Distribution Agreement

In presenting this thesis or dissertation as a partial fulfillment of the requirements for an advanced degree from Emory University, I hereby grant to Emory University and its agents the non-exclusive license to archive, make accessible, and display my thesis or dissertation in whole or in part in all forms of media, now or hereafter known, including display on the world wide web. I understand that I may select some access restrictions as part of the online submission of this thesis or dissertation. I retain all ownership rights to the copyright of the thesis or dissertation. I also retain the right to use in future works (such as articles or books) all or part of this thesis or dissertation.

Signature:

_____ _____

Margaret T. Person Date

Assessing the Influence of Social Capital on Water Point Sustainability in Rural Ethiopia

By

Margaret T. Person
Master of Public Health

Global Environmental Health

Matthew Freeman, PhD

Committee Chair

Paige Tolbert, PhD

Committee Member

Assessing the Influence of Social Capital on Water Point Sustainability in Rural Ethiopia

By

Margaret T. Person

Bachelor of Arts, Sociology
Second Major in Environmental Policy
College of William and Mary
2010

Thesis Committee Chair: Matthew Freeman, PhD

An abstract of
A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
in partial fulfillment of the requirements for the degree of
Master of Public Health
in Global Environmental Health
2015

Abstract

Assessing the Influence of Social Capital on Water Point Sustainability in Rural Ethiopia

By Margaret T. Person

Introduction: Rural Ethiopia has among the lowest rates of access to improved water in the world. One of the main challenges to achieving access to improved water is sustainability, or continued functionality, of water points over time. While there are many factors that affect sustainability, good community governance has been shown to be strongly associated with sustainable water points. A community's underlying social conditions are the basis for all community governance, which can be better understood by measuring social capital. Social capital refers to the networks, norms, and trust that facilitate social behaviors, and has not yet been explored in great detail in the water, sanitation, and hygiene sector.

Methods: The purpose of this study was to assess the influence of social capital on community water point governance and sustainability in rural Ethiopia. We achieved this by developing survey tools and conducting research in communities in the Amhara Region (n=16) and the Oromia Region (n=16). In each community we randomly sampled 20 households and administered a social capital survey (n=640), and also conducted functionality and governance assessments with one or more water committee members (n=32). Social capital was divided into six domains – groups and networks, trust and solidarity, information and communication, social cohesion and inclusion, and empowerment and political action – and each domain comprised a section of the household survey. Using our data, we created a social capital index, functionality index, and governance index, which we aggregated to the community level.

Results: We found significant associations ($p<0.05$) between a number of social capital domains and governance: groups and networks, trust and solidarity, and information and communication. Every governance indicator was significantly associated with functionality, supporting our assumption that good governance is associated with functionality. No social capital domains were significantly associated with functionality.

Conclusions: The significant domains of social capital can help us understand which community characteristics and beliefs contribute to stronger water point governance, and can inform institutional efforts to harness and guide social capital in the context of water sustainability. The survey tools can be used elsewhere in Ethiopia and adapted for use in other countries.

Assessing the Influence of Social Capital on Water Point Sustainability in Rural Ethiopia

By

Margaret T. Person

Bachelor of Arts, Sociology
Second Major in Environmental Policy
College of William and Mary
2010

Thesis Committee Chair: Matthew Freeman, PhD

A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
in partial fulfillment of the requirements for the degree of
Master of Public Health
in Global Environmental Health
2015

ACKNOWLEDGEMENTS

I would first like to thank the entire staff at Catholic Relief Services Ethiopia, the survey enumerators, and the staff of Water Action, Team Today and Tomorrow, and Meki Catholic Secretariat, without whom this project would not have been possible. I would particularly like to thank Yeshewahareg Feyisa and Yonas Tsegaye, who were with me through long days and countless hours on bumpy roads. Their patience, logistical magic, and insight into Ethiopia made this project an incredible learning experience for me. I would like to thank Bekele Abaire (Chief) – his guidance and vast knowledge of everything that is water in Ethiopia were essential to this project. I am also grateful to Maureen Cunningham, Art Kirby, Mekdes Tsige, and Mussie Tezazu for their support while I was in Ethiopia.

Additionally, I would also like to extend a hearty thank you to Dr. Matthew Freeman, my boss and thesis advisor, whose humor and understanding helped as much as his advice and detailed feedback throughout every phase of this project. I would also like to thank Kelly Alexander for her help in designing the project.

Finally, I would like to thank my friends and family, particularly Danny Sexton and Holly Vins, who provided invaluable editing and support.

TABLE OF CONTENTS

CHAPTER 1: Literature Review

ACCESS TO WATER IN 2015

In 2012, the Joint Monitoring Programme announced that the world met Millennium Development Goal 7C, halving the proportion of the population without sustainable access to safe drinking water and basic sanitation (UN, 2015) (UNICEF/WHO, 2012). Despite this achievement, 748 million people still lack access to improved drinking water sources, half of whom are in sub-Saharan Africa and 90% of whom live in rural areas (WHO/UNICEF, 2014)While much progress has been made, the lack of access to improved drinking water in rural sub-Saharan Africa remains a critical challenge for the development sector.

Though MDG 7C reflects coverage of improved water supply, there remain questions of whether or not it fully addresses water quality, quantity, and access (Clasen, 2012). These metrics are particularly inadequate when considering rural Africa, where current trends suggest that the MDG target for individual countries will not be met until 2033 (Foster, 2013). What is meant by "sustainability" is also not clearly defined (Clasen, 2012), and low sustainability "may also mean MDG coverage figures are overestimated, as many of the systems to which users are deemed to have 'access' are in reality nonfunctional or delivering a poor quality service" (Foster, 2013:12037). Without clear understanding of the metrics and definitions, true progress toward reaching water access goals cannot be realized.

Ethiopia has made progress towards increasing access to safe water, but its rates of access remain among the lowest in the world (World Bank, 2014). As of 2012, 97% of Ethiopia's urban population uses improved drinking water sources ("improved" meaning it is piped into dwelling, yard, or plot; a public tap or standpipe; a tubewell or borehole; a protected dug well; a protected spring; or rainwater collection), but only 42% of the rural population uses improved drinking water sources, a rate that is increasing at a rate of 2.4 percent per year (WHO/UNICEF JMP, 2014, 2015; World Bank, 2014). This discrepancy between urban and rural water coverage rates is not unique to Ethiopia, and highlights the need for improvement in the rural water supply sector (Harvey & Reed, 2004).

GLOBAL WATER-RELATED DISEASE BURDEN

Access to improved drinking water has vast implications for development (Council on Human Rights, 2010), particularly concerning human health. Improving drinking water sources has the potential to impact 9.1% of global disease burden and 6.3% of all mortality, including health effects from diarrheal disease, malnutrition, soil-transmitted helminthes, lymphatic filariasis, trachoma, schistosomiasis, and others (Prüss-Üstün, Bos, Gore, & Bartram, 2008). Diarrheal disease is a leading cause of mortality for children under five: 1 in 10 child deaths result from diarrheal disease (Kotloff et al., 2013).

WATER SUSTAINABILITY

Sustainability is an important consideration in the effort to achieve global access to improved water. In 1987, when the World Commission on Environment and Development issued the Brundtland Report, "Our Common Future", calling for a global

push towards sustainable development, including economic growth, environmental protection, and social equality (Brundtland, 1987). This was followed by the UN's 1992 Rio Declaration on Environment and Development, an action agenda on sustainable development to be executed globally, nationally, and locally (United Nations Conference on Environment and Development, 1992).

There are numerous definitions of sustainability. The definition provided in the Brundtland Report is, "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987:41). In the context of rural water supply, sustainability has a number of definitions:

- WaterAid (Betti, 2011:11) defines sustainability as: "whether or not WASH services… continue to work and deliver benefits over time. No time limit is set on those continued services… sustainability is about lasting benefits achieved through the continued enjoyment of water supply and sanitation services."
- Harvey and Reed (2004:7) assert that "a water service is sustainable if the water sources are not over-exploited but naturally replenished, facilities are maintained in a condition which ensures a reliable and adequate water supply, the benefits of the supply continue to be realized by all users indefinitely, and the service delivery process demonstrates a cost-effective use of resources that can be replicated."
- Parry-Jones, Reed, & Skinner (2001:iv) propose that "minimal external assistance in the long term, financing of regular operation and maintenance costs by users, and continued flow of benefits over a long period" comprise the core issues in defining water system sustainability.

- Lockwood and Smits (2011:23-24) consider sustainability to be "the maintenance of the perceived benefit of investment projects (including convenience, time savings, livelihoods, or health improvements) after the end of the active period of implementation."

Several key concepts arise from these definitions. First, benefits derived from the water system should last over time. Second, water users should manage financing and operation. And third, this management can happen with little external assistance. Here, we consider sustainability to be: *the continued functionality of a water system for its intended lifecycle, with operation and maintenance costs, as well as responsibility, borne primarily by water users.*

The paradigm shift towards sustainable development occurred at the end of the Drinking Water Supply and Sanitation Decade (1981-1990), a time that brought rapid construction of water schemes, often without community input or proper management mechanisms in place (Marks, Komives, & Davis, 2014). This approach did not reflect communities' needs and preferences, and as a result, many water systems failed prematurely because communities were unable or unwilling to operate and maintain the systems (Marks et al., 2014). The backlash from this approach and the absence of the state and private sector spurred a shift to community-based management of rural water supply, which has become the norm in recent decades (Foster, 2013; Isham & Kähkönen, 2002; Marks et al., 2014).

Despite this shift to community-based management of water supply, which has been shown to be associated with increased sustainability, many issues with maintaining the functionality of water points remain (Marks et al., 2014). At present, approximately one third of improved water points in rural sub-Saharan Africa are estimated to be non-

functional at any given time, which equates to $1.2-$1.5 billion in investments over 20 years (RWSN, 2010). The International Institute for Environment and Development states that in 2009 in the Menaca region of Mali, 80% of wells were reported to be dysfunctional, and 58% of water points in northern Ghana were shown to need repair (Skinner, 2009).

FACTORS AFFECTING SUSTAINABILITY

There are a number of reasons why the sustainability of water schemes is low, ranging from environmental and technical factors to social and management issues (Harvey & Reed, 2004). Harvey and Reed (2004:8) identify eight factors that are critical to achieving sustainable rural water supplies: "policy context, institutional arrangements, financial and economic issues, community and social aspects, technology and natural environment, spare parts supply, maintenance systems, and monitoring." Each of these factors is important in maintaining sustainability, and should not be considered in isolation. Montgomery, Bartram, & Elimelech (2009) cite three key drivers of water sustainability in rural Africa: effective community demand, local financing, and dynamic operations and management. Carter (1999) cites a chain of four essential links that need to be present in order to sustain community water supply: motivation, maintenance, cost recovery, and continuing support. These factors affecting sustainability implicate all stakeholders that are involved in water supply and management – government (institutions), communities, and management structures, which are often community-based. See Figure 1 for an explanation of how these different stakeholders interact. This shows that all stakeholders can impact sustainability.

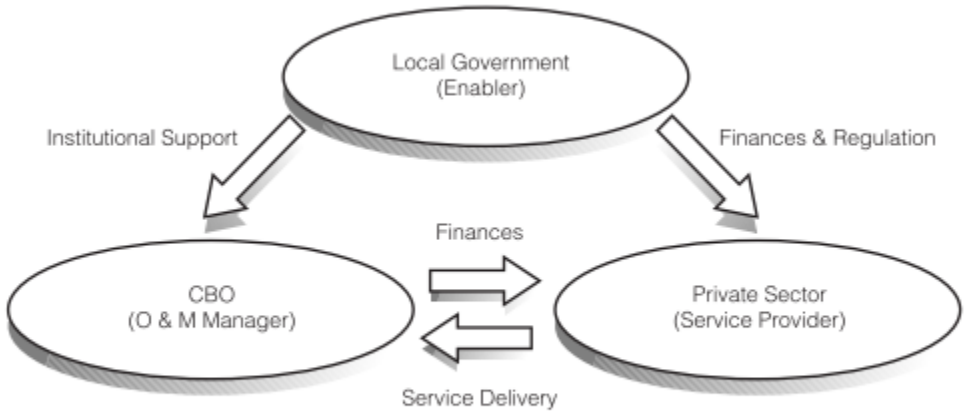


Figure 1.1: The Community Management Model (Harvey & Reed, 2004:41)

However, sustainability can be difficult to measure, particularly in studies taking place at one point in time. As a result, functionality is often used as a proxy indicator for sustainability because of its simplicity to measure, stemming from the use of "access to improved water" as a common indicator for water supply (Betti, 2011; Harold Lockwood & Smits, 2011). WaterAid (Betti, 2011) uses functionality as an indicator for sustainability in its monitoring system, and conducted a study in Tanzania in 2006 showing time-series data of rural water supply functionality.

However, many assert that a binary "whether there is currently water or not" definition of functionality is not sufficiently nuanced. Lockwood and Smits (2011:61) maintain that basic functionality indicators look just at output, rather than "underlying factors that make a service sustainable or not," and that functionality should be measured over time, providing snapshots of functionality to "give a measure of sustainability." Numerous other studies have also proposed more comprehensive operationalizations of sustainability. Katz and Sara (1998) propose a sustainability index consisting of "physical

condition, consumer satisfaction, O&M practices, financial management, and willingness to sustain the system" (Prokopy, 2005:1083). Isham and Kähkönen (2002) look at quality of construction and satisfaction with service design as measures of project outcomes. Marks et al. (2014) combine approaches from other studies (Davis et al., 2008; Prokopy, 2005) and operationalize sustainability along three dimensions: current infrastructure, quality of water service, and ongoing operation and management of the water point. A more comprehensive measure provides a more accurate estimation of sustainability.

GOVERNANCE

While a number of different factors impact sustainability, a great deal of research has been done on the influence of community-based management, or governance, upon sustainability (Bannon, 2011; E Bisung, Elliott, Schuster-Wallace, Karanja, & Bernard, 2014; Foster, 2013; Isham & Kähkönen, 2002). Community-based management encompasses financial management and maintenance, two important drivers of sustainability, and is currently the most common form of water system governance in sub-Saharan Africa (Foster, 2013; Harvey & Reed, 2004; Harold Lockwood & Smits, 2011; Marks et al., 2014). Responsibilities of community-based operation and maintenance include "tariff setting, revenue collection, and management of maintenance and repairs," as well as participation in planning and construction phases (Foster, 2013:12037). WaterAid (Betti, 2011:13) asserts that research "consistently shows that beneficiary participation was more significant than any other factor in achieving functioning water systems and in building local capacity."

Bannon (2011) outlines four domains of governance: accountability, inclusivity, participation, and transparency. He found that the governance factors most strongly

associated with having highly functional water points were maintenance training, committee existence and operations (consistent meeting and reporting to the community), participation of women, and transparency of roles, elections, bylaws, and general sharing of information. These core governance domains are enforced elsewhere in the literature (Rogers, Hall, & Global Water Partnership, 2003).

Iribarnegaray and Seghezzo (2012) propose a Sustainable Water Governance Index comprised of three categories of indicators: access, planning, and participation. Access encompasses economic accessibility to water, the quantity and quality of freely accessible information about the water system, and whether everybody has enough water to meet basic needs. Planning refers to the management capacity and suitability of the local institutional framework, and participation refers to the degree of involvement of institutional and individual actors (Iribarnegaray & Seghezzo, 2012).

However, there can be problems with shifting the majority of the management responsibility to water users, particularly without adequate external support (Betti, 2011; Harvey & Reed, 2004). Harvey and Reed (2004) describe several problems with this community-led model: it is difficult to replace members of water committees when they die or leave, participation is voluntary and committee members have little incentive to participate in the long term, a lack of trust and accountability causes the community to lose trust in the committee, water point users do not contribute, causing the committee to abandon the project, communication with and support from the implementing organizations (governmental or non-governmental) is lost, and communities are unable to pay for major repairs. This potential for breakdown in community-led management, particularly in the community's participation and support of community management

structures, shows that the social factors contributing to water governance – and therefore sustainability – must be better understood (E Bisung et al., 2014; Iribarnegaray & Seghezzo, 2012; H Lockwood, 2004).

SOCIAL CAPITAL

Social capital is a concept through which to better understand community water system management in the context of development (E Bisung et al., 2014; Elijah Bisung & Elliott, 2014; Isham & Kähkönen, 2002). Social capital has been conceptualized and applied in many disciplines, such as sociology, economics, political science, and now health (Elijah Bisung & Elliott, 2014; Khan, Rifaqat, & Kazmi, 2007). In the context of water and sanitation, it can help explain why communities are willing to collectively organize and manage their water systems (E Bisung et al., 2014; Isham & Kähkönen, 2002; Krishna & Uphoff, 2002)

Three major perspectives spearheaded the conceptualization of social capital, those of Pierre Bourdieu (1986), James Coleman (1988) and Robert Putnam (1993; 1995). Bourdieu (1986) considered relationships, both institutional and informal, as resources that exist to those of the dominant class, which are used to maintain their privilege (Lin, 1999). Bourdieu defines social capital as "the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition—or in other words, to membership in a group—which provides each of its members with the backing of the collectively-owned capital…" (1986:88). Relatedly, in his study of high school students and dropout rates, Coleman highlights three forms of social capital: "obligations and expectations, information channels, and social norms" (1988:S95) to be used as a

resource for action. Furthermore, in his seminal work, *Bowling Alone,* Robert Putnam defines social capital as "features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit" (1995:2). One point in which all perspectives agree is that social capital is a kind of resource that results from membership in social networks or relationships (Elijah Bisung & Elliott, 2014).

Uphoff (2000) distinguishes between two categories of social capital: structural and cognitive. Structural social capital refers to forms of social organization, such as networks, associations, and institutions, as well as the roles, rules, and procedures that govern them (Uphoff, 2000). This form of social capital tends to be relatively objective and externally observable (Grootaert & van Bastelaer, 2002). On the other hand, cognitive social capital refers to "culture and ideology, specifically norms, values, attitudes, and beliefs" (Uphoff, 2000:218), and is generally more subjective and intangible (Grootaert & van Bastelaer, 2002). Structural social capital is thought of as a manifestation of cognitive social capital – people's values and norms about how people should act create expectations for behavior, which then create the mechanisms through which structural capital is manifested (Uphoff, 2000). Both structural and cognitive social capital affect people's behavior either alone or in groups (Uphoff, 2000), which is why both are important to measure.

As part of the structural conceptualization of social capital, Lin (1999) focuses on networks and defines social capital as "resources embedded in a social structure which are accessed and/or mobilized in purposive actions" (35). Within this view, Woolcock (1998) describes the concepts of "bonding" (between family members, friends, and neighbors) and "bridging" (between more distant associates or between communities) social networks, which represent horizontal rather than vertical linkages between people (Khan

et al., 2007). Few studies distinguish between these concepts, however, partially because the definition of what community means is locally constructed and varies in different cultural contexts (Harpham, Grant, & Thomas, 2002).

MEASURING SOCIAL CAPITAL

As there are numerous definitions of social capital, there are varied ways to operationalize the concept. It is generally recognized that in order to incorporate all of the different components of social capital, one must have a sufficiently holistic operationalization (Grootaert, Narayan, Jones, & Woolcock, 2004; Grootaert & van Bastelaer, 2002; Harpham et al., 2002; Isham & Kähkönen, 2002; Krishna & Uphoff, 2002). Many researchers assert that the best way to measure social capital is through a combination of both quantitative and qualitative methods (E Bisung et al., 2014; Grootaert et al., 2004; Krishna & Shrader, 2000). Krishna and Shrader (2000) draw from other studies (Krishna & Uphoff, 1999; Narayan & Pritchett, 1999) and combine a community profile, organizational profile, and a household survey to measure social capital, which has been used in both Panama and India (Harpham et al., 2002). Krishna and Uphoff (2002) assess the observed relationship between social capital measures and development outcomes and evaluate whether social capital can be identified and measured quantitatively. They do so using data from official sources, interviews, and focus group discussions, and create a social capital index that they compare to development outcome variables.

Grootaert et al. developed the Social Capital Assessment Tool (SOCAT), which has been validated and applied in many cultural contexts (E Bisung et al., 2014; Grootaert et al., 2004; Grootaert & van Bastelaer, 2002). It is designed to provide a

conceptual framework that is consistent enough across applications yet flexible enough to allow for cultural variation (Grootaert & van Bastelaer, 2002). Grootaert et al. (2004) assert that at a household level, there are six primary dimensions of social capital: 1) groups and networks, 2) trust and solidarity, 3) collective action and cooperation, 4) information and communication, 5) social cohesion and inclusion, and 6) empowerment and political action.

Another consideration for the conceptualization and measurement of social capital is the scope at which it exists. Grootaert and van Bastelaer (2002) describe micro, meso, and macro level units of observation, as shown in Figure 2. Putnam's (1993) study investigating civic associations in Italy provides an example of social capital at the household (micro) level, which is a common level of conceptualization of social capital (Grootaert & van Bastelaer, 2002). The meso unit of observation refers to horizontal and vertical relations between groups, and the macro level refers to the surrounding institutional and political environment (Grootaert & van Bastelaer, 2002). Therefore, social capital can be measured at the household, community, and organizational level (Grootaert & van Bastelaer, 2002).

A number of studies investigate social capital on the ecological level. As Narayan and Cassidy (2001:60) state, "simply, social capital exists only when it is shared." It follows logically that studies that seek to measure community outcomes should do so at a community level (Krishna & Uphoff, 2002). Krishna and Uphoff recognize that collective action, or working together to achieve a common goal, can occur on many levels.

> "Social capital is produced in the minds of individuals, but roles and networks, rules, procedures, and precedents are social, i.e., collective creations, as are the

norms, values, attitudes, and beliefs associated with and supporting them. Social capital can be understood as aggregated at the village, regional level, or even national level, in terms of the amounts (and effectiveness) of rules, roles, procedures, precedents, networks, norms, attitudes, values, and beliefs conducive to collective action" (Krishna & Uphoff, 2002:122).

This community-level data can either be gathered through aggregating individual data or through direct observation of community characteristics (Harpham et al., 2002). Sampson et al. (1997) measured collective efficacy, which incorporated both social control and social cohesion, and aggregated individual responses to the neighborhood level, which they then analyzed as an ecologic characteristic. Kawachi et al. (1997) followed a similar method, as they aggregated information about social capital and mortality to the state level.

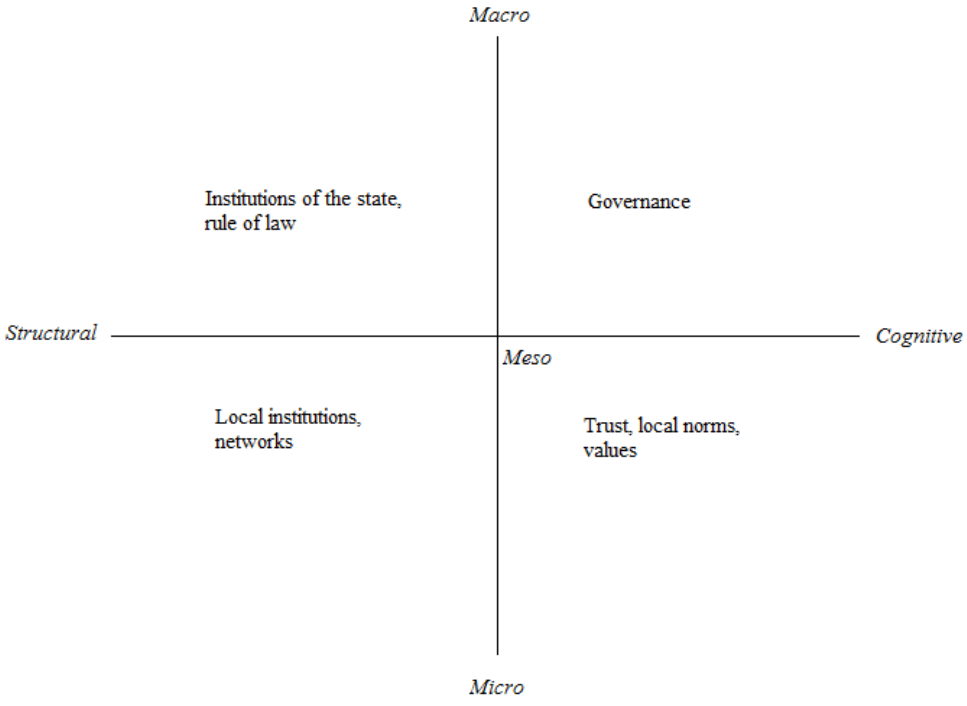


Figure 1.2: The Forms and Scope of Social Capital (Grootaert & van Bastelaer, 2002:4)

SOCIAL CAPITAL AND GOVERNANCE

As previously mentioned, the current model of community governance of water schemes requires a great deal of participation by the community, including choosing the type of scheme, contributing cash and/or labor during construction, and participating in operation and maintenance of the system (E Bisung et al., 2014). This often requires community members to work together, which people are not necessarily inclined to do if there are no clear personal gains, because those who choose not to cooperate with others typically gain in the short run (E Bisung et al., 2014). Social capital helps illuminate why people choose to cooperate collectively, and can be used to ascertain the characteristics that "predispose people to work together for mutual benefit" (Krishna & Uphoff, 2002:100).

Numerous studies have sought to measure social capital as it relates to governance and collective action. Robert Putnam (1993) studied civic engagement and institutional performance in Italy, and found that social capital is a necessary condition for governance. According to Grootaert and van Bastelaer, "participation in local networks and attitudes of mutual trust make it easier for any group to reach collective decisions and implement collective action" (2002:8).

In the context of water supply, Isham and Kähkönen (2002) found that social capital had a positive effect on the design, construction, and maintenance of water supply systems in villages. This effect was particularly strong for piped systems, which require more collective effort and cooperation, showing that social capital was more critical for their success (Isham & Kähkönen, 2002). The prevalence of social networks and community interaction was found to affect the community's ability to write and enforce

rules to manage water and sanitation facilities, and water system performance was influenced by the community's ability to form committees and cooperate with them (Elijah Bisung & Elliott, 2014; Isham & Kähkönen, 2002). Furthermore, Krishna and Uphoff (2002) investigated social capital and collective action to manage watersheds in rural Rajasthan, India and found social capital to be associated with better development outcomes.

The evidence shows that the barriers to water and sanitation access are often social and institutional rather than technical (Elijah Bisung & Elliott, 2014). Accordingly, social capital has started to be applied in the WASH sector (E Bisung et al., 2014; Elijah Bisung & Elliott, 2014), but there remains great potential for further research, as it has not been investigated in the direct context of WASH governance.

RESEARCH QUESTION AND OBJECTIVES

The primary question we will answer through this research is: what is the influence of social capital on water point sustainability in rural Ethiopia? The four objectives of this research are: 1) assess the feasibility of the adapted Social Capital Assessment Tool (SOCAT) to measure social capital in rural Ethiopia, 2) measure social capital in each of the 32 target communities in Ethiopia, 3) quantify if and how social capital influences water committee governance and functionality.

JUSTIFICATION FOR RESEARCH

This research project was part of a collaboration between Emory University (PI: Dr. Matthew Freeman, Assistant Professor of Environmental Health) and the Millennium Water Alliance (MWA). Catholic Relief Services (CRS), a member of the Millennium

Water Alliance, is an international non-governmental organization that has worked in Ethiopia since 1958 and is currently managing five water, sanitation, and hygiene (WASH) projects with a total of $4.8 million in funding (Catholic Relief Services, 2014). Projects include rehabilitating existing water points, building new water points, mobilizing communities to create and manage WASH interventions, and supporting community toilet-slab creation income generating activities. Their projects directly benefit 246,975 people and are implemented in 16 districts in the Tigray, Oromia, Dire Dawa, and Amhara regions (Catholic Relief Services, 2014).

The literature provides numerous examples of social capital being applied to collective action in the context of water projects, but none have explored social capital and community water governance. This research aims to fill that gap. Catholic Relief Services can use the assessment tools, including the social capital survey, governance assessment, and functionality assessment, as part of data collection before, during, and after projects. This will enable us to establish a trend of functionality and governance over time, which will allow us to truly measure sustainability (Grootaert et al., 2004; Harold Lockwood & Smits, 2011). By identifying 1) if social capital is associated with functionality and governance and 2) if the relationship changes over time, CRS and other implementing organizations can incorporate efforts to foster social capital into their programs.

CHAPTER 2: Manuscript

INTRODUCTION

Water Sustainability

Access to water is a basic human right and is essential for human health (Council on Human Rights, 2010). Though the Millennium Development Goal target to "halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation," (UN, 2015) was announced to have been met, 748 million people still lack access to improved drinking water sources. Half of these people are in sub-Saharan Africa and 90% live in rural areas (WHO/UNICEF, 2014). Access to improved water sources in Ethiopia reflects access in the sub-continent at large; as of 2012, 97% of Ethiopia's urban population was using improved drinking water sources, but only 42% of its rural population was using improved drinking water sources (WHO/UNICEF JMP, 2014). While much progress has been made, the lack of access to improved drinking water in rural sub-Saharan Africa remains a critical challenge in the development sector (Harvey & Reed, 2004).

Increasing access to improved water has great potential to improve human health: the World Health Organization (WHO) estimates it would reduce 9.1% of global disease burden and 6.3% of all mortality (Prüss-Üstün et al., 2008). Health impacts include diarrheal disease, malnutrition (Dangour et al., 2013), soil-transmitted helminthes (Strunz et al., 2014), lymphatic filariasis, trachoma (Stocks et al., 2014), and schistosomiasis (Grimes et al., 2015). Diarrheal disease is a leading cause of mortality for children under five; 1 in 10 child deaths result from diarrheal disease (Kotloff et al., 2013). However, for

these health impacts to be achieved, access to microbiologically safe water must be reliably available throughout the year, close in proximity, and in sufficient quantities (Wright, Gundry, & Conroy, 2004).

Sustainability, or the continued functionality of a water system for its intended lifecycle that can provide reliable and safe water, remains one of the key challenges to achieving universal access to safe water (Harold Lockwood & Smits, 2011). Approximately one-third of improved water points in rural sub-Saharan Africa are estimated to be non-functional at any given time, which equates to $1.2 billion – $1.5 billion in investments over 20 years (RWSN, 2010). These coverage rates are particularly low in some areas; in 2009 in the Menaca Region of Mali, 80% of wells were reported to be dysfunctional, and 58% of water points in northern Ghana were shown to need repair (Skinner, 2009).

There are a number of reasons that could explain the sub-optimal sustainability of water supply in rural areas (Foster, 2013; Harvey & Reed, 2004; Montgomery et al., 2009). Many countries face a double burden of maintaining existing water points in addition to expanding coverage to those who have never had access, stretching already limited resources thin and causing coverage rates to stagnate (Harvey & Reed, 2004). Though contextual factors (e.g., institutional policies, spare parts supplies, and the natural environment) are important, the social aspects, including maintenance, cost recovery, management capacity, and monitoring systems are particularly critical to water sustainability (Carter, 1999; Harvey & Reed, 2004; Montgomery et al., 2009). In community-based management approaches, which are the most common management model in rural water supply, the responsibility for cost recovery, managing maintenance, and reporting breakages lies primarily with community water committees (Harvey &

Reed, 2004). While community-based management is associated with more sustainable water points, there can be problems if there is inadequate trust in the committee by water users, inadequate communication with and support from implementing organizations, or inadequate support from the community (Harvey & Reed, 2004).

Community support, particularly a community's ability to organize around and manage their water system, has been shown to be essential to sustainability (Bannon, 2011; E Bisung et al., 2014; Foster, 2013; Isham & Kähkönen, 2002). The community-based governance approach requires a great deal of community input in the planning and construction stages, and charges the community with the responsibility of setting tariffs, collecting revenue, and managing maintenance and repairs (E Bisung et al., 2014; Foster, 2013).

Social Capital and Community Water Management

Social capital is understood in variety of ways, but the literature provides a few central themes: it is a community resource, conceptualized as both the social structure of communities as well as the norms and values by which those communities operate (Bourdieu, 1986; Lin, 1999; Putnam, 1993). Most theorists recognize that social capital includes both structural and cognitive aspects (referring to norms, values, attitudes, and beliefs), and so holistic, multidimensional approaches are necessary to accurately measure it (Grootaert & van Bastelaer, 2002; Uphoff, 2000). Because social capital is a community resource that is created through the beliefs and actions of the members of that community, it can be conceptualized and measured at either the individual or aggregate level (Bourdieu, 1986; Kawachi et al., 1997).

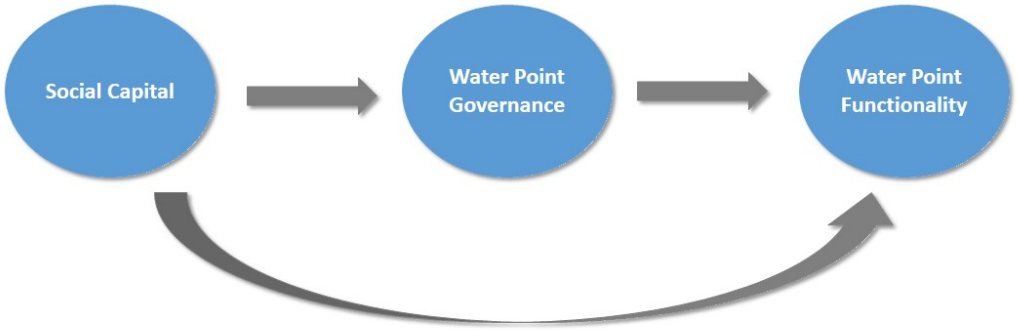
The key domains of social capital, are groups and networks, trust and solidarity, collective action and participation, information and communication, social cohesion and inclusion, and empowerment and political action (Grootaert et al., 2004). As each is important in the conceptualization of social capital, these domains can be combined to form a social capital index, both at the individual level and at the community level (Grootaert et al., 2004). Figure 1 describes topics within each of the social capital domains.

Social capital is essential to development, particularly in the water sector, because of its effect on community social behavior – the prime objective of many development efforts (Isham & Kähkönen, 2002; Khan et al., 2007). Community-based water point governance requires community members to work collectively to achieve a common goal, and the success of community-based approaches to water service delivery is influenced by the social capital that exists in the community (Elijah Bisung & Elliott, 2014). Evidence shows that a community's ability to form committees and cooperate with them affects rural water system performance, and their ability to do so is determined by the social capital present in that community (Isham & Kähkönen, 2002). Because of this, social capital can help us understand which characteristics predispose people to work for mutual benefit and govern their water points effectively (E Bisung et al., 2014; Krishna & Uphoff, 2002).

Figure 2.1: The Six Domains of Social Capital

We conducted a mixed methods study in rural Ethiopia to assess the associations between domains of social capital and water point sustainability. The association between strong governance and increased functionality is well supported in the literature (Bannon, 2011; Foster, 2013; Harvey & Reed, 2004; Harold Lockwood & Smits, 2011; Marks et al., 2014), but the contribution of social capital to this relationship remains unexplored. Figure 2 presents the relationship between social capital, governance, and functionality that we hypothesize. The aims of this study were to 1) assess the feasibility of the adapted Social Capital Assessment Tool (SOCAT) to measure social capital in rural Ethiopia, 2) measure social capital in each of the 32 target communities in Ethiopia, 3) quantify if and how social capital influences water committee governance and functionality.

Figure 2.2: The Hypothesized Social Capital, Governance, and Functionality Causal Pathway

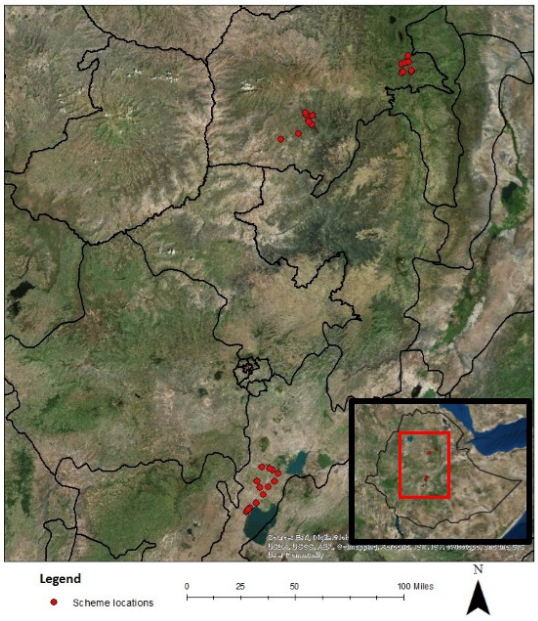


METHODS

Study Setting

This research project was part of a collaboration between Emory University and the Millennium Water Alliance (MWA), a consortium of 12 non-governmental organizations and one research organization that collaborates on projects throughout Africa and Latin America. Catholic Relief Services, a member of MWA, is an implementing non-governmental organization that has worked in Ethiopia since 1958. For our fieldwork, we collaborated with CRS and three of its partner NGOs: Water Action (WA), Team Today and Tomorrow (TTT), and Meki Catholic Secretariat (MCS). This study was conducted in four woredas, or districts, of Ethiopia: Kalu and Kelela in the Amhara

Figure 2.3: Study Sites, Ethiopia



Region, and Dugda and Bora in the Oromia Region. Though all four woredas are rural, the sites in the Amhara Region were generally farther away from the nearest town and more difficult to reach by vehicle than those in the Oromia Region. Most of the water schemes we sampled were MWA-funded schemes, but the government constructed eight or more and other NGOs constructed six schemes. The total number of schemes constructed by the government is unclear because of a lack of construction data for four schemes.

Selection Criteria

These four woredas were purposively chosen based on ongoing program activities of the partner organization. To allow for sufficient variation in functionality indicators, target villages were chosen based on the "functionality status" (as deemed by CRS's partner NGOs) of their primary water schemes; we selected 16 villages with "functional" schemes and 16 villages with "nonfunctional" schemes.

Survey Tool Development

Survey tools were derived from the World Bank's Social Capital Measurement Tool (SOCAT), which we adapted to fit the study setting, along with relevant questions from other sources (Grootaert et al., 2004; Isham & Kähkönen, 2002; Krishna & Uphoff, 2002). Each of the six social capital domains comprised a section of the survey. The survey also included a section asking demographic questions and a section asking questions regarding the community's water point. See Appendix A for an English copy of the tool. The tool was reviewed by CRS Ethiopia staff and adjusted to fit the Ethiopian context. This involved changing the wording of a few questions and removing topics that were deemed too sensitive and controversial.

To assess the feasibility of the adapted Social Capital Measurement Tool (SOCAT) to measure social capital in rural Ethiopia, we piloted the tool extensively before use in the study. The tool had previously been validated in numerous contexts by the developers, and has since been applied in many cultural contexts (E Bisung et al., 2014; Grootaert et al., 2004; Grootaert & van Bastelaer, 2002). It is designed to provide a conceptual framework that is consistent enough across applications yet flexible enough to allow for cultural variation (Grootaert & van Bastelaer, 2002).

We found that survey participants easily understood the survey questions, though the survey enumerators required a brief training in order to understand social capital (as it was a new topic for most) before being able to explain survey questions to participants. We ran descriptive statistics on the social capital indices for each community, woreda, and region to ensure that the tool reflected some degree of homogeneity between areas. The desired homogeneity was supported by the data, as shown in Figures 2.1 and 2.2 and Tables 2.1 and 2.2. We believe that the questions can easily be adapted for use elsewhere.

Data Collection

We conducted 20 surveys in each of 32 villages (n=640) from June to July 2014, evenly split between Amhara and Oromia Regions. In the Amhara Region, households were randomly selected from a list of members of the social unit (or neighborhood) surrounding the water point, which was usually comprised of all water users. In the Oromia Region, households were randomly selected from a list of members of the social unit (neighborhood) surrounding the water point, which generally was comprised of users in the 2-3 closest villages to the water point. The lists were obtained from local government officials or community leaders. The random sampling technique ensured that

we spoke with people at varying distances from the water scheme, and the use of the neighborhood as the sampling unit ensured that data could be aggregated to the community level in a relevant social unit. The enumerators skipped a household if an adult member of the household was not available or if the household refused to participate in the survey.

CRS staff members translated the survey into both Amharic and Oromifa. In the Amhara Region, four enumerators who spoke Amharic administered the survey, and in the Oromia Region, five enumerators who spoke both Amharic and Oromifa administered the survey, usually in Oromifa. The enumerators were trained on survey administration methods, research ethics, confidentiality, and the content of the survey tool. The random sample of households was taken in each village and divided up spatially for each enumerator.

Functionality assessments, which sought to provide a more nuanced version of our "functionality" indicator, were conducted at each water point for a total of 32 assessments. Because this was a cross-sectional study with only one time point for data collection, functionality was used as a proxy for sustainability (Davis et al., 2008; Marks et al., 2014; Prokopy, 2005). For each assessment, we observed the scheme's construction quality and interviewed at least one water committee member about the history of the water point, scheme maintenance, governance practices, financial management, and any additional challenges faced by the committee that they wanted to share. The tool was derived using that which was presented by Alexander et al. (2015). See Appendix B for a copy of the functionality assessment.

As part of the functionality assessment, we collected the GPS coordinates schemes. We used the data in an illustrative way (through a GIS map of the water schemes) rather than as part of our analysis. See Figure 2.3 for a map of water scheme locations.

Data Analysis

Data were collected on paper surveys by trained enumerators and manually entered into Excel 2011. We cleaned the community level data using SAS 9.3 (Cary, NC), and used Stata 13.1 (College Station, TX) for the remainder of the analysis.

To address aim 2, which was to measure social capital in each of the 32 target communities, we created a social capital index for each of the domains by standardizing the data. To standardize, the ordinal binary data was first added together (within each domain) to get counts, and then those counts were standardized with a mean of zero and a standard deviation of one. We treated the ordinal categorical data (such as the Likert scales) as continuous data, which we standardized separately. We then averaged the standardized variables within each domain, giving us an index for each domain. All data were ordinal, and very few variables had to be rescaled to fit the order of the index. To calculate the social capital index, we performed an average of all the social capital domains, weighted by the number of standardized variables comprising each domain, divided by the total number of standardized variables. Indices for functionality and governance were created using the community-level data from the functionality assessments by standardizing the data and then averaging all of the standardized variables. Because functionality was bimodal, we split the continuous functionality index into a binary functional/nonfunctional variable. The functionality index and governance index serve as our outcome variables of interest.

We produced descriptive statistics and figures to illustrate the distribution of social capital between sub-groups of key socio-demographic variables (Table 2.1), including region, woreda, type of scheme, gender, years lived in the village, age, level of education (a proxy for socioeconomic status) household roof material (a proxy for socioeconomic status) and number of people per household. We conducted two sample t-tests and analysis of variance (ANOVA) tests comparing social capital distributions for the sub-categories of the different variables, and variables with significant differences are marked with a star in Table 2.1. We separated age at quartiles, years lived in the community at the mean, and number of people per household at the mean in order to show social capital distributions for different groups.

To address aim 3, which was to quantify if and how social capital influences water committee governance and functionality, the functionality and governance data were used first at the individual level for non-regression analysis, and then aggregated to the community level. This aggregation was done by calculating averages of all indices and covariates of interest for each community. Using the functionality index and the governance indicators, we performed x^2 tests of association and two-sample t-tests to assess the relationship between governance and functionality (Table 2.2). To test the relationship between social capital and functionality, we conducted x^2 tests of association between social capital indicators and functionality (Table 2.3). To investigate the relationship between social capital and governance, we performed ANOVA tests and two-sample t-tests between social capital indicators and governance (Table 2.4).

We performed bivariate logistic regression between the six social capital domain indices and functionality. To assess the relationship between the social capital domain indices and governance, we used bivariate and multivariate linear regression, using

unadjusted models and an adjusted model (Table 2.5). Using the only social capital domain variable (information and communication) that had a significant bivariate association with governance, we ran a multivariate linear regression between information and communication and governance, controlling for years of education, number of people per household, and time lived in the community, all considered common variables to control for in social capital analyses (Harpham et al., 2002).To estimate the association between social capital and governance, controlling for functionality, we used unadjusted and adjusted linear regression models (Table 2.6).

RESULTS

Social Capital Indices

To answer aim 2, which was to measure social capital in each of the 32 target communities, we calculated frequencies of key socio-demographic variables and the distributions of social capital for each sub-category (Table 2.1). The social capital index is normally distributed, as shown in Figure 4, with a mean of -0.3 and a standard deviation of 0.3. Bivariate analysis revealed that all socio-demographic variables, besides household roof material and years lived in the community, had significantly different levels of social capital. Figure 2.5 shows the distributions of social capital in the four woredas.

Table 2.1: Social capital index distribution for select socio-demographic characteristics (n=640)

Socio-demographic variables		N (%)	Social Capital Index Mean (SD)
Region*	Amhara	320 (50.0)	-0.2(0.3)
	Oromia	320 (50.0)	0.1 (0.3)
Woreda*	Kalu	160 (25.0)	-0.3 (0.3)
	Kelela	160 (25.0)	-0.1 (0.3)
	Dugda	160 (25.0)	0.1 (0.3)
	Bora	160 (25.0)	0.1 (0.3)
Type of scheme*	Bore hole	300 (46.9)	0.1 (0.3)
	Gravity spring	140 (21.9)	-0.3 (0.3)
	Shallow well	60 (9.4)	-0.3 (0.3)

	Spot spring	140 (21.9)	-0.1 (0.3)
Gender*	Male	296 (46.5)	0.03 (.4)
	Female	341 (53.5)	-0.1 (0.3)
Age (years)ɣ*	18-30	138 (21.6)	0.03 (0.3)
	30-40	178 (27.8)	0.004 (0.4)
	40-50	154 (24.1)	-0.1 (0.4)
	>50	170 (26.6)	-0.08 (0.4)
Years lived in community (mean = 33 years) °	<33	332 (51.9)	-0.02 (0.3)
	≥33	308 (48.1)	-0.06 (0.3)
Level of education*	No formal education	411 (65.0)	-0.08 (0.3)
	Some primary (<grade 6)	139 (22.0)	0.07 (.4)
	Completed primary (grade 8)	50 (7.9)	-0.1 (.3)
	Completed secondary (grade 12)	28 (4.4)	-0.002 (0.4)
	Tertiary	4 (0.6)	0.1 (.3)
Household roof material	Corrugated iron	379 (59.2)	-0.06 (0.3)
	Wood/mud	4 (0.6)	0.3 (.2)
	Thatch	257 (40.1)	-0.001 (0.4)
Number of people per household (mean =5) °*	1-5	371 (58.0)	-0.1 (0.3)
	More than 5	269 (42.0)	0.06(0.3)

°Break between these values occurred at the mean, following Bisung et al. (2014)

ɣ Break between these values occurred at the median/mean and quartiles (E Bisung et al., 2014)

* These variables have p values <0.05 when comparing social capital values with ANOVA and two-sample t-tests

Figure 2.4: Distribution of Social Capital Index Score by Woreda

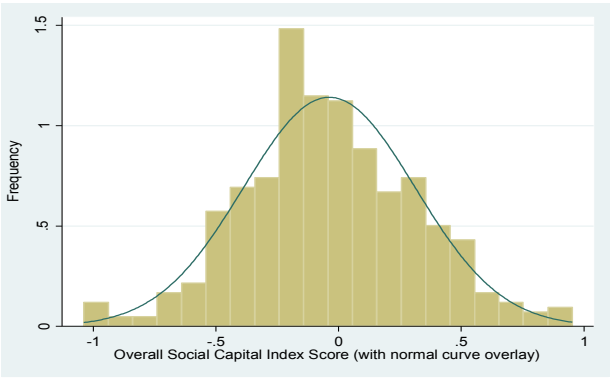
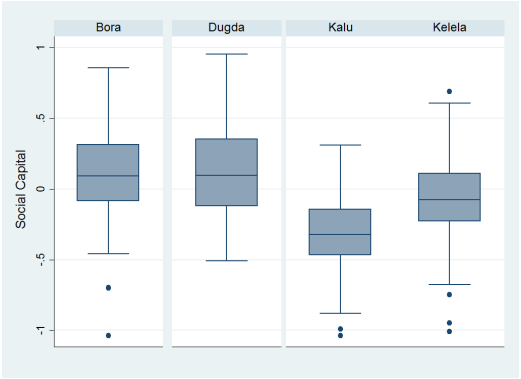


Figure 2.5: Distribution of Social Capital



Social Capital, Functionality, and Governance

To address aim 3, we assessed the relationship between indicators of good water point governance and functionality of the water point (Table 2.2). All governance variables were significantly associated with functionality.

Table 2.2: Associations between Governance Indicators and Functionality Score (n=32)

Water Committee Governance Variables	Yes n (%)	Somewhat n (%)	No n (%)	*Functionality score p value*
Fee charged	19 (59.4)	9 (28.1)	4 (12.5)	<0.001*
Fee covers minor repairs	19 (59.4)	1 (3.1)	12 (37.5)	<0.001*
Fee covers major repairs	3 (9.4)	3 (9.4)	26 (81.3)	<0.001*
Fee has increased in recent years	9 (29.0)	10 (32.3)	12 (38.7)	<0.001*
There is a caretaker/mechanic	22 (68.8)	5 (15.6)	5 (15.6)	<0.001*
Caretaker is compensated	17 (53.1)	5 (15.6)	10 (31.3)	<0.001*
Member of committee or caretaker is trained on how to perform minor repairs	17 (53.1)	1 (3.1)	14 (43.8)	<0.001*
How often are meetings? (specific time, when there is a problem, never)	21 (65.6)	8 (25.0)	3 (9.4)	<0.001*
Women on committee (mean=2.0, SD 1.0)	-	-	-	<0.001^
There is a bank account for committee funds	15 (46.9)	1 (3.1)	16 (50.0)	<0.001*
Committee keeps financial records	27 (84.4)	1 (3.1)	4 (12.5)	<0.001*
There have been external financial audits on water committee records	18 (56.3)	5 (15.6)	9 (28.1)	<0.001*
Overall governance score	-	-	-	0.001^

*p values were calculated using x^2 tests between functionality (yes/no) and governance indicators
^p values were calculated using t-tests between continuous governance variables and binary functionality scores

We evaluated the relationship between indicators of social capital and water point functionality (Table 2.3). The only statistically significant association is between "if you suddenly faced a long-term emergency such as the death of a breadwinner or crop failure, how many people beyond your immediate household could you turn to who would be willing to assist you?" and functionality. This is a component of the groups and networks

domain and measures the strength of one's network, and is essential to social capital because groups and networks are the means through which social capital is accumulated (Grootaert et al., 2004). There is also a weak association between "do you think people should attend meetings and be part of these groups?" and functionality. This question is also a component of groups and networks, and reveals one's beliefs and norms about groups.

Table 2.3: Frequencies and Bivariate Associations between Social Capital Indicators and Scheme Functionality Scores (n=640)

Indicators of Social Capital	Yes *n (%)*	Somewhat *n (%)*	No *n (%)*	*Functionality Score p value**
Participation in community groups has impact	198 (31.3)	206 (32.6)	228 (36.1)	0.34
Trust majority of people in community	547 (87.5)	-	78 (12.5)	0.87
People in community trust each other when it comes to borrowing and lending money	516 (82.4)	-	110 (17.6)	0.20
Believes in ability to change their life course	530 (83.5) ɑ	42 (6.6)	63 (9.9) †	0.50
Can count on neighbors in an emergency	418 (65.7) ɑ	147 (23.1)	40 (6.3)	0.03
People in community would work together if there was a problem with water supply	617 (97.0) ɑ	11 (1.7)	8 (1.3) †	0.81
Proportion of village that commits time or money toward common development goals	571 (89.7) ɑ	46 (7.2)	20 (3.1) †	0.13
People generally unite when a neighbor is in need of help	602 (94.5) ɑ	16 (2.5)	19 (3.0) †	0.77
Majority of community willing to help out others	580 (82.7)	-	46 (7.3)	0.44
More people should attend community meetings	565 (99.6)	-	2 (0.4)	0.057

ɑ Combined highest two scores on Likert scale
† Combined lowest two scores on Likert scale
*p values were calculated using chi square tests of association

We assessed the relationship between social capital indicators and governance (Table 2.4). Trust appears to be the domain most predominantly linked to governance, as two questions – "most people in this village can be trusted (agree/disagree)" and "people

in this village trust each other when it comes to borrowing and lending money" – are significantly associated with governance. The same question that was significantly associated with functionality "if you suddenly faced a long-term emergency such as the death of a breadwinner or crop failure, how many people beyond your immediate household could you turn to who would be willing to assist you?" was significantly associated with governance, which further highlights what this question implies: that this perception and belief in a strong network somehow drives governance.

Table 2.4: Bivariate Associations between Social Capital Indicators and Governance Index Scores (n=640)

Indicators of Social Capital	*Governance Score p value**
Participation in community groups has impact	0.06
Trust majority of people in community	0.04
People in community trust each other when it comes to borrowing and lending money	0.02
Believes in ability to change their life course	0.18
Can count on neighbors in an emergency	0.004
People in community would work together if there was a problem with water supply	0.64
Proportion of village that commits time or money toward common development goals	0.43
People generally unite when a neighbor is in need of help	0.55
Majority of community willing to help out others	0.21
More people should attend community meetings	0.13

*p values were calculated using ANOVA and t-tests

To address aim 3 (to quantify if and how social capital influences water committee governance and functionality) on a community level, we aggregated the social capital data and evaluated the association between the social capital domains and governance (Table 2.5), as well as the association between the social capital domains and functionality. Information and communication was the sole domain that was significantly associated with governance in the unadjusted model, and the association was not present in the adjusted model (comprised of all the domains). We explored the

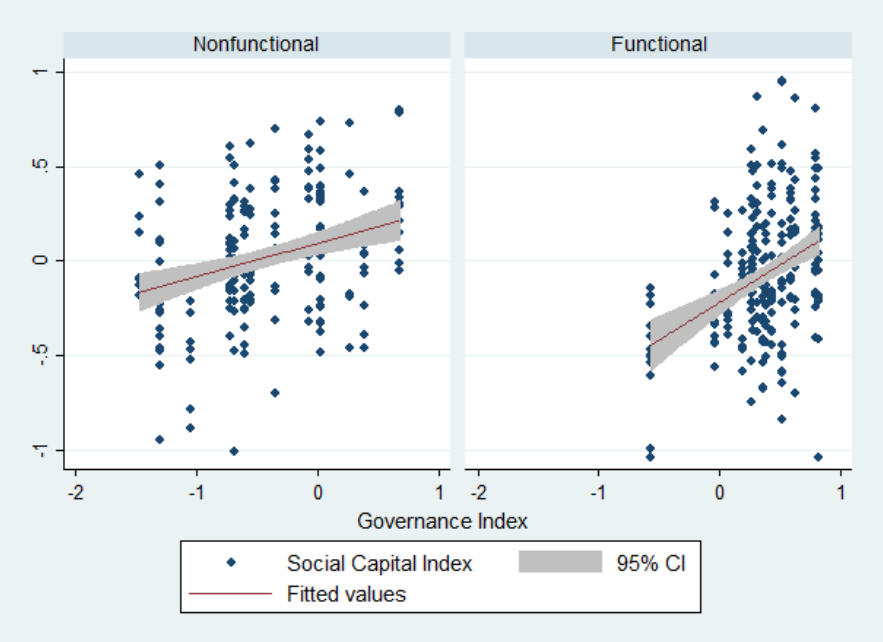
relationship between information and communication and governance further by adjusting for average education level, average number of people in the household, and years lived in the community. Years lived in the community was the only additional covariate that produced a positive significant association ($p<0.05$), meaning that, taken together, information and communication (β: 1.06, CI: 0.43-1.70) and years lived in the community (β: 0.05, CI: 0.004-0.09) show a significant linear relationship with governance. None of the social capital domains had significant associations with functionality.

Table 2.5: Social Capital Domains and Governance Score (n=32)

	Unadjusted model		Adjusted model	
Social Capital Domains	*Beta coefficient*[a]	*CI (95%)*	*Beta coefficient*[a]	*CI (95%)*
Groups and Networks	0.45	(-1.29-2.20)	0.12	(-2.35-2.59)
Collective Action and Cooperation	0.59	(-0.54-1.72)	0.36	(-0.91-1.63)
Trust and Solidarity	0.10	(-0.94-1.14)	-0.82	(-2.38-0.73)
Information and Communication	*0.60	(0.10-1.09)	0.79	(-0.07-1.66)
Social Cohesion and Inclusion	0.67	(-0.79-2.13)	-0.12	(-1.98-1.75)
Empowerment and Political Action	0.48	(-0.24-1.21)	-0.05	(-1.18-1.08)
Overall Social Capital Score	0.89	(-0.21-1.98)	-	-

[a]Beta coefficients were calculated using simple linear regression for the unadjusted model, and using multiple linear regression for the adjusted model, which included all domains of social capital
*Indicates a p value of <0.05

Figure 2.6: Association between social capital and governance, by functionality status



To estimate the relationship between social capital and governance, we first evaluated the relationship between social capital on governance, and the Beta coefficient was not significant (Table 2.6). When we controlled for functionality, both coefficients were positively associated with governance and significant (Table 2.6). Figure 2.6 also shows a positive relationship between social capital and governance, separated by functionality status. The different slopes of the lines suggest a positive relationship between social capital and governance, as mediated by functionality.

Table 2.6: Social Capital and Governance, Unadjusted and Adjusted for Functionality

	Unadjusted model		Adjusted model	
	Beta coefficient[a]	*CI (95%)*	*Beta coefficient*[a]	*CI (95%)*
Social Capital Index	0.89	(-0.21-1.98)	*1.41	(0.63-2.18)
Functionality Index	-	-	*0.90	(0.58-1.21)

[a]Beta coefficients were calculated using simple linear regression for the unadjusted model, and using multiple linear regression for the adjusted model, which included the social capital index and the functionality index
*Indicates a p value of <0.001

DISCUSSION

We investigated the associations between six domains of social capital and water point sustainability. The World Bank social capital tool was well adapted to measure social capital in the Ethiopian context, and showed the variation in social capital within key socio-demographic variables. Our data supported a clear positive relationship between governance and functionality, and a number of social capital domains were significantly associated with governance: groups and networks, trust, and information and communication. Because the variables were standardized and the numbers presented only relative meaning, we did not attempt to quantify the exact magnitude of the associations. We did not find evidence of a clear association between social capital and functionality, which may be due to small sample size, imprecise measures of functionality and social capital, limitations of our study design, or myriad other factors that influence functionality independent of social capital.

A number of social capital domains were significantly associated with governance. Groups and networks, and specifically social network strength, has been shown to have an effect on the ability of communities to organize and effect change (Grootaert et al., 2004; Isham & Kähkönen, 2002; Lin, 1999). This demonstrates that communities with stronger networks may be better able to govern their water points, which may be attributed to their ability to organize, their desire to work together toward a common goal, or other factors (E Bisung et al., 2014; Krishna & Uphoff, 2002).

Trust was another domain of social capital that was shown to be significant in the analysis. Trust in community groups has been studied widely in the social capital literature, and breakdowns in trust of water committees have been shown to be major

impediments to effective community governance of water points (Betti, 2011; Harpham et al., 2002; Krishna & Shrader, 2000). Trusting each other with borrowing and lending money is a belief that may show a predisposition in the community to trust the water committee in its handling of funds, thus making the water users more inclined to pay user fees. Trust and transparency in managing bodies have been shown to be incentives for water user participation (Harvey & Reed, 2004)

Information and communication was also shown to be important for governance, and is recognized in the literature as critical to water sustainability (Montgomery et al., 2009). Effective demand for water services and repairs requires facilitation by communication networks, often hindered by a lack of telecommunication infrastructure in rural areas (Montgomery et al., 2009). This isolation prevents effective communication between water committee members and those to whom they wish to report technical issues, namely government water offices and other providers (Harvey & Reed, 2004; Montgomery et al., 2009). Few formal incentives exist for service providers to maintain sufficient contact with water users after the completion of projects, which is an important challenge to overcome (Carter, 1999; Montgomery et al., 2009).

We have begun to demystify the relationship between social capital, water governance, and water point functionality. Governance's significant association with functionality confirms our assumptions that governance directly relates to functionality (Bannon, 2011; E Bisung et al., 2014; Foster, 2013; Isham & Kähkönen, 2002). The significant associations reinforce that the governance practices included in the analysis are linked to functional water schemes, which has great programmatic implications. We have shown the relationship between different domains of social capital and governance.

Therefore, social capital is positively associated with governance, which is positively associated with functionality, yet through our analysis we were unable to determine a direct positive association between social capital and functionality. We hypothesize that this is due to functionality being further down the causal pathway from social capital (Figure 2.7), and that governance, therefore, is the essential link between the two constructs. This is logical, as governance is the social component of water point sustainability (Bannon, 2011; Betti, 2011; E Bisung et al., 2014; Harvey & Reed, 2004; Iribarnegaray & Seghezzo, 2012; H Lockwood, 2004). However, this lack of association between social capital and functionality also may have been a limitation of our study design, as we were only considering 32 community-level data points in this section of the analysis, which may have provided inadequate power to detect an association.

Figure 2.7: The Observed Social Capital, Governance, and Functionality Causal Pathway

Strong community-based governance of water points in rural sub-Saharan Africa has been shown to determine functionality, a finding that was supported by our data (Bannon, 2011; E Bisung et al., 2014; Foster, 2013; Isham & Kähkönen, 2002). This study investigated the characteristics of the study communities by assessing community members' beliefs and norms and how they manifest in social behaviors. Community governance involves a great deal of participation by the community, and therefore these

norms and behaviors surrounding community participation are essential to understand (Elijah Bisung & Elliott, 2014; Krishna & Uphoff, 2002).

The notion of building social capital is controversial (Grootaert et al., 2004; Khan et al., 2007), and we did not investigate the determinants of social capital in this analysis, which would inform any effort to build social capital. Khan et al. (2007) assert that in order to be able to harness and guide social capital, it must first be present to some degree in the community. The role of institutions that may be interested in harnessing community social capital can do so by "building on the trust, social ties, and solidarity already present in communities" (Khan et al., 2007). This can involve promoting participatory development methods, and in the context of rural water supply, participatory planning and monitoring efforts (Khan et al., 2007; H Lockwood, 2004).

Limitations

There are a number of limitations to this study. It was a cross-sectional study, occurring at only one point in time, and we were therefore unable to measure sustainability, instead using functionality as a proxy for sustainability. The functionality and governance assessments were not sufficiently nuanced, as they did not enable us to investigate which governance practices occurred before breakage, which biased the governance results for those points that were nonfunctional. For example, if there was no fee currently charged, the answer that there was "no fee" was recorded, and did not take into account if there had once been a fee when the point had been functional. Also, some water points were currently being rehabilitated, or were planning to be rehabilitated, which we were not able to incorporate into our measurement of functionality or governance.

The number of communities (32) limited our ability to include multiple covariates, which left us unable to properly adjust for other covariates, such as socioeconomic status or years lived in village. The lack of associations in the adjusted models can likely be explained by the lack of parsimony of the model in comparison to the number of data points – the aggregated analysis was at the community level, therefore including only 32 data points and limiting the number of covariates that can reasonably be included in the model.

Since some aspects of social capital were significantly associated with governance only at the indicator level rather than at the domain level, a more nuanced analysis method, such as factor analysis or principal component analysis (PCA), is recommended for the future – the effects of the significant social capital indicators may have been diluted by their inclusion in a non-parsimonious index, which included all social capital indicators at equal weights rather than discerning between how much different indicators contribute to the variance, and weighting the indicators accordingly within an index. We were unable to employ PCA for this analysis because of the nature of our variables. Aggregating our data to the community level also may have contributed to the masking of an association. However, despite performing ecological level analyses, we did not have cross-level bias since we avoiding making inferences about individuals based on ecological data (Kawachi et al., 1997).

There were also external factors that may have confounded the relationship between social capital, water governance, and functionality. The availability of other sources was not taken into account, which may have influenced community members' incentives to effectively govern the water point of interest. In addition, other external

factors such as the availability of spare parts and government responsiveness were not considered, though we recognize that they have a major influence on whether community governance can effectively achieve functionality (Harold Lockwood & Smits, 2011; Oyo, 2006)

In the future, a more nuanced method of measuring functionality and governance should be used, and individual-level questions about community governance outcomes should be asked in order to have adequate statistical power to perform more in-depth analyses on the individual level. Ideally, the number of communities would be large, but this is infeasible because of the cost of transport in rural Ethiopia.

CONCLUSION

We were able to measure social capital in rural Ethiopia with the social capital tool, and we showed variation between communities, woredas, and regions. We were able to establish several significant associations between social capital domains and water point governance, particularly groups and networks, trust, and information and communication, which can help inform water development policy. We showed a clear positive relationship between governance and functionality, a finding reinforced by the literature (Bannon, 2011; E Bisung et al., 2014; Foster, 2013; Isham & Kähkönen, 2002). This study is a first step in the conceptualization and measurement of social capital and water sustainability, and provides a useful base for future research. The social capital tool can be used in many ways: it can be administered at baseline prior to launching a project, then used as part of monitoring and evaluation data collection efforts to establish a trend over time (Grootaert et al., 2004). Only then will we be able to truly measure social capital's effect on water point sustainability, and subsequently improve sustainability by

harnessing and guiding the aspects of social capital that are most relevant for sustainability, and ultimately, human health.

CHAPTER 3: Public Health Implications

FOSTERING SOCIAL CAPITAL

Understanding social capital has great potential to impact human health, particularly in the WASH sector (Elijah Bisung & Elliott, 2014; Harpham et al., 2002; Isham & Kähkönen, 2002). Social capital is a determinant of why people work for collective benefit, and it therefore has great implications for development (Isham & Kähkönen, 2002; Khan et al., 2007). Creating social capital is controversial because it is complex, and is heavily influenced by external social, political, and cultural factors, as well as the economic climate (Grootaert et al., 2004). However, social capital can be harnessed and guided if it is already present in a community by building on existing norms and social ties (Khan et al., 2007).

Institutions can harness social capital in many means. One is participatory development, a method that empowers communities and relies on local expertise (Khan et al., 2007). In the WASH sector, this can be done through participatory planning, construction, and monitoring, all methods that have been shown to be associated with sustainability (Harold Lockwood, Bakalian, & Wakeman, 2003; Marks et al., 2014; Rogers et al., 2003). Community participation is associated with positive project outcomes, and therefore contributions from as many households as possible should be encouraged (Prokopy, 2005). Another avenue through which one can harness social capital is by the formation of groups, which can encourage structural social capital (Khan et al., 2007).

APPLICATION OF FINDINGS

So how can these methods be applied in the context of this study? Groups and networks, trust, and information and communication were all shown to be significantly associated with governance. To influence the groups and networks domain, projects can encourage the formation of water committees in order to increase the structural social capital of the community (Kahkonen, 1999). Establishing operational rules and norms for those committees can also contribute to social capital (Kahkonen, 1999). If community trust in the water committee is an issue, the committee can be trained in transparency and good financial management practices (Harvey & Reed, 2004). If communication is an issue, projects can make an effort to improve communication with water committees in all stages of the project. For example, if committee members feel that they are not adequately able to report breakages after construction, projects can try to improve decentralized reporting mechanisms (Harold Lockwood & Smits, 2011). Further research would need to be done on how each of these domains uniquely manifest in the communities of interest before any efforts to influence them.

These actions target community support of water committees by influencing their norms and behaviors regarding collective action. Governments and implementing organizations can work to harness and guide social capital as part of broader projects and development efforts. Ultimately, social capital's influence on water governance is an important component of what drives water sustainability.

REFERENCES

Alexander, K., Tesfaye, Y., Dreibelbis, R., Abaire, B., & Freeman, M. (2015). Governance and functionality of community water schemes in rural Ethiopia. *International Journal of Public Health*.

Bannon, B. (2011). *Assessing Water Point Sustainability through Community Governance in Ethiopia, Uganda and Mozambique*. *WATER+*. Atlanta, GA: CARE.

Betti, W. M. (2011). Sustainability framework, 40.

Bisung, E., & Elliott, S. (2014). Toward a social capital based framework for understanding the water-health nexus. *Social Science & Medicine*, *108*, 194–200.

Bisung, E., Elliott, S. J., Schuster-Wallace, C. J., Karanja, D. M., & Bernard, A. (2014). Social capital, collective action and access to water in rural Kenya. *Soc Sci Med*, *119*, 147–154. http://doi.org/10.1016/j.socscimed.2014.07.060

Bourdieu, P. (1986). The Forms of Capital. In J. E. Richardson (Ed.), *Handbook of Theory for Sociology of Education*. New York: Greenwood Press.

Brundtland, G. H. (1987). Report of the World Commission on Environment and Development : Our Common Future, 1–300.

Carter, R. C. (1999). Impact and Sustainability of Community Water Supply and. *Water*, *13*(August), 292–296.

Catholic Relief Services. (2014). Ethiopia Programs: Water and Sanitation. Retrieved from http://crs.org/countries/ethiopia

Clasen, T. F. (2012). Millennium Development Goals water target claim exaggerates achievement. *Tropical Medicine and International Health*, *17*(10), 1178–1180. http://doi.org/10.1111/j.1365-3156.2012.03052.x

Coleman, J. S. (1988). Social Capital in the Creation of Human Capital. *American Journal of Sociology*, *94*(1988), S95. http://doi.org/10.1086/228943

Council on Human Rights. (2010). *Resolution 64/292 - The human right to water and sanitation*.

Dangour, A., Watson, L., Cumming, O., Boisson, S., Velleman, Y., Cavill, S., … Uauy, R. (2013). Interventions to improve water quality and supply , sanitation and hygiene practices , and their effects on the nutritional status of children (Protocol), (8).

Davis, J., Lukacs, H., Jeuland, M., Alvestegui, A., Soto, B., Lizárraga, G., … Wakeman, W. (2008). Sustaining the benefits of rural water supply investments: Experience from Cochabamba and Chuquisaca, Bolivia. *Water Resources Research*, *44*, 1–14. http://doi.org/10.1029/2007WR006550

Foster, T. (2013). Predictors of sustainability for community-managed handpumps in sub-saharan Africa: Evidence from Liberia, Sierra Leone, and Uganda. *Environmental Science and Technology*, *47*, 12037–12046. http://doi.org/10.1021/es402086n

Grimes, J. E., Croll, D., Harrison, W. E., Utzinger, J., Freeman, M. C., & Templeton, M. R. (2015). The roles of water, sanitation and hygiene in reducing schistosomiasis: a review. *Parasites & Vectors*, *8*(1), 1–16. http://doi.org/10.1186/s13071-015-0766-9

Grootaert, C., Narayan, D., Jones, V. N., & Woolcock, M. (2004). *Measuring Social Capital: An Integrated Questionnaire* (Vol. Working Pa). Washington, D.C.: World Bank.

Grootaert, C., & van Bastelaer, T. (2002). *Understanding and Measuring Social Capital*. Washington, D.C.: The International Bank for Reconstruction and Development/The World Bank.

Harpham, T., Grant, E., & Thomas, E. (2002). Measuring social capital within health surveys: key issues. *Health Policy and Planning*, *17*(1), 106–111.

Harvey, P. a, & Reed, R. a. (2004). Rural water supply in Africa: Building blocks for handpump sustainability. *Water, Engineering, and Development Centre (WEDC)*, 1–316. Retrieved from papers2://publication/uuid/910B95D2-BED6-4E16-A1FE-AAE027B9C5D2

Iribarnegaray, M. A., & Seghezzo, L. (2012). Governance, sustainability and decision making in water and: Sanitation management systems. *Sustainability*, *4*, 2922–2945. http://doi.org/10.3390/su4112922

Isham, J., & Kähkönen, S. (2002). How do participation and social capital affect community-based water projects? Evidence from Central Java, Indonesia. In *The Role of Social Capital in Development* (pp. 155–187). United Kingdom: International Bank for Reconstruction and Development.

Kahkonen, S. (1999). *Does Social Capital Matter in Water and Sanitation Delivery?* Washington, DC.

Katz, T., & Sara, J. (1998). World Bank Supply Sustainable : Recommendations from a Global Study Making Rural Water Supply Sustainable : Recommendations from a Global Study, 1–8.

Kawachi, I., Kennedy, B. P., Lochner, K., & Prothrow-Stith, D. (1997). Social Capital, Income Inequality, and Mortality. *American Journal of Public Health*, *87*(9), 1491–1498.

Khan, S. R., Rifaqat, Z., & Kazmi, S. (2007). *Harnessing and Guiding Social Capital for Rural Development*. New York: Palgrave Macmillan.

Kotloff, K. L., Nataro, J. P., Blackwelder, W. C., Nasrin, D., Farag, T. H., Panchalingam, S., … Levine, M. M. (2013). Burden and aetiology of diarrhoeal disease in infants and young children in developing countries (the Global Enteric Multicenter Study, GEMS): A prospective, case-control study. *The Lancet*, *382*, 209–222. http://doi.org/10.1016/S0140-6736(13)60844-2

Krishna, A., & Shrader, E. (2000). *Cross-Cultural Measures of Social Capital: A Tool and Results from India and Panama*. *Social Capital Initiative*. World Bank.

Krishna, A., & Uphoff, N. (2002). Mapping and measuring social capital through assessment of collective action to conserve and develop watersheds in Rajasthan, India. In *The Role of Social Capital in Development* (pp. 85–124). United Kingdom: International Bank for Reconstruction and Development .

Lin, N. (1999). Building a Network Theory of Social Capital. http://doi.org/10.1108/14691930410550381

Lockwood, H. (2004). Scaling up community management of rural water supply. *Scaling up Community Management of Rural Water …*, (March). Retrieved from http://bases.bireme.br/cgi-bin/wxislind.exe/iah/online/?IsisScript=iah/iah.xis&src=google&base=REPIDISCA&lang=p&nextAction=lnk&exprSearch=19179&indexSearch=ID

Lockwood, H., Bakalian, A., & Wakeman, W. (2003). Assessing Sustainability in Rural Water Supply: The Role of Follow-Up Support to Communities (draft), 63.

Lockwood, H., & Smits, S. (2011). *Supporting Rural Water Supply*. (IRC International Water and Sanitation Centre and Aguaconsult, Ed.). Practical Action Publishing.

Marks, S. J., Komives, K., & Davis, J. (2014). Community participation and water supply sustainability: evidence from handpump projects in rural Ghana. *Journal of Planning Education and Research*, 1–11. http://doi.org/10.1177/0739456X14527620

Montgomery, M. a., Bartram, J., & Elimelech, M. (2009). Increasing Functional Sustainability of Water and Sanitation Supplies in Rural Sub-Saharan Africa. *Environmental Engineering Science*, *26*(5), 1017–1023. http://doi.org/10.1089/ees.2008.0388

Narayan, D., & Cassidy, M. F. (2001). A Dimensional Approach to Measuring Social Capital: Development and Validation of a Social Capital Inventory. *Current Sociology*, *49*(2), 59–102. http://doi.org/10.1122/1.548947

Narayan, D., & Pritchett, L. (1999). Cents and Sociability: Household Income and Social Capital in Rural Tanzania. *Economic Development and Cultural Change*, *47*(4), 871–897. http://doi.org/10.1086/452436

Oyo, A. (2006). *Spare part supplies for handpumps in Africa: success factors for sustainability*. (M. Stanford, Ed.)*Rural Water Supply Series*. Water and Sanitation Programme.

Parry-Jones, S., Reed, R., & Skinner, B. H. (2001). Sustainable Handpump Projects in Africa: A Literature Review. *Water, Engineering, and Development Centre (WEDC)*, 1–49.

Prokopy, L. S. (2005). The relationship between participation and project outcomes: Evidence from rural water supply projects in India. *World Development*, *33*(11), 1801–1819. http://doi.org/10.1016/j.worlddev.2005.07.002

Prüss-Üstün, A., Bos, R., Gore, F., & Bartram, J. (2008). Safer Water, Better Health: Costs, benefits, and sustainability of interventions to protect and promote health. Geneva, Switzerland: WHO.

Putnam, R. (1993). *Making Democracy Work: Civic Traditions in Modern Italy*. Princeton, NJ: Princeton University Press. Retrieved from http://books.google.com/books?hl=en&lr=&id=gKZP8_Tp27UC&oi=fnd&pg=PP1&dq=putnam+civic+engagement+italy&ots=5o6FpHeI-R&sig=bckz0suSU3C-p4jZE6AgU4rte9I#v=onepage&q&f=false

Putnam, R. (1995). Bowling Alone: America's Declining Social Capital. *Journal of Democracy*, *6*(1).

Rogers, B. P., Hall, A. W., & Global Water Partnership. (2003). *Effective Water Governance*. *Water*. http://doi.org/91-974012-9-3

RWSN. (2010). *Myths of the Rural Water Supply Sector* (Vol. RWSN Persp).

Sampson, R. J., Raudenbush, S. W., & Earls, F. (1997). Neighborhoods and violent crime: a multilevel study of collective efficacy. *Science (New York, N.Y.)*, *277*(5328), 918–924. http://doi.org/10.1126/science.277.5328.918

Skinner, J. (2009). *Where every drop counts: tackling rural Africa's water crisis* (Vol. December). Retrieved from www.iied.org/pubs/display.php?o=17077IIED

Stocks, M. E., Ogden, S., Haddad, D., Addiss, D. G., McGuire, C., & Freeman, M. C. (2014). Effect of Water, Sanitation, and Hygiene on the Prevention of Trachoma: A Systematic Review and Meta-Analysis. *PLoS Medicine*, *11*(2). http://doi.org/10.1371/journal.pmed.1001605

Strunz, E. C., Addiss, D. G., Stocks, M. E., Ogden, S., Utzinger, J., & Freeman, M. C. (2014). Water, Sanitation, Hygiene, and Soil-Transmitted Helminth Infection: A Systematic Review and Meta-Analysis. *PLoS Medicine*, *11*(3). http://doi.org/10.1371/journal.pmed.1001620

UN. (2015). We Can End Poverty: Millennium Development Goals and Beyond 2015. Retrieved from http://www.un.org/millenniumgoals/environ.shtml

UNICEF/WHO. (2012). Millennium Development Goal drinking water target met. Retrieved from

http://www.who.int/mediacentre/news/releases/2012/drinking_water_20120306/en/

United Nations Conference on Environment and Development. (1992). Earth Summit, Agenda 21. *Reproduction*, (June), 351. http://doi.org/10.1007/s11671-008-9208-3

Uphoff, N. (2000). *Understanding Social Capital: Learning from the Analysis and Experience of Participation*. The World Bank. Retrieved from http://books.google.com/books?hl=en&lr=&id=6PZ8bvQQmxEC&oi=fnd&pg=PA215&dq=uphoff+2000+Understanding+Social+Capital:+Learning+from+the+Analysis+and+Experience+of+Participation&ots=EHkhCjfNYn&sig=tT9Gm9761BtbAoMhd3GMPBe0oo0#v=onepage&q&f=false

WHO/UNICEF. (2014). *Progress on Drinking Water and Sanitation: 2014 Update*.

WHO/UNICEF JMP. (2014). *Ethiopia: estimates on the use of water sources and sanitation facilities (1980-2012)*.

WHO/UNICEF JMP. (2015). Improved and unimproved water and sanitation facilities. Retrieved from http://www.wssinfo.org/definitions-methods/watsan-categories/

Woolcock, M. (1998). Social Capital and Economic Development : Toward a Theoretical Synthesis and Policy Framework Social capital and economic development : Toward a theoretical synthesis and policy framework. *Theory and Society*, *27*, 151–208.

World Bank. (2014). Ethiopia. Retrieved from http://data.worldbank.org/country/ethiopia

Wright, J., Gundry, S., & Conroy, R. (2004). Household drinking water in developing countries: A systematic review of microbiological contamination between source and point-of-use. *Tropical Medicine and International Health*, *9*(1), 106–117. http://doi.org/10.1046/j.1365-3156.2003.01160.x

APPENDICES

APPENDIX A

June/July 2014

Social Capital Household Survey **HOUSEHOLD ID: ___ ___ - ___ ___** *(Place ID on EVERY PAGE)*

Household Identification
Woreda: _____ **Kebele**: _____ **Village:** _____
Scheme *:* _____
Date of survey (dd/mm/yyyy) |____|____||____|____|**|_2_|_0_| _1_|_4 |**
Enumerator _____ Enumerator CODE: |____|____|

➡ *IMPORTANT NOTE TO ENUMERATOR: The desired and preferred respondents are household members (male or female) over age 18. You must talk to a person 18 years of age or older.*

➡ *IMPORTANT NOTE TO ENUMERATOR: Please get CONSENT BEFORE you start filling in the questionnaire*

Hello, my name is _____. I am working for Catholic Relief Services and Emory University. We are doing a survey to learn more about social networks in this village and district. Your household has been randomly chosen to participate in this study. The survey is a confidential exercise and your name will not be disclosed anywhere. Please feel free to answer these questions as they will help in future village development and will help improve water scheme sustainability. The survey will take about 25 minutes, and I will minimize the time that it

takes because I know you have a lot to do. Participation is absolutely voluntary and that you can stop at any time. Would you be willing to have a discussion with me?

***If YES**, mark 01 here to acknowledge that consent for respondent was given.* |___|___|

***If NO** consent, or if eligible person over age 18 is not at home, mark it in your "survey ID tracking form" and go the next household on the list.*

1. RESPONDENT "I would like to first learn about you."		
1.01	*OBSERVE:* Gender of respondent	0. Male 1. Female
1.02	Age of respondent *(If age is unknown, approximate through past events)*	|___|___| years
1.03	Who is the head of this household?	1. Myself 2. Husband or Father 3. Wife or Mother 4. Another man 5. Another woman
1.04	What is the marital status of the head of this household?	1. Married 2. Single 3. Widowed 4. Divorced/ separated 5. Other
1.05	How long have you lived in this village?	|___|___| years
1.06	Do you own your home?	0. No 1. Yes
1.07	What is your level of education?	1. No formal education 2. Some primary (< grade 6) 3. Completed primary (Grade 8) 4. Completed secondary (Grade 12) 5. Tertiary
1.08	What is your occupation?	1. Farmer 2. Trade 3. Handcrafts 4. Other
1.09	What is your ethnicity?	1. Amhara 2. Oromo 3. Other: |_____|

2. HOUSHOLD COMPOSITION AND CHARACTERISTICS "I would like to ask you about composition of this household, both male and female, and the characteristics of the household."		
2.01	How many adults 18 years or older usually	Adults: |___|___|

	live in this household?	
2.02	How many children age 5-17 years old usually live in this household?	Children 5-17: |___|___|
2.03	How many children under 5 years old usually live in this household?	Children < 5: |___|___|
2.04	In your household, is/are there…	***Read out all responses. Circle all that apply.*** 1. Electricity 2. One or more radios 3. One or more televisions 4. One or more bicycles 5. One or more motorcycles, scooters 6. One or more cars, trucks 7. One or more telephones 8. One or more electric mitads 9. One or more kerosene lamps, pressure lamps 10. One or more beds, tables 11. One or more cattle, camels 12. One or more horses, mules, donkeys 13. One or more sheep, goats
2.05	Do any of the members of your household own…	***Read out all responses. Circle all that apply.*** 1. A house 2. Crop land 3. Cash crops
2.06	Do the members of your household work their own or family's agricultural land?	0. No 1. Yes
2.07	What is the principal source of drinking water for your household?	***DO NOT list -- wait for respondents to answer. Choose one.*** 1. Piped water in dwelling 2. Piped water outside dwelling 3. Piped water in public faucet 4. Well in dwelling 5. Covered well 6. River, canal, surface water 7. Open spring 8. Rainwater 9. Other
2.08	What is the principal type of fuel for cooking used by your household?	***Choose one.*** 1. Electricity 2. Gas 3. Biogas 4. Kerosene 5. Charcoal 6. Wood 7. Dung, manure 8. Other
2.09	What is the principal type of toilet facility used by your household?	***Choose one.*** 1. Private flush toilet 2. Private latrine 3. VIP latrine

		4. Bush, field as latrine
2.10	What is the principal material used for the floors in your household?	***Choose one.*** 1. Dirt, sand, dung 2. Cement 3. Wood plank 4. Parquet, polished wood 5. Bamboo, reed 6. Vinyl, asphalt 7. Tiles 8. Carpet 9. Other
2.11	What is the principal material used for the roof of your household?	***Choose one.*** 1. Corrugated iron 2. Cement, concrete 3. Wood and mud 4. Thatch 5. Bamboo, reed 6. Plastic sheet 7. Mobile roof of nomads 8. Other
2.12	How many people stay in your house?	|___|___| *(number of people)*

3. GROUPS AND NETWORKS "I would like to start by asking you about the **groups or organizations, networks, associations** to which you or any member of your household belong. These could be **formally organized groups** or just **groups of people who get together *regularly* to do an activity or talk about things**."**		
3.01	Of how many such groups are you or any one in your household a member?	|___|___| *(If NONE → **Skip to Question 3.10**)*
3.02	Of all these groups to which you or members of your household belong, which one is the most important to your household?	| _____ | *(name of group)*
3.03	What type of group is this?	***Only list if respondent needs prompting. Choose ONE.*** 1. Farmers' group 2. Traders' association/business group 3. Cooperative 4. Women's group 5. Credit/finance group (formal) 6. Politial group 7. Youth group 8. Religious group

		9. Cultural association/Edir 10. Neighborhood/village association 11. Parent group 12. School committee 13. Health committee 14. Water/waste 15. Sports group 16. Civic group 17. NGO 18. Professional association 19. Trade union 20. Other		
3.04	How many times in the past 12 months did anyone in this household participate in this group's activities, e.g. by attending meetings or doing group work?	|___|___| *(number of times)*		
3.05	Are most of your neighbors members of the group and/ or another group?	0. No 1. Yes		
3.06	Do you think that more people **should** attend meetings and be part of these groups?	0. No 1. Yes		
3.07	Thinking about the members of **this group**, are most of them of the same….	**3.07.1** Religion? 0. No 1. Yes	**3.07.2** Gender? 0. No 1. Yes	**3.07.3** Linguistic background? 0. No 1. Yes
3.08	Do members mostly have the same…	**3.08.1** Occupation? 0. No 1. Yes	**3.08.2** Educational level? 0. No 1. Yes	
3.09	Does this group work with or interact with groups **outside** the village?	0. No 1. Yes, occasionally 2. Yes, frequently		
3.10	About how many **close friends** do you have these days? These are people outside your extended family that you feel at ease with, can talk to about private matters, or call on for help.	|___|___| *(number of close friends)*		

3.11	If you suddenly needed to borrow a small amount of money (enough to pay for expenses for your household for one week), <u>are there people beyond your immediate household and close relatives</u> to whom you could turn and who would be willing and able to provide this money?	1. Definitely not 2. Probably not 3. Unsure 4. Probably 5. Definitely
3.12	If you suddenly had to go away for a day or two, could you count on your neighbors to take care of your children?	1. No 2. Sometimes 3. Yes
3.13	If you suddenly faced a long-term emergency such as the death of a breadwinner or crop failure, how many people beyond your immediate household could you turn to who would be *willing* to assist you?	1. No one 2. One or two people 3. Three or four people 4. Five or more people
3.14	In the past 12 months, how many people with a personal problem have turned to you for assistance?	|___|___| *(number of people)*

4. TRUST AND SOLIDARITY			
4.01	Generally speaking, would you say that most people can be trusted?		0. No 1. Yes
In general, **do you agree with the following statements?**			
	4.02	Most people in this village are willing to help if you need it	0. Disagree 1. Agree
	4.03	In this village, one has to be alert or someone is likely to take advantage of you	0. Disagree 1. Agree
	4.04	Most people in this village/neighbourhood can be trusted	0. Disagree 1. Agree
	4.05	In this village/neighbourhood, people generally trust each other in matters of lending and borrowing money	0. Disagree 1. Agree
How much do you accept:			

	4.06	Local government officials	0. Do not trust 1. Trust some 2. Strongly trust
	4.07	Central government officials	0. Do not trust 1. Trust some 2. Strongly trust
	4.08	People from your ethnic group	0. Do not trust 1. Trust some 2. Strongly trust
	4.09	People **not** from your ethnic group	0. Do not trust 1. Trust some 2. Strongly trust
4.10	If a village project does not directly benefit you but has benefits for many others in the village, would you contribute **time** to the project?		0. No 1. Yes
4.11	If a village project does not directly benefit you but has benefits for many others in the village, would you contribute **money** to the project?		0. No 1. Yes
4.12	If you keep money or other valuables in the house, are you ever worried someone in the family may take it?		0. No 1. Yes
4.13	Generally do you trust your family members?		0. No 1. Yes
4.14	If you and your family leave town for a week, who do you trust to watch over your house while you are gone?		0. No one 1. Family or close friends only 2. Any neighbor
4.15	Suppose some person from this village had to go away for a while with his family. In whose charge would this person leave his fields?		0. No one 1. Only close relatives 2. Larger group of villagers
4.16	Do you worry that someone will break in and steal or vandalize while you are away?		0. No 1. Yes
4.17	Do people ever need to pay local leaders in order to get something they need (official document, etc.)?		0. No 1. Yes
4.18	If a household in this village pays "extra" will they be more likely to receive a service?		0. No 1. Yes

4.19	If a crop disease were to affect the entire standing crop of this village, who do you think would come forward to deal with this situation?	0. No one 1. Village leaders 2. Government 3. NGO (local or international)

5. COLLECTIVE ACTION AND PARTICIPATION		
5.01	In the past 12 months did you or any one in your household participate in any communal activities, in which people came together to do some work for the benefit of the village?	0. No (SKIP → to question 5.03) 1. Yes
5.02	How many times in the past 12 months?	|___|___| *(number of times)*
5.03	How likely is it that people who do not participate in village activities will be criticized or sanctioned?	1. Very unlikely 2. Unlikely 3. Unsure 4. Likely 5. Very likely
5.04	What proportion of people in this village contributes time or money toward common development goals, such as building a farmer training center or doing soil conservation work?	0. No one 1. Less than half 2. About half 3. More than half 4. Everyone
5.05	Suppose something unfortunate happened to someone in the village, such as a serious illness, or the death of a parent. How likely is it that some people in the village would get together to help them?	1. Very unlikely 2. Unlikely 3. Unsure 4. Likely 5. Very likely
5.06	If there was a water supply problem in this village, how likely is it that people will cooperate to try to solve the problem?	1. Very unlikely 2. Unlikely 3. Unsure 4. Likely 5. Very likely
5.07	If your house needed repairs after a storm, would any of your neighbors help out?	0. No 1. Yes
5.08	If your neighbor's house needed repairs after a storm, would you help them out?	0. No 1. Yes
5.09	Generally when neighbors have issues or challenges, are village members willing to help out?	0. No 1. Yes
5.10	Do you feel that people in this village are fair? (For example: if you help them, will they be expected to help you?)	0. No 1. Yes
5.11	If you are sick and it is harvest time, would your neighbors help harvest in your place?	0. No 1. Yes

5.12	If you are sick and need help getting to the hospital, would your neighbors help you?	0. No 1. Yes
5.13	If your child is sick and you need money to pay for a hospital visit, would people in your village help?	0. No 1. Yes

6. INFORMATION AND COMMUNICATION		
6.01	How many times in the last month have you or anyone in your household read a newspaper or had one read to you?	|___|___| *(number of times)*
6.02	How often do you listen to the radio?	1. Every day 2. A few times a week 3. Once a week 4. Less than once a week 5. Never
6.03	How often do you watch television?	1. Every day 2. A few times a week 3. Once a week 4. Less than once a week 5. Never
6.04	In the past month, how many times have you made or received a phone call?	|___|___| *(number of times)*
6.05	What are your three main sources of information about what the government is doing (such as agricultural extension, workfare, family planning, etc.)?	***(READ** list aloud. **Choose THREE)*** 1. Relatives, friends and neighbours 2. Village bulletin board 3. Local market 4. Village or local newspaper 5. National newspaper 6. Radio 7. Television 8. Groups or associations 9. Business or work associates 10. Political associates 11. Village leaders 12. An agent of the government 13. NGOs 14. Internet

7. SOCIAL COHESION AND INCLUSION		
7.01	There are often differences in characteristics between people living in the same village. For example, differences in wealth, income, social status, ethnic or linguistic background. There can also be differences in religious or political beliefs, or there can be differences due to age or sex. To what extent do any such differences characterize your village?	1. To a very small extent 2. To a small extent 3. Neither great nor small extent 4. To a great extent 5. To a very great extent
7.02	Do any of these differences cause problems?	0. No ***(SKIP→ to question 7.05)***

		1. Yes	
7.03	Which **two differences** most often cause problems?	***(READ** list aloud. **Choose TWO)*** 1. Differences in education 2. Differences in landholding 3. Differences in wealth/material possessions 4. Differences in social status 5. Differences between men and women 6. Differences between younger and older generations 7. Differences between long-term and recent residents 8. Differences in political party affiliations 9. Differences in religious beliefs 10. Differences in ethnic or linguistic background 11. Other differences	
7.04	Have these problems ever led to violence?	0. No 1. Yes	
7.05	I am now going to ask a few questions about your everyday social interactions. How many times in the past month have you got together with people to have food or drinks, either in someone's home or in a public place?	|___|___| *(number of times)* *(if NONE, → **SKIP to question 7.07**)*	
7.06	Were any of these people…	**7.06.1** Of different linguistic group?	0. No 1. Yes
		7.06.2 Of different economic status?	0. No 1. Yes
		7.06.3 Of different social status?	0. No 1. Yes
		7.06.4 Of different religious group?	0. No 1. Yes

7.07	In the last three months, how many times have you gotten together with people to play games, sports, or other recreational activities?	|___|___| *(number of times)*
7.08	How many times in the past 12 months did you participate in a family or village festival/ceremony (wedding, funeral, religious festival, etc.)?	|___|___| *(number of times)*
7.09	In general, how safe from crime and violence do you feel when you are alone at home?	1. Very unsafe 2. Moderately unsafe 3. Neither safe nor unsafe 4. Moderately safe 5. Very safe
7.10	How safe do you feel when walking down your street alone after dark?	1. Very unsafe 2. Moderately unsafe 3. Neither safe nor unsafe 4. Moderately safe 5. Very safe

8. EMPOWERMENT AND POLITICAL ACTION		
8.01	Do you feel that you have the power to make important decisions that change the course of your life?	1. Totally unable to change life 2. Mostly unable to change life 3. Neither able nor unable 4. Mostly able to change life 5. Totally able to change life
8.02	Overall, how much impact do you think you have in making this village a better place to live?	0. No impact 1 .A small impact 2. A big impact
8.03	In the past 12 months, how often have people in this village gotten together to jointly petition government officials or political leaders for something benefiting the village?	0. Never 1. Once 2. A few times (<5) 3. Many times (>5)
8.04	Lots of people find it difficult to get out and vote. Did you vote on the last state, national, or presidential election?	0. No 1. Yes

8.05	In the past 12 months, did your household have to pay some additional money to government officials to get things done?	0. No 1. Yes, occasionally 2. Yes, often
8.06	Are such payments effective in getting a service delivered or a problem solved?	0. Usually not 1. Yes, usually 2. Yes, but only occasionally

9. WATER SYSTEM QUESTIONS		
9.01	Did the village have a role in project planning or design of the system?	0. No ***(SKIP → to question 9.03)*** 1. Yes
9.02	Do you think it was useful for the village to be involved in the project?	0. No 1. Yes
9.03	Did the village contribute money or labor to the construction of the system?	0. No ***(SKIP → to question 9.06)*** 1. Yes
9.04	Did the village do so willingly?	0. No 1. Yes
9.05	Do you think it was important for the village to make these contributions?	0. No 1. Yes
9.06	Does the village contribute fees for water use?	0. No ***(SKIP → to question 9.09)*** 1. Yes
9.07	Do all households pay a fee?	0. No households pay a fee 1. Some households pay a fee 2. Yes, all or most households pay ***(SKIP → to question 9.09)***
9.08	Do you think it is fair that some households do not pay?	0. No 1. Yes
9.09	Does the village support or contribute to operation and maintenance or cleaning of the water point?	0. No 1. Yes
9.10	Does the water system provide enough water for your household needs?	0. No 1. Yes ***(SKIP → to question 9.14)***
9.11	What does your water system provide for **drinking** purposes?	0. None 1. Some

		2. A lot/a sufficient amount
9.12	What does your water system provide for **cooking** purposes?	0. None 1. Some 2. A lot/a sufficient amount
9.13	What does your water system provide for **cleaning** purposes?	0. None 1. Some 2. A lot/a sufficient amount
9.14	Does the water system provide clean water?	0. No 1. Yes
9.15	Is water available every day?	0. No 1. Yes
9.16	How much do you agree with this statement: the water system is "very well maintained"?	1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree

999. Do you have any questions or comments for me?

_____

APPENDIX A

June/July 2014

Water Scheme Rapid Monitoring Form

Kebele ID: ___ ___

(Place ID on EVERY PAGE)

Water Scheme Identification
Woreda: _____ **Kebele**: _____ **Kebele code**: |____|____|
GPS coordinates : _____
Date of survey (dd/mm/yyyy) |____|____||____|____|**|_2_|_0_| _1_|_4 |**

1. Water Scheme Information		
1.01	Common name of water scheme:	|_____|
1.02	Position of person(s) that were interviewed	1. Water committee member 2. Community member 3. Other: _____

1.03	Which gots (villages) does this scheme serve?	1. _____ 2. _____ 3. _____ 4. _____ 5. _____ 6. _____
1.04	In what year was this scheme first developed?	|____|____|____|____| *(Western calendar)*
1.05	Who originally developed the scheme?	
1.06	Has this scheme been rehabilitated?	0. No ***(SKIP → to 1.07)*** 1. Yes
1.07	If it is rehabilitated, in what year was it rehabilitated?	|____|____|____|____| *(Western calendar)*
1.08	What type of water source is it?	1. Spot spring – protected 2. Gravity scheme/spring development with rural pipe scheme 3. Hand-dug/shallow well equipped with hand pump 4. Bore hole

2. Functionality Observations				
2.01	How many water points are there for this scheme?	[_____] *If more than one water point in scheme, try to visit at least two*		
2.02	**Scheme #1**			
2.02.01	Construction Quality	No issues	Some issues	Potential for recontamination
2.02.02	Flow rate (seconds to fill 20L jerrican)	[_____] If there is no water, skip to next point.		
2.02.03	Drainage	Good	Med	Bad
2.02.04	Does the water point have a closing time? (*i.e.* does the water point get locked at some point each day?)	Yes	Don't know	No
2.02.05	Does the water point have a fence?	Yes	Partially	No
2.02.06	Is water collected out of the main pipe? (*i.e.* not broken pipe)	Yes	Both	No
2.03	**Scheme #2**			
2.03.01	Construction Quality	No issues	Some issues	Potential for recontamination
2.03.02	Flow rate (seconds to fill 20L jerrican)	[_____] If there is no water, skip to next point.		
2.03.03	Drainage	Good	Med	Bad

2.03.04	Does the water point have a closing time? (*i.e.* does the water point get locked at some point each day?)	Yes	Don't know	No
2.03.05	Does the water point have a fence?	Yes	Partially	No
2.03.06	Is water collected out of the main pipe? (*i.e.* not broken pipe)	Yes	Both	No

3. Maintenance *(interview with WASH Committee member)*				
3.01	Has the water point ever needed repairs?	No **(SKIP to 3.07)**	Don't know	Yes
3.02	Has the water point been repaired yet?	Yes **(SKIP to 3.07)**	Repairs have been scheduled	No
3.03	If no, has the repair been reported?	Yes	Don't know	No
3.04	To whom?	NGO	Government	Don't know/other
3.05	If yes, who did the last repair?	Committee	Government	NGO
3.06	If the point is still in need of repairs, how long has it been since the water point has needed repairs?	<2 weeks	<1 month	>1 month or don't know
3.07	What is the closest place to get spare parts for repairs? (minutes)	<30 minutes	<60 minutes	>60 minutes or don't know
3.08	Does the scheme have a daily caretaker?	Yes	Don't know	No **(SKIP to 3.07)**
3.09	Does the caretaker receive compensation?	Yes	Don't know	No
3.10	Do members of the WASHCo know how to make minor repairs?	Yes	Don't know	No
3.11	Do members of the WASHCo know who to contact for additional expertise in case of any problems beyond local capacity?	Yes	Don't know	No
3.12	How often are WASHCo meetings?	Specific time frame given	When there is a problem	Never
3.13	How many people are on the WASHCo?	|_____|_____| people		
3.14	How many women are on the WASHCo?	|_____|_____| women		

4. Financial Management				
4.01	How many households are served by this water point?	|_____|_____|_____| households		
4.02	Is there a fee collected?	Yes	Don't know	No
4.03	How many households contribute fees regularly?	All, or nearly all of them	Some households	None
4.04	What is the situation regarding committee knowledge and practice of regular record keeping?	☐ Has knowledge and keeps records which have been seen	☐ Has some knowledge of record keeping but is incomplete or not practiced	☐ Does not have the knowledge of how to keep records
4.05	Have there been any audits or external financial checks undertaken on the water point?	☐ Yes, periodically	☐ Yes, once	☐ No or Don't know
4.06	Is there a bank or microcredit account for money collected from users?	Yes	Don't know	No
4.07	How much are users charged?	_____ birr per jerrican _____ birr per month	_____ birr per year	No charge
4.08	Tariffs (fee charged for water) over the last few years have…	Increased	Stayed the same	Decreased
4.09	Is the current fee enough to cover minor (basic) repairs?	Yes	Don't know	No
4.10	Is the current fee enough to cover major repairs?	Yes	Don't know	No

5. Comments from committee about challenges they face, or anything else they'd like to say: