Sustainable WASH Systems Learning Partnership

# Stakeholder-Driven Factor Mapping for WASH Systems

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University of Colorado Boulder

## Introduction

There is increasing recognition within the WASH sector that delivering sustained services requires more than just functional infrastructure. New approaches are needed to better understand the wide array of dynamic and context-specific factors that support, or hinder, service delivery. While many of these common factors are well known (financing, operation and maintenance [O&M], regulations, etc.), there are few tools available to map how these factors interact and affect each other. To address this gap, as part of the United States Agency for International Development (USAID) Sustainable WASH Systems Learning Partnership (SWS), researchers at the University of Colorado Boulder (UCB) are piloting factor mapping workshops with local partners to gain an understanding of the complexity of local systems, and ways to strengthen them for improved service sustainability.

### Key Findings

- While workshop participants tend to identify a common set of factors required to sustain WASH services, they describe unique relationships between these factors across different contexts

- Outputs of the process can support better decision making by targeting systematic leverage points

- Factor mapping can help improve local stakeholders' understanding of complex WASH systems and align participants perspectives of the key components and mechanisms that lead to service delivery outcomes

Under SWS, UCB, with local partners IRC, Whave, and WaterSHED, conducted 10 factor mapping workshops in five locations in Ethiopia, Uganda, and Cambodia. Eight workshops focused on factors that influence rural water service delivery in Ethiopia and Uganda, another explored small-town sanitation services in Ethiopia, and another investigated sanitation and hygiene coverage in rural Cambodia.

## Process

Factor mapping is a form of group model building, a participatory method of creating a visual model of a system to enable practitioners to think in a systems way. Factor mapping brings together knowledgeable stakeholders for a structured discussion with an explicit focus on the interactions between factors in a system. This process allows the group of participants to share, formalize, and align their perspectives about how key factors interact to produce service delivery outcomes. The workshop format provides a platform through which participants can discuss complex problems using shared terminology. Ultimately, three key steps in the workshop (see Figure 1) help the group foster consensus around shared strategies and actions needed to strengthen local systems.
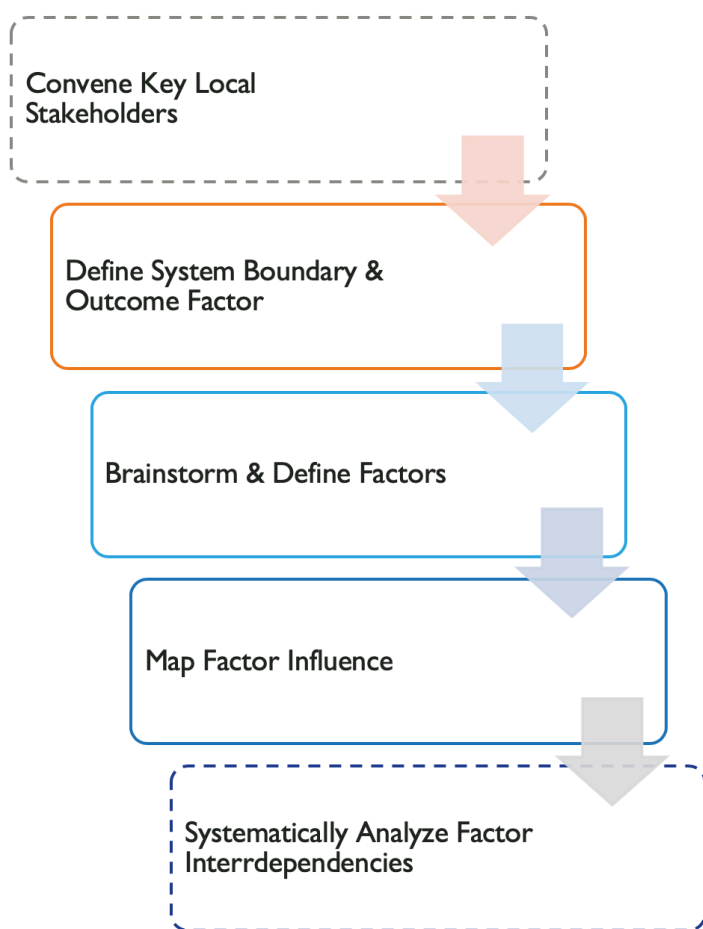
### Convene Key Local Stakeholders

### Define System Boundary & Outcome Factor

### Brainstorm & Define Factors

### Map Factor Influence

### Systematically Analyze Factor Interrdependencies

Figure 1. Factor Mapping Process

### Determining the System Boundary and Outcome Factor

Workshop participants start by determining the geographic and/or political boundary of the water, sanitation, and hygiene (WASH) service delivery area to define the WASH system to evaluate. The boundary needs to be explicit as it delineates which factors are internal (e.g., tariffs) and external (e.g., bilateral aid) to the system. Next, the group defines the outcome factor, the focal issue to map the system around. In the pilot cases, the outcome factor is a sustained service (e.g., rural water services, small town sanitation), but it can also be a specific sub-system of interest within the larger WASH system (e.g., payment for services, preventative maintenance).

### Factor Brainstorming

After defining the boundaries and outcome factor, the group identifies the relevant factors[1] to analyze within the system. Each proposed factor must have a clear definition collectively agreed to by the majority of the group to ensure a productive discussion. The group then prioritizes and distills the longer factor list (typically comprised of 20 to 40) down to 10 to 15 priority factors to include in the mapping exercise, helping to make sure the next workshop step is manageable. This prioritization process can take different forms, including grouping by common factors, expanding factor definitions, or polling participants for their top choices.

### Discuss Factor Influence

Once the group determines the prioritized list of factors, they evaluate how each factor influences the other factors, including the outcome factor. Using a cross-impact matrix (see Figure 2), both row and column headings list factors. The facilitator walks the group through evaluating each factor-to-factor influence, represented by each box of the matrix. For each box, the group considers three attributes of each directional relationship: influence (e.g., Does the factor influence the other factor? Yes or no?), polarity (e.g., Is the influence positive or negative?), and strength (e.g., Relatively speaking, how strong is this influence, compared with the other influences discussed?).

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[1] Core factors discussed within the workshops are identified with proper names in italics in the report. E.g., *Coordination* vs. coordination (in general).
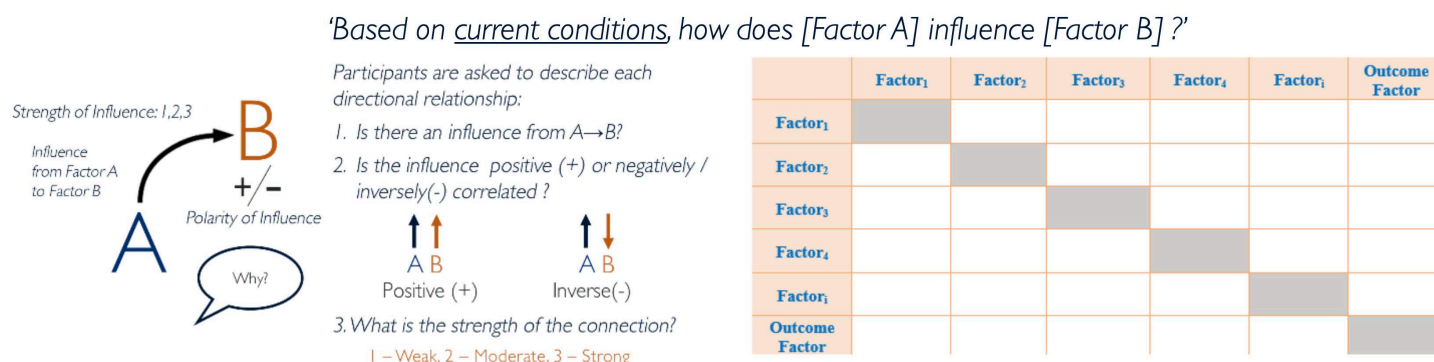
*'Based on current conditions, how does [Factor A] influence [Factor B] ?'*



Figure 2. Mapping Factor Influence Using a Cross-Impact Matrix

## Analyze the WASH System

The summary table, or "cross-impact matrix" (see Figure 2), generated during the workshop can be used to conduct three distinct and complementary analyses to gain insight into influence mapping, centrality analysis, and causal loop analysis (see Table 1). Each of these three methods provides different insights into the system and, collectively, they are used to translate the cross-impact matrix into meaningful systems insights that can be used to inform interventions and policies for systems strengthing activities.

Table 1. Systems Analyses Employed in Factor Mapping Process

| Analysis | Outputs |
|---|---|
| Influence Mapping | Rankings of the relative influence – the degree to which a factor affects others – and dependence – the degree to which each factor is affected by others |
| Centrality Analysis | Ranking of how much factors are connected, directly and through other factors (indirectly), and which factors are most central |
| Causal Loop Analysis | Prioritized lists of circular cause-and-effect chains of factors that generate either reinforcing (compounding growth or decay) or balancing (pushing towards and equilibrium) behavior |

## Findings

### Factors are Common Across Contexts but Play Different Roles in Each System

Across the factor mapping workshops, participants identified a relatively common set of factors including *Coordination, Local Government*, and the *Role of User Committees.* While this may suggest WASH systems generally consist of the same fundamental components, analysis of the cross-impact matrices from each workshop indicates how much these factors impact the system (influence) and how other factors in the system affect

them (dependence) can vary significantly across contexts (see Figure 3). While systems that support WASH services may rely on the same set of key factors, how those factors interact and connect is unique to each local system. Each system, while comprised of similar parts, has unique barriers and leverage points that affect its strength. For example, the influence *Users* have in driving the outcomes of their local WASH services varied significantly across context (see Figure 3). In some cases where users were very influential, participants described their unique role in closely monitoring water scheme functionality and being

able to quickly report to user committees, mechanics, or other service providers (accounting for their prominent influence on the system). In other contexts, participants described users' lack of influence over other key factors such as *Coordination, Financing, Capacity Building,* and *Water Resource Management,* making them weaker factors in the system.
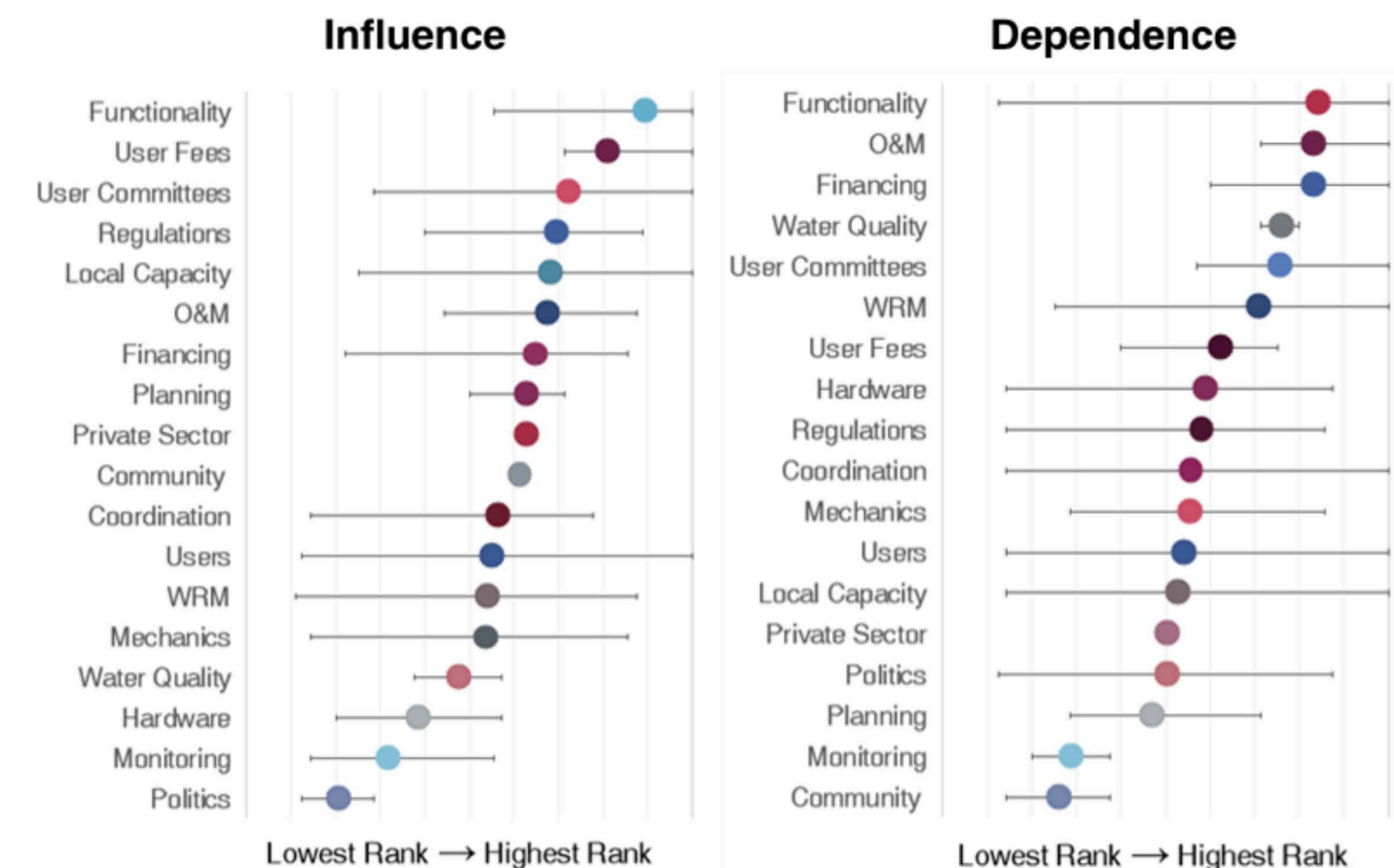


**Figure 3.** Median relative ranks of Influence and Dependence for common factors across contexts (dot) overlaid on range of high and low scores from all contexts (grey bar)

## Interconnections between factors are complex, dynamic, and context-specific

Findings from the causal loop analysis also provided quantitative evidence that there are a set of complex and dynamic feedback loops – chains of cause and effect relationships between factors – driving service delivery outcomes that appear to be unique to each local context. This indicates the most effective and efficient means of strengthening local systems involve identifying strategic leverage points (factors and/or interconnections) within the systems that will improve the resiliency of key underlying processes, not simply improving the strength of all factors individually.

For example, in a workshop in South Ari Woreda, Ethiopia, the individual influence of *Finance* and *O&M* on services were both rated relatively low by participants, but the causal loop analysis highlighted a unique dynamic between these factors in a "balancing loop" that also involved *Community Participation* and government *Policy* around who pays for *O&M.* The interaction of these factors, as viewed through the causal loop diagram, identified a potentially influential dynamic whereby a lack of understanding among water users of how tariffs are used to finance O&M could limit community members' willingness to pay tariffs for water
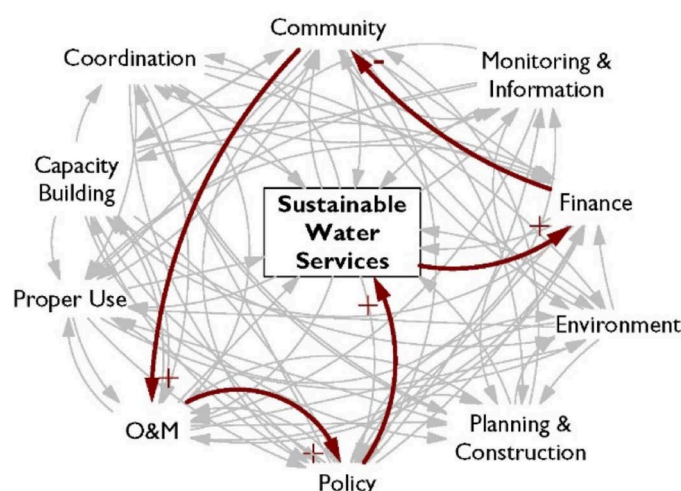
Figure 4. Using Causal Loop Analysis to Identify Key Dynamic Feedback Loops

services (*Finance (-) → Community Participation → O&M → Policy → Service Sustainability*). Thus only assessing the individual strength of factors would overlook the cumulative effect these factors exert when interacting with one another.

## Factor mapping can help improve local stakeholders' understandings of complex systems

Across the 10 factor mapping workshops, over 95 percent of participants indicated the activity improved their understanding of the complexity of local WASH systems in their pre-/post-workshop surveys. By bringing together local government officials, civil servants, NGOs, and community members, the factor mapping process seeks to provide a platform for a diverse group of actors to develop a deeper understanding of the system in which they each play an important and unique role.

> *"We were aware of these factors, but now the things we took for granted, we appreciate some of the interactions between those factors"*
>
> –Workshop Participant
> (Kabarole, Uganda)

## Recommendations

### The factor mapping process significantly benefits from high-quality facilitation and documentation

The factor mapping activity places participants in a focus group type format. The facilitators' ability to engage the group in a "systems thinking" mindset enhances how well participants can accurately describe factor interactions. Effective facilitation includes encouraging participants to discuss the range of impacts one specific factor can have on another in hypothetical scenarios and how these impacts can change over time. Detailed documentation of participants' discussions is also highly desirable for extracting meaning from the cross-impact matrix, and for informing and validating the findings of the activity. While the matrix represents the participants' direct identification of the strength and influence of factor-to-factor relationships, capturing rich discussion points during the activity is necessary to provide a narrative that describes how these factors behave within each the local system.

### Workshop participants should represent multiple perspectives of the local system

As a participatory exercise, the perspectives of the participants within each workshop ground the outcomes of the factor mapping process. Thus, the participants must be carefully selected to ensure they have sufficient working knowledge of the local WASH system, represent multiple perspectives, and contribute to the group discussion about factor interactions. Ensuring the assembled group represents a diversity of viewpoints on the complexity of the system improves the overall validity of the analysis.

### Incorporating factor mapping into WASH programming

Because the factor mapping process is not problem- or process-specific, it can help WASH practitioners deal with a wide range of complex issues in planning, implementation, and monitoring and evaluation. Although some elements of the analysis require specialized knowledge, organizations and practitioners can conduct workshops on their own with limited prior experience or instruction in the method. In particular, factor mapping can benefit the following programmatic steps:

- **Pre-program planning**: Identify technical focus areas to improve services based on locally-influential leverage points.

- **Early program stages**: Build ownership or buy-in from local partners on systems-strengthening activities by showing how selected interventions lead to systemic improvements.

- **Evaluation milestones (mid- or end-point)**: Evaluate the impact of program activities on WASH support systems and understand how local perspectives of these systems have shifted or evolved.

- **Project closeout and post-project evaluation**: Assess how well interventions addressed leverage points and reflect on how this has changed the structure of the systems itself.

When considering the use of the factor mapping process, it is important to identify the goals of the activity and the key local stakeholders to involve to provide a robust range of perspectives on the topic of interest. The process also benefits from iteration, where participants reflect on how the outcomes change over time. By bringing together a diverse group of stakeholders, engaging them in an accessible conversation about local systems, and repeating the activity over time, the factor mapping process can help WASH practitioners effectively understand and manage complexity in their programs and activities to promote more sustainable outcomes.

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