considerable input from Peter Magara of IRC.

Study Aims and Objectives

The overall aim of the research is to inform strategies for improving the sustainability of WASH services that can be led by the Learning Alliance in Uganda, specifically in Kabarole District. The most direct intent is to identify where can relationships be strengthened, which issues should be addressed, and who might be involved in order to address sustainability issues. Beyond this, the study further intends to contribute to broader research objectives of the international SWS consortium that extend beyond the scope of the Ugandan Learning Alliance.

Objectives

Specific objectives further define the questions that the research intends to answer. These objectives primarily focus on the first research aim of providing actionable insight to the Learning Alliance in Uganda to improve WASH sustainability, although all findings and data can potentially contribute to the broader learning agenda of the project. The primary research objectives for Kabarole District are:

1. To identify coordination gaps;

2. To identify gaps in technical support;

3. To identify challenges, positive factors, and how they relate to specific stakeholders;

4. To identify stakeholders that were previously not identified as participants in the network;

5. To assess how network ties relate to service levels in communities; and

6. To contribute to consortium understanding of how to study, analyse, and strategically act to influence WASH service delivery systems.

Research methods and intended analysis are therefore designed to focus on these questions, and additional analysis can later be conducted to answer other specific questions that emerge from the research process.

Scope

The research focuses on the Learning Alliance in Kabarole District and other stakeholders that are central to WASH service delivery in the District. The list of relevant stakeholders has been provided by IRC, and has been developed in collaboration with Learning Alliance partners in Kabarole. Additionally, data will be collected from all communities in three Parishes – one from each of three different Sub-Counties – to provide network data on how Learning Alliance stakeholders relate to communities. The stakeholders identified plus the communities in the three Parishes define the boundaries of the network in this study. The current list of stakeholders planned for inclusion in interviews is presented in Table 8.

Table 8 - List of stakeholders planned for inclusion in fieldwork interviews

Stakeholder Type	Stakeholder
Political leadership	Local Council V – Chairperson Secretary for Works
Ministry of Water and Environment – Regional level Support Institutions	Technical Support Unit 6 Umbrella Organization for Water and Sanitation
Technical team/District Water Office	District Water Officer Assistant District Water Officer – Sanitation Assistant District Water Officer - Mobilisation Bore Hole Maintenance Officer
Other District Staff	Health Assistants Community Development Officers Sub county Chiefs
Town Councils	Mugusu Town Council – Town Clerk
CSOs	HEWASA JESE IRC SNV AAID
Service Providers	Water Supply and Sanitation Boards Water User Committees
Operators	Hand Pump Mechanic Associations Scheme Attendants

Other stakeholders might be identified in the course of fieldwork. Their ties with stakeholders interviewed will be captured in network data, but these new stakeholders will not followed-up with for interviews in the planned fieldwork. Newly identified stakeholders can potentially be interviewed at a later time if their inclusion is deemed relevant to the analysis.

Supplemental Data

Some additional data are expected to augment network analysis. These data are not expected to be captured during fieldwork, and can instead be provided by existing records held by IRC and local government. Additional data include:

1. Data on service levels for communities interviewed;
2. GPS locations of stakeholders interviewed, and the locations of infrastructure related to communities interviewed; and
3. Geospatial data for Kabarole district.

Data on service levels can be used to analyse how particular network properties might relate to service levels, and geospatial data can be used to visualise networks in physical space.

Methods

Methods are adapted from recent research conducted by Cambridge University that studied rural water supply stakeholder networks in Ghana, Malawi, India, Tajikistan, Bangladesh, and Bolivia. These methods are designed to capture stakeholder network data that can be analysed quantitatively, as well as qualitative data that can be used to identify factors influencing service delivery. The qualitative component further helps to identify relevant characteristics to examine in stakeholder network properties.

Stakeholder networks are defined by nodes and ties that each have their own properties. Node properties describe the type of stakeholder, and definitions are consistent with descriptions provided by LINC during a similar network mapping exercise in Ethiopia. Service Users, such as communities, have also been added to this list. It is also possible that additional node properties can be added to network data after primary data collection if deemed relevant by the Learning Alliance.

Table 9 - Node properties

Node Property	Description
Type of Stakeholder	Government Office Public Enterprise (such as water utility) Non-Governmental Organisation Community-Based Organisation Academic Institution Private Sector (including formal companies and MSMEs) Service User
Scope	Water Supply Sanitation Hygiene

Ties then define the relationships between these nodes. Each tie is weighted and directional. Relationships can also be multiplex, meaning that multiple ties can exist in parallel. Tie definitions were originally developed as part of Doctoral research at Cambridge University and are derived from definitions of social power (Table 11). Participants will also be asked to indicate how frequently they interact with each stakeholder whom they have a relationship with, although this property relates to the overall relationship instead of specific ties (Table 10). These tie frequencies may be updated prior to commencement of fieldwork after further consultation with local partners on the appropriateness of these descriptions for the context.

Table 10 - Tie frequency definitions

Relationship Frequency	Description
Weekly	At least once per week
Monthly	At least once per month
Yearly	Less than monthly but within the past year

Table 11 - Tie types

Tie Type	Sub-type (weight)	Description
1. Information	1.1 Download	Information sent from one to the other
	1.2 Discussion	Issues are identified, discussed, and clarified
	1.3 Dialogue	Exploring assumptions together leads to new understanding between stakeholders
2. Resources	2.1 Low	Precise numbers to be confirmed with the Uganda team. Enumerators will be asked to write down the estimated annual size of a resource tie in UGX on the network itself
	2.2 Mid	
	2.3 High	
3. Authority	3.1 Influence	Ability to influence the interests of others indirectly
	3.2 Authority	Control; the authority able to enforce consequences for non-compliance
4. Skills	4.1 Consulting	Temporary skill provision to complete a task
	4.2 Training	Providing temporary skill building activities
	4.3 Coaching	On-going customised interaction to support participants' ability to overcome challenges
	4.4 Co-Development	Supporting another stakeholder to develop their own way of doing things

Finally, interviews will also include a qualitative verbal statement captured from participants. These commentaries are captured to identify issues, and understand how these relate to different stakeholders or parts of the network. Questions are designed to solicit participant perceptions of challenges, benefits, and opportunities for change in the WASH service network that they interact with. Responses will be both audio recorded for later transcription and analysis, and enumerators will summarise responses through handwritten notes during the interview. The questions are listed in the Interview Format section (page 8).

Overall, the interview with each stakeholder identified for inclusion in the study begins with an egocentric network mapping exercise whereby the participant, as a representative of that particular stakeholder, draws a network showing how they relate to the other stakeholders also identified for inclusion in the study (Figure 47). The interviewee's stakeholder is written on a post-it note in the center of a sheet of flip chart paper, and the other stakeholders that have been written on post-it notes. These other post-it notes are then placed by the participant in concentric rings that have been drawn on the paper to indicate the frequency of interaction – weekly, monthly, or yearly. Colored, directional

arrows are drawn by the participant to indicate ties, and the number of arrowheads is used to denote weight. Qualitative questions are then asked and recorded after completion of the network drawing.

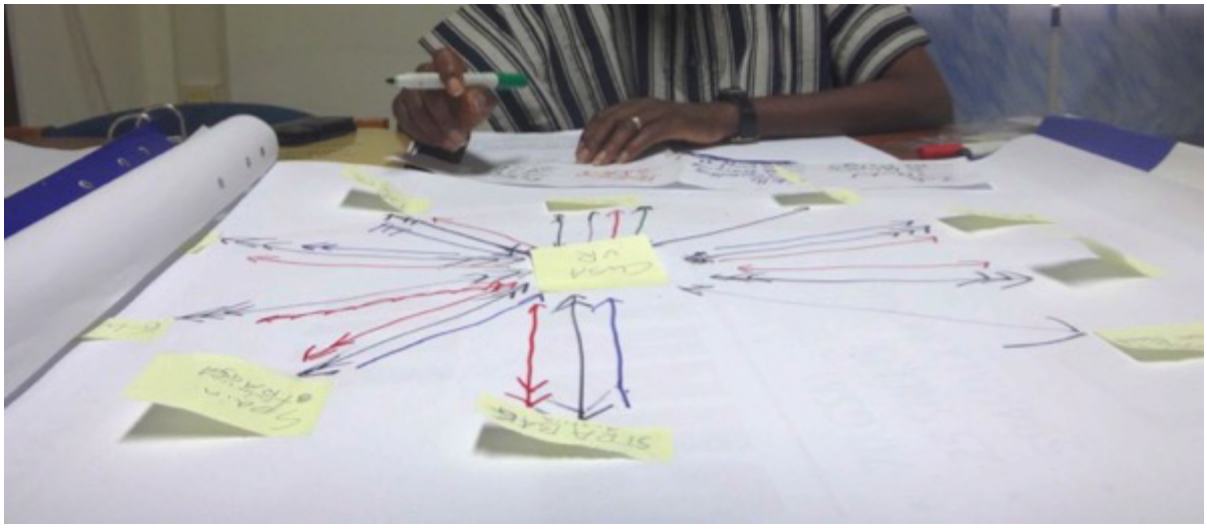

Figure 47 - An egocentric network drawn by an interview participant

Interview Format

Prior to the interview, the enumerator should prepare:

- A legend showing different tie colors and descriptions;
- A sample image of a completed network on A4 paper;
- A list of stakeholders in the network for participants to select from; and
- A sheet of flip chart paper with concentric rings labelled Weekly, Monthly, and Yearly (Figure 48). The enumerator's name and date of the interview should be written on the back.

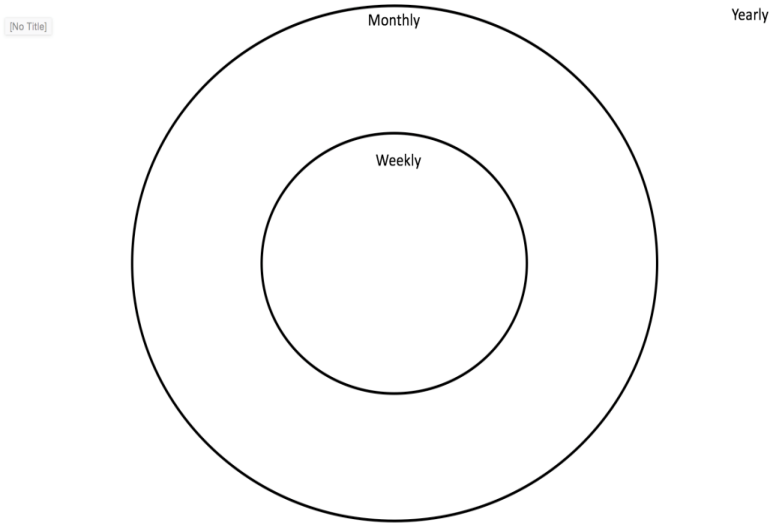

Figure 48 - Template for network data collection

Additionally, the enumerator will require:

- Flip chart paper;
- Post-it notes;
- Colored markers;
- Ballpoint pens;
- A notebook;
- A digital camera; and
- An audio recording device.

Part 1 – Introduction and Node Properties

The interview commences with an introduction of the research aims and survey outline. Suggested phrasing is presented in italics, but will necessarily differ depending on the audience and spoken language.

IRC, in collaboration with Kabarole District Council, is conducting a study to understand the network of stakeholders involved in WASH service delivery in Kabarole district, and issues affecting the sustainability of services. We are asking you to participate in a brief survey to draw the network of your organisation/stakeholder, and to identify both benefits and challenges with this network. The survey should take approximately 30 minutes.

In the first step, we will draw a network to understand who you interact with and how. The completed network will look like this:

The enumerator shows the example of a complete network, then produces the flip chart paper to be used for the interview. The enumerator then writes the name of the stakeholder being interviewed on a post-it note and places this in the center of the flip chart.

Firstly, let us begin with your contact information for any necessary follow up. We will not share your contact details outside of the analysis team.

The enumerator should then record, on the back of the flip chart, the respondent's:

- First name
- Last name
- Organisation
- Position
- Mobile phone number
- Personal email address

Now, please select the term that best describes your organisation/stakeholder type, and the scope of your work.

Answers are to be selected from the list of stakeholder types and scope presented in Table 9 and written on the post-it note with the name of the stakeholder being interviewed.

Part 2 – Network Mapping

The enumerator then presents the list of stakeholders involved in the study and asks the participant to identify whom they have had information, skill, resource, or authority relationships with over the past year[13]. These can be either incoming or outgoing ties.

From this list of stakeholders, please identify whom you have had a relationship with in the past year. This can be anyone you share information with, give or receive support from, pay or are paid by, or who you influence or control in the WASH sector. Please also identify if any important stakeholders are missing from this list.

As the participant identifies each stakeholder, the enumerator writes the name on a post-it note and places it on the flip chart paper. Responses are expected to include both stakeholders already identified in the network, and any other stakeholders that are perceived as important.

Please now move the stakeholders on the flip chart to indicate how often you interact. Is it weekly, monthly, or less than monthly within the past year?

The participant should then move the post-it notes that label stakeholders identified to the appropriate ring on the flip chart paper. It is ideal if the participant does this directly instead of the enumerator doing it on the respondent's behalf.

The enumerator then presents the tie categories, starting with information. For each tie category, the participant is handed the appropriate colored marker and instructed to draw their ties. The enumerator should describe the tie categories and clarify any questions as appropriate. All enumerators will be trained and tested in facilitating this process prior to data collection.

We will now draw the relationships between you and the stakeholders you identified. We will start with information, followed by skills, resources, and then authority. We will use colors to indicate the relationship type arrowheads to indicate direction, and the number of arrowheads to indicate the strength of the relationship. Let's start with this stakeholder. What is your relationship here?

Participants usually grasp the exercise quickly once they have completed one or two examples. It is important that they hold the markers throughout the exercise so that results are not unintentionally influenced by the enumerator. Enumerators should be prepared to clarify any

[13] This period is appropriate because the next network study is planned for October 2018

questions as necessary while the participant draws the network.

The process continues until relationships for each tie type for each stakeholder have been discussed. For resource ties, the enumerator should also write down the estimated annual size of the resource flow in Ugandan shillings. Enumerators should check for completeness at the end of the exercise and encourage participants to make any corrections or additions that they see fit.

Please check the network you have drawn and feel free to make any changes. Does anything need to be added or changed? Is anyone missing?

The enumerator can proceed to the final part of the interview when the participant is satisfied that the network is complete.

Part 3 – Qualitative Interpretation of Factors

This final part of the interview captures participant perspectives of factors affecting WASH services and their sustainability, and qualifies the importance of particular network relationships. The interview format is a semi-structured interview consisting of four questions. Responses to these are audio recorded, and enumerators are expected to make summarising notes of key points simultaneously.

Importantly, for all questions, enumerators should encourage participants to elaborate on their responses through prompts including "tell me more", "and", and simply pausing to encourage further detail. Other than necessary clarifications, enumerators should minimise specific follow-up questions that could influence responses, and instead allow participants to direct the conversation towards what they perceive as most important. If a response becomes too lengthy or redundant, enumerators can interrupt to summarise the point to ensure it is understood correctly, and encourage respondents to move on to new points with the prompt of "what else?" Responses are anticipated to not require more than 15-20 minutes. Training on these interview techniques will be included for all enumerators.

The following questions represent the intent of the inquiry, but may require translation or adaptation to specific context. Enumerators are expected to understand the intent of the questions, assess whether or not the respondents are providing the desired type of information, and adapt approaches as required. These questions, and the approach to asking them, is expected to be iterated on throughout fieldwork to ensure that the required data are captured.

Finally, I would like to ask you a few questions about how this network works, and about the sustainability of WASH services in this district. To make sure we do not miss any points that you make, we would like to audio record this part of the interview. Is it okay to record you? [If YES, begin audio recording; if NO take handwritten notes]

1. In your opinion, what do you think is working well with water and sanitation service delivery in your district?
2. What do you think are the main problems with the long-term sustainability of water and sanitation services in your district?
3. What ideas or recommendations do you have about solutions to these problems? [Enumerators should restate the problems mentioned and ask participants to offer recommendations for each one]
4. Of the solutions you listed, which is the most important? Follow-up: Can you walk me through what next steps would happen if this solution occurs, and how this could lead to more long-lasting services?

On completion of the interview, the enumerator should thank participants for their time, and capture any further feedback, comments, or reflections from the interview. Enumerators should also photograph the drawn network and be sure that the audio recording is properly saved.

Data Processing

Egocentric networks drawn during interviews can then be aggregated to create whole networks for analysis. These drawn networks are manually converted to a node list and tie list for analysis by enumerators. Recorded verbal responses are transcribed by enumerators and translated to English where necessary. The result is:

- **1.** A node list;
- **2.** A tie list; and
- **3.** Transcripts of verbal responses from each stakeholder.

Aggregating ties from separate interviews can produce conflicts where two stakeholders perceive the same relationship differently. The final network will therefore include all ties reported from interviews, and conflicts will be averaged. If desired, future analysis can investigate the frequency of conflicts if discrepancies in perspectives are of interest to the Learning Alliance. Original and averaged tie data will therefore be provided by the study.

Coding of verbal response transcripts will be handled by the University of Colorado Boulder. These coded themes can then be transformed into an tie list that links stakeholders to the issues they identified. This data set can then be used as a bimodal network for further analysis. Simultaneously, enumerators are expected to be summarising key points during the course of interview verbal responses. These summary

points can also be turned into an tie list that links stakeholders to issues identified as a means of verification for the coding done by the University of Colorado Boulder.

Tentative Workplan

16th September	Duncan McNicholl Arrives in Kampala	
18th September	Travel to Kabarole (Peter & Duncan)	
19th September	Training on Network Mapping Data Collection Methodology	
20th September		# Interviews
	Technical Support Unit 6 (Team Leader)	1
	District Water Officer	1
	Asst. Mobilisation	1
	Mid-Western Umbrella Organisation	1
21st – 22 September		
	Mugusu Town Council	
	LC III Chairperson/ Mayor - Mugusu Town Council	1
	Town Clerk - Mugusu Town Council	1
	Health Assistant	1
	Hand Pump Mechanic/Scheme Attendant	1
	Community representatives	
	Water Board	2
	Water User Committees	2
	Water users	3
23rd & 24th September		
	Kasenda Sub County	
	LC III Chairperson Kasenda	1
	Sub County Chief Kasenda	1
	Health Assistant	1
	Hand Pump Mechanic/Scheme Attendant	1
	Community representatives	
	Water Board	2
	Water user Committee	2
	Water users	3
25th – 26th September		
	Karambi Sub County	
	LC III Chairperson Karambi	1
	Sub County Chief Karambi	1
	Health Assistant Karambi	1
	Hand Pump Mechanic/Scheme Attendant	1
	Community representatives	
	Water user Committee	3
	Water users	3
27th September		
	Wrap up meeting Kabarole & Travel to Kampala	

Anticipated Analysis

Detailed analysis of data collected should be informed by the interests of the Learning Alliance so that findings might inform actionable strategies. Some analysis is proposed as a starting point to outline how data collected can be used to produce initial findings. Interested stakeholders can then consider these initial findings to develop hypotheses or new lines of inquiry that can be further explored in available data.

Force Atlas Visualisations

A force directed visualisation orients network data to show stakeholders that are most closely connected to each other. This algorithm is particularly useful for identifying clustering of stakeholders, brokers, and network gaps. Stakeholders can see where they are in the network, and where they might build new relationships in order to bridge gaps. These visualisations can be produced for each of the four tie types, and for different frequencies of interaction (weekly, monthly, and yearly).

Additional visualisations can include new stakeholders identified during interviews that were not originally included in the list of stakeholders to interview in the Learning Alliance. Comparing this extended network to the original one can consider whether additional stakeholders should be invited to participate in the Learning Alliance.

Geospatial Visualisations

Network data can also be visualised geospatially to show how these networks exist across real space in the District. As with the force atlas visualisations, these networks can be made for each tie type, and for different frequencies of interaction. This analysis can be useful for identifying where certain network interactions are concentrated in particular geographical locations and where there are gaps.

Challenges, Benefits and Opportunities Analysis

Qualitative investigation of the verbal responses to interview questions can be coded to identify the frequency and importance of challenges, benefits, and opportunities for improving WASH service sustainability. Analysis can describe these factors, and indicate who identified them. The most immediate benefit is expected to be quantification of the different factors to understand which are perceived as important by the greatest number of stakeholders interviewed.

Bimodal Network Visualisations

Qualitative analysis can be extended to show how stakeholders are linked to the factors they identified in a bimodal network. A bimodal network includes both the actors, and the factors as two separate node groups. Visualising relationships between stakeholders and challenges, benefits, and opportunities can be used to identify where clusters of stakeholder groups perceive similar issues that they might collectively address, or identify where a group of stakeholders have developed a successful approach.

Network Analysis of Communities

Combining network data from community interviews with existing data on service levels provides an opportunity to explore how network properties might be linked to service levels. Recent research suggests that gaps in information and skill ties might be linked to lower levels of institutional development, and data from this study can be used to explore the relationship between network properties and service levels with greater rigor.

These initial types of analysis are likely to generate more specific hypotheses and questions to explore in network data. In particular, these types of analysis are assumed to be useful starting points for Learning Alliance members to answer two key questions that can inform future action:

1. Where are there gaps, and where do we want to strengthen the network?

2. What are key issues we want to address, and who should be involved?

Implications and Follow-Up

Network analysis can be particularly useful for identifying gaps in stakeholder relationships. Such gaps can be missed opportunities for accessing capacity, resources, or information from a broader network that any one stakeholder might require to perform or improve in its service delivery role. Identifying network gaps can inform opportunities for strengthening service networks, and stakeholders can consider the network to identify specific relationships they want to develop or improve.

Qualitative analysis of challenges, benefits and opportunities can add to network analysis by helping Learning Alliance members to identify where stakeholder groups report similar challenges or capacity gaps. Identifying these common challenges can then provide a basis for collaborative action. The analysis can be used to prioritise where to focus and who to involve.

Finally, if specific network indications are identified as important for service delivery, Learning Alliance members might consider capture data to monitor network activity over time. Such data might serve as a proxy indicator for service delivery and the relationship between network activity and service levels can be formally explored. This is an example of a specific hypothesis that might be identified by Learning Alliance members from preliminary analysis, and supplemental analysis can be performed on data from the study as deemed strategically useful.

Follow-Up

Once available, findings and data from fieldwork and preliminary analysis are expected to be presented at a workshop with Learning Alliance members. This workshop can discuss findings, identify further questions for analysis and explore the relationships between factors identified in the research. Identifying relationships between factors is expect to be facilitated by University of Colorado Boulder for additional analysis of the systemic nature of WASH issues. The workshop is expected to culminate in a set of proposed actions to influence WASH service networks and issues affecting WASH services in Kabarole District to be implemented by members of the Learning Alliance.

A follow-up network study could later study how the network changes after the Learning Alliance has been strategically influencing relationships in the District. Repeating similar data collection would create opportunities for comparative analysis, and investigate the utility of these methods as a monitoring and evaluation tool in the context of WASH service delivery. The follow-up study is tentatively planned for October 2018.

Appendix C – Betweenness Centrality by Tie Type

Information Ties

Rank	Yearly	Quarterly	Monthly	Weekly
1	District Councillor Karambi	District Executive/ Sec Works	HPMA	Sub County chief Kasenda
2	District Executive/ Sec Works	District Health Inspector	District Councillor Kasenda	District Councillor Kasenda
3	District Councillor Kasenda	Health Assistant Karambi	Parish councillor Rubingo	District Executive/ Sec Works
4	HPMA	District Councillor Kasenda	District Water Officer	District Councillor Karambi
5	District Water Officer	HPMA	Sub County chief Kasenda	Sub County chief Karambi
6	Health Assistant Karambi	Sub County chief Kasenda	CDO Karambi	HPMA
7	Sub County chief Kasenda	Health Assistant Kasenda	Sub County chief Karambi	Kibuga A
8	IRC	District Water Officer	District Executive/ Sec Works	District Water Officer
9	JESE	Hand Pump Mechanic Karambi	Health Assistant Kasenda	Kasenda Water Board
10	Health Assistant Kasenda	IRC	LCIII Karambi	CDO Kasenda
11	HPM Kasenda	CDO Karambi	Hand Pump Mechanic Karambi	LCIII Karambi
12	HEWASA	Sub County chief Karambi	LCIII Kasenda	Hand Pump Mechanic Karambi
13	CDO Karambi	Parish councillor Rubingo	CDO Kasenda	IRC
14	CDO Kasenda	LCIII Kasenda	District Councillor Karambi	JESE
15	Sub County chief Karambi	Umbrella	HEWASA	Parish councillor Nyabweya
16	LCIII Kasenda	CDO Kasenda	Health Assistant Karambi	LCIII Kasenda
17	Parish Chief Rubingo	TSU	Parish Chief Rubingo	TSU
18	Hand Pump Mechanic Karambi	HEWASA	IRC	HEWASA
19	Parish councillor Rubingo	Parish councillor Nyabweya	TSU	Health Assistant Kasenda
20	Parish councillor Nyabweya	LCIII Karambi	JESE	AWMZ

Skill Ties

Rank	Yearly	Quarterly	Monthly	Weekly
1	District Health Inspector	District Health Inspector	Sub County chief Kasenda	Sub County chief Kasenda
2	District Councillor Karambi	Health Assistant Kasenda	District Water Officer	District Councillor Kasenda
3	Health Assistant Kasenda	Health Assistant Karambi	HPMA	District Executive/ Sec Works

4	Sub County chief Kasenda	Sub County chief Kasenda	Parish councillor Rubingo	District Councillor Karambi
5	District Executive/ Sec Works	District Executive/ Sec Works	CDO Karambi	Sub County chief Karambi
6	Parish councillor Nyabweya	District Water Officer	Health Assistant Kasenda	HPMA
7	District Water Officer	Parish councillor Rubingo	District Councillor Kasenda	District Water Officer
8	Parish councillor Rubingo	Parish councillor Nyabweya	District Councillor Karambi	Kibuga A
9	Health Assistant Karambi	IRC	Sub County chief Karambi	IRC
10	District Councillor Kasenda	HPMA	HEWASA	Kasenda Water Board
11	HEWASA	CDO Karambi	District Executive/ Sec Works	CDO Kasenda
12	HPMA	HEWASA	Kibuga A	Health Assistant Kasenda
13	IRC	JESE	Health Assistant Karambi	LCIII Karambi
14	JESE	Sub County chief Karambi	LCIII Karambi	Hand Pump Mechanic Karambi
15	CDO Karambi	Hand Pump Mechanic Karambi	Kibuga B	AWMZ
16	Hand Pump Mechanic Karambi	LCIII Karambi	JESE	JESE
17	Sub County chief Karambi	District Councillor Kasenda	TSU	TSU
18	LCIII Kasenda	LCIII Kasenda	CDO Kasenda	HEWASA
19	Kibuga B	Umbrella	Umbrella	Umbrella
20	Kabende	AWMZ	Parish councillor Nyabweya	National Water & Sewerage Corporation

Resource Ties

Rank	Yearly	Quarterly	Monthly	Weekly
1	District Water Officer	District Water Officer	District Water Officer	IRC
2	Sub County chief Kasenda	District Executive/ Sec Works	District Executive/ Sec Works	District Executive/ Sec Works
3	IRC	Sub County chief Kasenda	Sub County chief Kasenda	District Water Officer
4	District Executive/ Sec Works	IRC	IRC	LCIII Karambi
5	HPM Kasenda	LCIII Karambi	LCIII Karambi	Kibuga A
6	LCIII Karambi	CDO Karambi	HEWASA	TSU
7	Kibuga A	Kasenda Water Board	Kibuga A	Umbrella
8	HPMA	Sub County chief Karambi	CDO Karambi	National Water & Sewerage Corporation
9	CDO Karambi	Health Assistant Karambi	Sub County chief Karambi	AWMZ
10	Sub County chief Karambi	HPMA	Health Assistant Karambi	HPMA
11	Health Assistant Karambi	HEWASA	HPMA	District Councillor Kasenda

12	Kasenda Water Board	Kibuga A	AWMZ	District Councillor Karambi
13	JESE	AWMZ	JESE	District Health Inspector
14	HEWASA	JESE	TSU	JESE
15	AWMZ	TSU	Umbrella	HEWASA
16	TSU	Umbrella	National Water & Sewerage Corporation	Turi Kumwe
17	Kibuga B	National Water & Sewerage Corporation	District Councillor Kasenda	Sub County chief Kasenda
18	Rwenkuba	District Councillor Kasenda	District Councillor Karambi	Sub County chief Karambi
19	Kinombe	District Councillor Karambi	District Health Inspector	CDO Kasenda
20	Nyabweya A	District Health Inspector	Turi Kumwe	CDO Karambi

Authority Ties

Rank	Yearly	Quarterly	Monthly	Weekly
1	District Councillor Kasenda	District Councillor Kasenda	District Councillor Kasenda	District Councillor Kasenda
2	IRC	IRC	CDO Karambi	District Executive/ Sec Works
3	District Water Officer	District Water Officer	HPM Kasenda	Sub County chief Kasenda
4	CDO Karambi	CDO Karambi	HPMA	Kibuga A
5	District Executive/ Sec Works	District Executive/ Sec Works	District Water Officer	District Councillor Karambi
6	HPMA	Health Assistant Karambi	District Executive/ Sec Works	Sub County chief Karambi
7	HPM Kasenda	Health Assistant Kasenda	Parish councillor Rubingo	District Water Officer
8	Health Assistant Karambi	LCIII Karambi	HEWASA	CDO Kasenda
9	Health Assistant Kasenda	HPM Kasenda	Sub County chief Karambi	JESE
10	Parish councillor Rubingo	Parish councillor Rubingo	Health Assistant Kasenda	Kasenda Water Board
11	LCIII Karambi	HPMA	LCIII Karambi	IRC
12	District Councillor Karambi	Parish councillor Nyabweya	JESE	Turi Kumwe
13	Parish councillor Nyabweya	HEWASA	Kibuga A	HEWASA
14	HEWASA	TSU	TSU	TSU
15	TSU	District Health Inspector	Parish councillor Nyabweya	LCIII Karambi
16	Hand Pump Mechanic Karambi	LCIII Kasenda	Kitojo	Health Assistant Kasenda
17	District Health Inspector	Kitojo	Health Assistant Karambi	AWMZ
18	JESE	JESE	Sub County chief Kasenda	CDO Karambi
19	LCIII Kasenda	Sub County chief Karambi	CDO Kasenda	Umbrella
20	Sub County chief Karambi	Kibuga A	Umbrella	National Water & Sewerage Corporation