TAMPEREEN TEKNILLINEN YLIOPISTO
TAMPERE UNIVERSITY OF TECHNOLOGY

Beshah Mogesse Behailu

Rural Water and Sanitation

Community Managed Project Approach for Sustainability in Ethiopia

Julkaisu 1435 • Publication 1435

Tampere 2016

Tampereen teknillinen yliopisto. Julkaisu 1435
Tampere University of Technology. Publication 1435

Beshah Mogesse Behailu

Rural Water and Sanitation

Community Managed Project Approach for Sustainability in Ethiopia

Thesis for the degree of Doctor of Science in Technology to be presented with due permission for public examination and criticism in Rakennustalo Building, Auditorium RG202, at Tampere University of Technology, on the 30th of November 2016, at 12 noon.

Tampereen teknillinen yliopisto - Tampere University of Technology
Tampere 2016

ISBN 978-952-15-3854-4 (printed)
ISBN 978-952-15-3867-4 (PDF)
ISSN 1459-2045

Supervisor and Custos	Adjunct Professor, Dr. Tapio S. Katko Department of Civil Engineering, Tampere University of Technology, Tampere, Finland
Instructors	Adjunct Professor, Dr. Jarmo Hukka Department of Civil Engineering, Tampere University of Technology, Tampere, Finland Dr. Harri Mattila Häme University of Applied Sciences, HAMK Bioeconomy Research Centre Cleantech Research Group Forssa, Finland Associate Professor, Dr.Ing., Gashaw Yayehyirad School of Civil and Environmental Engineering, Addis Ababa Institute of Technology, Addis Ababa University, Addis Ababa, Ethiopia
Preliminary assessors:	Professor Johann Tempelhoff North-West University, Potchefstroom Campus, Johannesburg Area, South Africa Dr. Richard C Carter, Director, Richard Carter and Associates Ltd Visitor, Cambridge University Department of Engineering Senior Research Associate, Overseas Development Institute Former Professor of International Water Development, Cranfield University London, United Kingdom
Opponent	Adjunct Professor, Dr. Henry Nygård Faculty of Art, History Åbo Academy University Turku, Finland

ABSTRACT

Tampere University of Technology
www.tut.fi

Author: Beshah Mogesse Behailu

Name of dissertation: Rural Water and Sanitation: *Community Managed Project Approach for Sustainability in Ethiopia*

Abstract

Water is a natural need and basic requirement of humankind. Civilization, human settlements, establishments of industry, and locations of agricultural farms have been linked to the presence of water sources. However, the availability of freshwater resources is gradually becoming more challenged by climate change, and service production is being influenced by several factors, including population growth and service breakdowns. A potable water supply for all is unquestionable for enhancing development, education, economies, and social performance. Moreover, sanitation is mandatory for maintaining clean and potable water supply sources. Striving to improve water and sanitation services and focusing on service delivery are fundamental to societies' overall wellbeing.

The concept of service delivery extends beyond investment in the initial implementations of systems. Instead, it includes sound operation and maintenance of facilities and ensures availability of services throughout the lives of the built systems. Service delivery endeavours are overwhelmed by the implementations of new systems because most of the actors in the sector are actively building new schemes instead of rehabilitating existing ones. Therefore, the tendency in service coverage often means moving two steps forward and one step back because of service failures. To overcome this challenge, the future paradigm should be to intensify the service delivery and make it as important as the implementation of new systems. Stakeholders, particularly user communities, should be involved in every step of the process of implementing the systems that serve them to establish feelings of ownership and to give them active roles during post-construction.

The objective of this study is to obtain insight into service delivery in which the user community is at the centre of service production. It assesses the effects and effectiveness of the Community Managed Project Approach (CMP) in Ethiopia. The study was conducted in the Amhara and Benishangul-Gumuz regions in northwest Ethiopia. These regions were selected because of the presence of CMP and the availability of other implementation approaches for comparison. Data were collected using numerous methods, such as household surveys (n = 1806), focus groups (n = 49), field observations (n = 49), and personal interviews with governmental officials at the district, regional, and federal levels (n = 7). Based on these data, four peer-reviewed journal articles and one international peer-reviewed conference paper were published.

The results of this study indicate that community management is a preferable way to extend water supply and sanitation services in rural areas. The participation of user communities should be managed so that genuine participation leads to feelings of ownership. However, all types of participation (labour, financial, and material contributions) are not

always possible to achieve ownership. In some circumstances, the concept of participation might be abused, which might lead to forced involvement. In that case, the dream of community participation might not be realized. Regarding this, CMP has remarkably performed for reaching and involving user communities. To create strong, cohesive, and collective actions, exploring local experiences is crucial. For example, the traditional water management of the Borana and Konso communities in southern Ethiopia are significantly more sustainable than the modern systems built in these areas because of the philosophical differences in management between the community schemes and the introduced schemes.

This study suggests that a wide variety of perspectives on service provision and production should be considered. Community participation should be clearly defined and sensibly implemented. Failure of community participation in the process of building community management might be due to technical experts' lack of understanding of the reasons that a community should be involved and to citizens' resistance. Several factors are identified as reasons for frequent service failures in rural water supply, including institutional and social aspects. Therefore, understanding the factors behind the problems, incorporating social capital, and engaging traditional knowledge could improve efforts to sustain service delivery.

Keywords: Rural water supply, sanitation, services, sustainability, community management, CMP, Ethiopia
Language: English
Number of Pages: 77

TIIVISTELMÄ

Tampereen Teknillinen Yliopisto
www.tut.fi

Tekijä: Beshah Mogesse Behailu

Väitöstyön nimi: Maaseudun vesihuoltopalvelut: *CMP lähestymistapa Kestävän kehityksen edistämiseksi Etiopiassa*

Vesi on välttämätöntä luonnolle ja perustarve ihmiskunnalle. Yhdyskunnat, teollisuus ja maatilat tarvitsevat vesihuoltoa. Makean veden saatavuutta rajoittavat ilmaston muutos ja vesihuoltopalveluiden tuoton kapasiteetti mm. väestön kasvun ja toimimattomien järjestelmien kautta. Juomakelpoinen vesi kaikille on kiistaton tavoite, kun edistetään elinoloja, koulutusta sekä taloudellista ja yhteiskunnallista kehitystä. Sanitaatio puolestaan edellyttää, että raakavesilähteet pidetään puhtaita. Ponnistelut vesihuollon ja palveluiden kehittämiseksi ovat välttämättömiä yhteiskuntien hyvinvoinnille.

Vesihuoltopalvelut kattavat järjestelmien toteuttamisen ohella niiden kestävän käytön ja kunnossapidon niiden koko elinkaaren ajan. Pyrkimykset tarjota vesihuoltopalveluita korostavat kuitenkin voimakkaasti uusia hankkeita. Useimmat sektorin toimijat ovat aktiivisia uusien järjestelmien rakentamiseksi olemassa olevien saneerausten sijaan. Tämän vuoksi palveluiden kattavuutta korostava trendi usein merkitsee kahta askelta eteenpäin ja yhtä taaksepäin. Tämän haasteen voittamiseksi tulevaisuuden paradigman tulisi korostaa järjestelmien käyttöä ja tehdä se yhtä elintärkeäksi kuin uuden vesihuollon rakentaminen. Sidosryhmät ja erityisesti käyttäjäyhteisöt tulee saada mukaan hankkeiden toteutukseen niiden kaikissa vaiheissa, mitä kautta voidaan edistää kansalaisten omistajuutta ja aktiivista osallistumista käyttövaiheeseen.

Tämän tutkimuksen tavoitteena on tuottaa näkemystä vesihuoltopalveluista saattamalla käyttäjäyhteisö palvelutuotannon keskiöön. Tutkimus arvioi Etiopian maaseudulla käytetyn, ns. Community Managed Project (CMP)- lähestymistavan vaikuttavuutta ja tehokkuutta. Hankkeen tietoaineisto kerättiin Amharan ja Benishangul-Gumuzin lääneistä maan luoteisosassa. Nämä läänit valittiin siksi, että niissä on käytetty CMP-sekä muita lähestymistapoja, joita voidaan verrata toisiinsa. Tutkimusaineistoa hankittiin useilla menetelmillä kuten kotitalouksien kyselyillä (n=1806 henkeä), fokusoiduilla ryhmäkeskusteluilla (n=49), kenttähavainnoilla (n=49) sekä eri hallintotasojen virkamiesten haastatteluilla (n=7). Tutkimusaineiston pohjalta julkaistiin neljä kansainvälistä vertaisarvioitua artikkelia sekä yksi kansainvälinen vertaisarvioitu konferenssiesitelmä.

Hankkeen tulokset osoittavat, että yhteisön mukanaolo on suositeltava keino maaseudun vesihuoltopalveluiden laajentamiseksi. Käyttäjien osallistaminen tulee hoitaa kunnolla siten, että aito osallistuminen voi johtaa omistajuuteen. Osallistuminen kaikissa muodoissa ei kuitenkaan aina ole mahdollista. Joissain olosuhteissa osallistamista voidaan käyttää väärin, mikä voi johtaa pakotettuun osallistumiseen, jossa aito osallistuminen ei toteudu. Tässä suhteessa CMP on osoittautunut huomattavan toimivaksi osallistaessaan käyttäjäyhteisöjä. Paikalliset olosuhteet tulee tuntea vahvojen, yhtenäisten ja yhteisten toimien luomiseksi. Esimerkiksi perinteisen vesihuollon järjestelyt Borana and Konso-kansojen parissa Etelä-Etiopiassa ovat huomattavasti kestävämpiä kuin sellaisille alueille tehdyt modernit järjestelmät erilaisten toimintafilosofioiden vuoksi.

Tutkimus osoitti, että vesihuoltopalveluiden järjestämiseksi ja tuottamiseksi tulee huomioida monia näkökulmia. Yhteisöjen osallistuminen tulee määritellä ja sitä tulee toteuttaa järkevästi.

Epäonnistunut yhteisöjen osallistaminen voi johtua kansalaisten vastaanhangoittelusta mutta myös tekniikan asiantuntijoiden puuttuvasta ymmärryksestä osallistamisen osalta. Maaseudun vesihuollon käyttöön liittyvät ongelmat voivat johtua monista syistä mukaan luettuna sosiaaliset ja institutionaaliset seikat. Siksi ongelmien ymmärtäminen, sosiaalisen pääoman huomioiminen ja perinteisen tiedon hyödyntäminen edistävät palvelutuotannon kestävyyttä.

Avainsanat: vedenhankinta, sanitaatio, vesihuoltopalvelut, kestävyys, CMP-lähestymistapa, yhteisöjen osallistuminen
Kieli: Englanti
Sivumäärä: 77

PREFACE AND ACKNOWLEDGEMENTS

Why socio-engineering?

Most professionals apparently associate water supply and sanitation development with construction, design, and other engineering tasks. However, these technical aspects of water delivery alone are insufficient to produce sustainable services. This fact is a lesson already learned from the International Drinking Water Supply and Sanitation Decade (1981 – 1990). During planning and implementation, technical aspects (hardware) should be accompanied by social aspects (software), and they should be paid equal attention to enable user communities to operate their systems because external agents cannot and should not operate and maintain them, at least not always.

Socio-engineering combines the hardware and software aspects of implementation. When physical structures are constructed, awareness and behavioural changes should be installed at the heart of the user community because, then, everyone involved in the provision and production of services would be responsible for ensuring ownership. In socio-engineering, engineers do not celebrate when they complete construction, but they do embrace success when the people obtain the intended services from those structures. This is about thinking ahead to the sustainability of services and organizing the implementation so that it can bear any potential future challenges to the services. The concept is more applicable in areas where fully or partially non-functional systems are common and the users are forced to fetch water from unprotected sources.

Why am I interested?

Although my educational background is strictly in engineering, my interest in community thinking was conceived in my heart a decade ago when I was working for the Hararghe Catholic Secretariat, a local-level non-governmental organization (NGO) in Ethiopia devoted to, among other things, water supply and sanitation development. My thinking changed because of a local man's resistance to a water supply project. The project was based on a spring source located near the man's farm. His story follows.

The organization for which I was working had planned to construct a water supply project in a village of Gorogutu District, and I was in charge of the technical matters. Thus, after informing the local administration, I went to the site to make measurements at the water source. In the meantime, a farmer who owned land adjacent to the spring was told about the plan and, being quite angry about it, he waited for my arrival. When I saw him, I saluted, but he refused to respond. I explained that I was there to improve the water source of his water supply, expecting a positive emotional response from him. However, he was not surprised to hear about it because he already knew of my mission. Unfortunately, he was totally against the construction of the scheme because of his previous experiences

in which water sources had been abandoned after construction. He said, 'cement dries a spring', and, although I was shocked, I started to listen and learn from his experiences. Everything that he told me was logical and pointed to previous developmental faults. He pointed out several sources that had dried up after protective structures were constructed on the springs.

The valuable lesson that I learned from this case was the importance of listening to reasons that a community points out against a development. I listened to him with respect as if he was my teacher, and he was very proud to tell me about his feelings. After a good discussion, we were able to resolve the issue. Our discussion lasted only about 20 minutes, but we settled a matter that could have cost as much as the entire value of the project. Since then, I have been thinking that every community might have valuable reasons to oppose certain actions. For services to be sustainable, these concerns must be resolved before action is taken. I am indebted to that man, with whom I was able to lay a foundation of community management thinking, and to the Hararghe Catholic Secretariat for allowing me to learn of these practices.

Acknowledgements

This study was conducted at Tampere University of Technology (TUT) in the Department of Civil Engineering, and the data were collected in Ethiopia. I am grateful to TUT for the opportunity to study for my doctoral degree in this globally outstanding university.

I am sincerely grateful to my supervisors, Adjunct Professor Tapio S. Katko, Adjunct Professor Jarmo Hukka, and Associate Professor Gashaw Yayehyirad, for their supportive supervision and guidance throughout the study period. In particular, the commitment and patience of Tapio Katko, which he provided throughout the process, have special places in my heart. My special thanks go to Dr. Harri Mattila, Mr. Arto Suominen, and the COWASH project for initiating the ReCMP research project and facilitating the fieldwork through their logistical and technical supports. I also thank Dr. Pekka Pietila, who was with me through arrangement of the technical and administrative matters during the entire study period.

My gratitude is immense to the COWASH staff, the FinnWASH-BG staff, Amhara water supply and sanitation division, Mr. Yimer, Mr. Abreham Kebede, the heads of all of the district water supply offices, the interviewees, and the persons involved in the data collection process. Without their kind cooperation, the data collection process would not have been as smooth as it was. I also acknowledge the substantial financial support received from a CIMO scholarship, Maa- ja Vesitekniikan tuki ry, and the Academy of Finland (no. 288153).

I am very thankful for the discussions and comments on the work from Dr. Petri Juuti, MSc. Samuel Kibocha, Dr. Vuokko Kurki, Prof. Ezekiel Nyangeri, MSc. Venla Pesonen, Dr. Riikka Rajala, MSc. Annina Takala and all Capacity Development in Water and Environmental Services (CADWES) research team members. Moreover, my deepest

thanks go to MSc. Birhanu Assefa, Mr. Henock Dandena, Dr. Muluget Fikadu, and all of the Ethiopian fellows in Tampere and Helsinki, who always and in all ways encouraged me to this end. The proofreading services of Mikko Pitkänen, Jorma Tiainen, Emmi Seppänen and Elsevier were invaluable to the readability of the manuscript and the articles.

My wife, Netsanet Belete, and my daughter, Gelila Beshah, were significant contributors to the study's success. My wife, in particular, shouldered a great part of our family responsibilities and care of our daughter. Moreover, I am grateful to my mother, Tirunesh Tesemma, and to my cousins and sisters, who have always given me moral support. Last but not least, my gratitude goes to Dr. Agizew Nigusie who laid an important foundation to my study.

Beshah M. Behailu
November 07, 2016
Tampere, Finland

I dedicate this dissertation to my late father, Mogesse Behailu, whom I lost in the course of this study, and in memory of my siblings, Amare and Widinesh Mogesse.

Contents

LIST OF PUBLICATIONS

I Behailu B. M., Suominen A., Katko, T. S. "Evolution of Community Managed Water Supply Projects (CMP) from 1994 to the 2010s in Ethiopia", *Public Works Management & Policy. 20(4), 379-400*, 2015.

II Behailu B. M., Suominen A., Katko, T.S., Mattila H., Yayehyirad G. "Comparison of Community Managed Projects and Conventional Approaches in Rural Water Supply of Ethiopia" , *African Journal of Environmental Science and Technology. 10(9), 292-306, 2016.*

III Behailu BM, Hukka JJ, Katko TS. "Service Failures of Rural Water Supply Systems in Ethiopia and Their Policy Implications." *Public Works Management & Policy.* OnlineFirst July 1, 2016 DOI:1087724X16656190.

IV Behailu B. M., Pekka Pietila., Katko T. S. "Indigenous Practices of Water System Management for Sustainable Services: *Case of Borana and Konso, Ethiopia*", *SAGE open. Accepted.*

V Behailu B.M., Harri Mattila. "Need of Services and Understanding of Service Providers in Water and Sanitation: A Case of Ethiopia", *Proceedings of the CIB World Building Congress 2016 : Volume IV - Understanding Impacts and Functioning of Different Solutions. 431-440*, 2016.

AUTHOR'S CONTRIBUTION

Paper I

Beshah M. Behailu collected and analyzed the data, wrote the article as a main and corresponding author. Arto Suominen and Tapio Katko provided input in their respective fields of expertise.

Paper II

Beshah M. Behailu collected and analyzed the data, wrote the article as a main and corresponding author. Arto Suominen, Harri Mattila, Tapio Katko and Gashaw Yayehyirad provided input in their respective fields of expertise.

Paper III

Beshah M. Behailu collected and analyzed the data, wrote the article as a main and corresponding author. Jarmo Hukka and Tapio Katko provided input in their respective fields of expertise.

Paper IV

Beshah M. Behailu collected and analyzed the data, wrote the article as a main and corresponding author. Pekka Pietila and Tapio Katko provided input in their respective fields of expertise.

Paper V (conference paper)

Beshah M. Behailu collected and analyzed the data, wrote the article as a main and corresponding author. Harri Mattila read and commented the content.

List of Figures

ABBREVIATIONS AND ACRONYMS

BoFED	Bureaue of Finance and Economic Development
CDF	Community Development Fund
COWASH	Community Led Accelerated WASH
CMP	Community Managed Project
CWA	Consolidated Water Supply, Sanitation and Hygiene (WASH) Account
DA	Development Agent
FINNIDA	Finnish International Development Agency
GoE	The Government of Ethiopia
GoF	The Government of Finland
GTP	Growth and Transformation Plan
HEW	Health Extension Worker
IDWSSD	International Drinking Water and Sanitation Decade (1981-1990)
Lpcd	Litres per capita per day
MFI	Micro Finance Institution
MoFED	Ministry of Finance and Economic Development
MoWE	Ministry of Water and Energy
NGO	None Governmental Organization
NGO-MP	NGO Managed Projects
OWNP	One WASH National Programme
O& M	Operation and Maintenance
RBM	Result-Based Monitoring and Evaluation
ReCMP	CMP Research Project
RWSEP	Rural Water Supply and Environmental Programme
RWSS	Rural Water Supply and Sanitation
SDGs	Sustainable Development Goals
SSA	Sub-Saharan Africa
UAP	Universal Access Plan
WASH	Water Supply, Sanitation and Hygiene
WASHCO	WASH Committee
WHO	World Health Organization
WIF	WASH Implementation Framework
WMP	Woreda Managed Projects
WSSA	Water Supply and Sewerage Authority
WWO	Woreda Water Office
WWT	Woreda WASH Team

CHAPTER 1

INTRODUCTION

'When the well is dry, we know the worth of water'.

Benjamin Franklin

1.1 Background

Water is a fundamental need for human survival, and it is vital to economic and social development (Brown and Lall, 2006). Efforts towards food security, improved health, education, and other developments revolve around potable water supplies and sanitation (Montgomery and Elimelech, 2007; Wilderer, 2004). In addition, water is a major gateway connecting the environment to the human body. Due to water-borne diseases, significant numbers of people spend their productive time out of work and their money on medications. Moreover, women and children (girls) in developing economies tend to devote their time to water collection at the expense of school attendance, social activities, and financial affairs. Therefore, although it is scarce and poorly serviced, water is crucial to social and economic development.

Because water is plentiful on Earth, there is some confusion about the meaning of water scarcity. Although water covers three-fourths of the Earth's surface, drinking water has been a top agenda item of the United Nations and its partner countries for the past four decades. These opposing views might puzzle people. However, the answer might be found in Samuel Taylor Coleridge's famous 1798 poem, 'The Rime of the Ancient Mariner', which describes the presence of water and its inaccessibility in the following lines: *'Water, water, everywhere; nor any drop to drink'*[1]. Although it was written for mariners, it holds true for the current global situation regarding the uneven distribution of freshwater resources, and, particularly, access to water services.

Approximately three per cent of global water resources is freshwater (Gleick, 1993), most of which is not easily accessible because it exists in distant forms, such as glacial ice or deep groundwater deposits. As a result, signicant regions of the world suffer from water scarcity caused by unavailability and lack of proper management (Biswas, 2013)[2]. The

[1]Source: www.poetryfoundation.org/poem/173253

[2]A speech from www.youtube.com/watch?v=Axs3FzgKj2Ufeature=youtube

drinking water supply problem is most serious in sub-Saharan African countries where the initial developmental and systemic managements are poor in terms of financial capacities and the availability of skilled labour (Seppälä and Katko, 2003). Therefore, a lack of proper management has magnified the problem of water scarcity.

During the past four decades, the financial and technical support of international donors and NGOs was significant to the water supply and sanitation sectors of developing countries. However, their targets were not achieved by 2015. The efforts merely responded to the margin of population growth, i.e., 300 million people are obtaining water in excess of population growth since the 1990s (WHO/UNICEF, 2015). The system failures caused by poor operation and maintenance (O&M) are a substantial hindrance to the process of change. Biswas (2013) pointed out that the post-construction management problems should be the concerns of all stakeholders to achieve groundbreaking effects in the sector.

Currently in sub-Saharan Africa, water system management is a critical problem particularly in rural areas where the majority of the people has no educational access, and, therefore, they cannot keep up with the rapid technological advances that influence them. Urban areas are better positioned financially to hire skilled labour or appoint community members to manage the water systems. Moreover, rural and urban water supply policies significantly differ, particularly in Ethiopia. Thus, it is vital that water system management plans separately consider rural and urban areas.

The rural water supply notably received attention during the International Drinking Water Supply and Sanitation Decade (IDWSSD) of 1981 – 1990. During the decade, a holistic plan was developed to address water supply and sanitation services for all people. Although the decade's campaign aimed to achieve its objectives by constructing physical facilities, it was found that non-engineering aspects were equally crucial to sustaining water supply and sanitation systems. These aspects were strongly linked to the attitudes and commitments of user communities. Subsequently, the sector and its global partners accounted for those software components and designed a bottom-up approach to develop water supply and sanitation services. In that approach, user demands for services are indispensable for deepening the roots of ownership feelings and, hence, management. Since the early 1990s, the bottom-up approach has undergone noticeable changes around the world. Still, in sub-Saharan countries, it remains a developmental agenda by focusing on community management. A similar approach is named Community-Managed Project (CMP), which evolved from the Community Development Fund (CDF), to implement Ethiopia's rural water supply and sanitation services (WIF, 2013).

CDF has been implemented in Ethiopia since 2003, and it is currently being replaced by CMP. CMP is one of four approaches implemented in rural Ethiopia. The project operates in collaboration between the Finnish and Ethiopian governments as bilateral projects. Finland finances the capacity-building and technical advice and Ethiopia determines the capital budget for personnel and the construction of schemes. Currently, CMP is delegated to five regions of the country and is the mainstream approach of the WASH

Implementation Framework (WIF, 2013). The WIF framework is based on a memorandum of understanding signed by four ministries[3] (Ministry of Health, Ministry of Education, Ministry of Water and Energy, and Ministry of Finance and Economics Development). Although CMP has gained popularity in the country, only a few scientific studies have assessed its achievements and suitability across communities. On the other hand, the rural population, which is this study's focus, accounts for 84% of the population of Ethiopia (CSA, 2010), and it is the focus of CMP with respect to improving water supply coverage and reducing unresolved system failures in the country's rural areas.

The other implementation approaches in Ethiopia are *Woreda*[4] Managed Projects (WMP), Non-Governmental Organization Managed Projects (NGO-MP), and self-supply (WIF, 2013). Their basic differences concern the flow of funding, project administration, and the mechanism of community involvement in the projects. Otherwise, all of the approaches exert all possible efforts to improve the services in the sector, including achieving sustainability.

Striving towards sustainability is not the task of a single discipline; instead, all stakeholders must participate and take responsibility while performing their appointed tasks. Hence, engineers, as technical staff, manage the planning, designing, and constructing of the water supply schemes. Moreover, they must be accountable for the extent to which the services reach their intended beneficiaries. A successfully accomplished project does not mean that the beneficiaries will avail themselves to the same extent (Kusek and Rist, 2004). Therefore, the general objective is to seek solutions aiming to narrow the conceptual gap between implementation and services.

The issues of sustainability and functional failure of water supply systems are not limited to Ethiopia; they are somewhat common to most developing economies, particularly those in sub-Saharan Africa. In that region, the non-functionality rate of systems could be as high as 50% (Chaka et al., 2011; Jones, 2011; Harvey and Reed, 2007; Harvey, 2008). The water supply coverage of those countries is less than 70% and access to sanitation is approximately 50% (WHO/UNICEF, 2015). The implication of this problem is that those countries face similar challenges in terms of providing services and operating their systems. Although this study focused on Ethiopia, the findings are applicable to other countries with similar contexts.

1.2 Objectives and research questions

The overall objective of this study was to contribute to the process of mitigating the challenges of rural water supply and sanitation services. The study is significant in its contribution to achieving the goal of universal coverage of the rural water supply and sanitation services and to safeguarding and sustaining the built water supply and

[3] As the names of ministries and governmental organization change over time, this paper will use the names that were valid at the beginning of this study (2012).

[4] The Ethiopian administrative unit that is equivalent to a district

sanitation infrastructure, systems, and facilities. The following research questions were based on the above-stated objective and purpose.

- Are there significant lessons to be learned from the evolution of a CMP approach?
- How are users involved and what types of services do rural communities receive?
- What are the prevailing factors that contribute to service failures of rural water supply and sanitation systems?
- Can indigenous knowledge of water systems' management contribute to the sustainability of water and sanitation services?

Based on the results of this study, four articles and one conference paper were published. The descriptions of the papers are as follow.

Article I: This paper reviewed the evolution of the CMP approach and linked it to international reforms of service delivery approaches and the country's water development timeline. The paper combined the findings of the previous literature, the first author's fieldwork, the second author's long-term experience, and the third author's commentary.

Article II: Different approaches require tailored procedures to embrace and empower the end users. CMP, WMP, and NGO-MP are commonly conducted in Ethiopia in addition to self-supply. The objective of this paper was to compare CMP to non-CMP (approaches that include WMP and NGO-MP) in the context of long-term WASH service delivery in Ethiopia. However, self-supply was not included in this study because it was in its initial stages.

Article III: The purpose of this paper was to investigate the key causes of service failures and to propose mitigating measures to alleviate the problems of rural water services in developing nations, particularly Ethiopia.

Article IV: This paper aimed to investigate the binding force of solidarity in the user community regarding the water management systems of the case study area and point out lessons that can be learned from traditional management.

Article V: This paper provided an overview of Ethiopian developmental policies, strategies, regulations, and developmental plans regarding water supply and sanitation.

1.3 Structure and scope of the study

1.3.1 Thesis structure

This study is based on four peer-review articles, one peer-reviewed international conference paper, and a synthesis of those research findings. The structure of the thesis is illustrated in Figure 1.1. The first chapter discusses the background, objectives, and scope of the study, and it provides definitions of the key terms commonly used in the study.

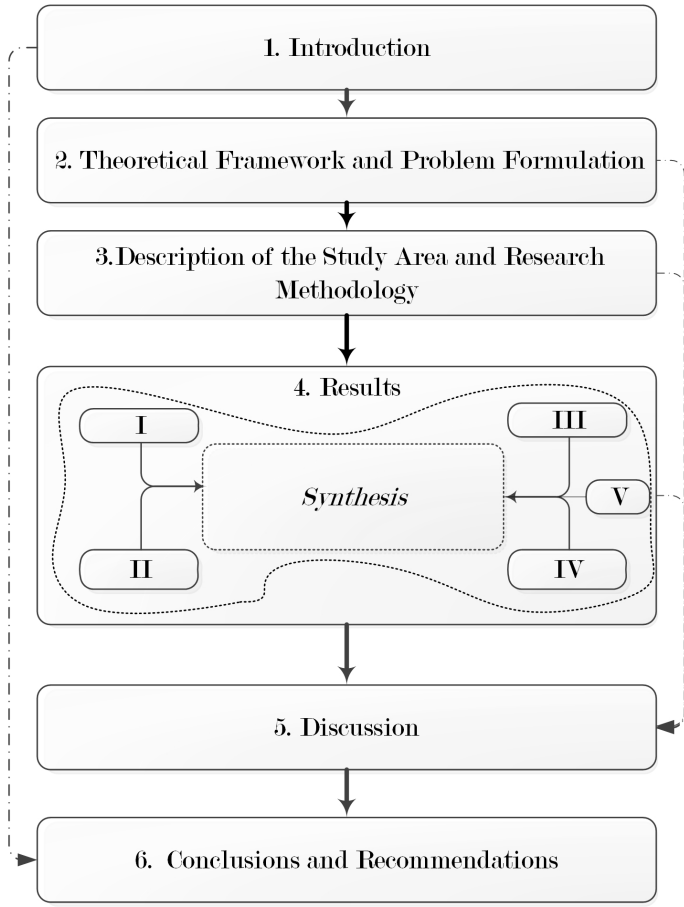


Figure 1.1: Structure of the thesis.

The second chapter provides the historical background of the rural water supply and sanitation services, a discussion of the paradigm shifts regarding management of services, and the theoretical framework of the study. Chapter Two also discusses the concepts of sustainability, governance of water supply and sanitation, aid efficiency, communal actions in development, citizen participation, indigenous knowledge, spare parts supplies, and Result-Based Monitoring and Evaluation (RBM).

Chapter Three concerns the background of the study area and the research methodology. The first part of the chapter discusses the study area, administrative overviews, demography, water resources, types of water supply schemes and implementation approaches in Ethiopia. The second part of the chapter describes the research approach and the data collection methods.

Chapter Four presents the results of the study as a synthesis of the analyses of the published articles and some research findings not discussed in any of the articles. This chapter provides a comprehensive exposition of the study's outcomes, whereas the fifth chapter discusses the results against the backdrop of information available on theoretical discourses and views articulated in the literature.

The sixth chapter sets forth the general conclusions of the study, the scientific contributions of the research, recommendations, policy implications, and suggestions for future research.

1.3.2 Scope of the study

This study focused solely on Ethiopia's rural water supply and sanitation. As defined below, 'rural area' refers to Ethiopian rural settlements. Moreover, the study is based on the water supply technologies dominant in those rural areas, such as springs and hand-dug or shallow wells manually operated with hand pumps.

Regarding study sites, two regions of the country, Amhara and Benishangul-Gumuz, were included. The study concentrated on the accessibility, community management, amount of water consumption, and sanitation aspects of those regions, and it investigated the flow of communication between service providers and producers. Moreover, indigenous water managements practices were also investigated in Borana and Konso. However, water quality indicators and sanitary inspections were not included in this study.

1.4 Definitions of key terms

The following key terms were used.

Scheme, water supply system and water point

These terms used interchangeably in the study.

Water supply coverage

'Water supply coverage' could be defined as the proportion of the total population that might have access to an improved water supply. Of course, the term 'coverage' is clear, but the term 'improved water supply' should be clearly explained to avoid ambiguity because the presence of a water point of access in a community does not guarantee service. Piped water (house-connected, yard, public tap), boreholes, protected springs, protected dug wells, rainwater harvesting, and bottled water are considered aspects of an improved water supply system (WHO/UNICEF, 2005). However, a service should satisfy the required quantity and standard quality within a reasonable distance.

Non-functionality

The Oxford definition of 'non-functionality' is 'not operating or in working order'. In the context of rural water supply schemes, non-functionality could imply schemes that stop working, schemes that fail frequently, schemes with inadequate water, and schemes with poor water quality. Generally, water supply schemes that encourage users to use alternative water sources are referred to as non-functional schemes. Because this denition is not universal, the context in which the word is used is consistently clarified in the study.

Sustainability

The definition of 'sustainability' is increasingly subjective, and it varies from discipline to discipline. Generally, 'sustainable development' is defined as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (Brundtland et al., 1987). In this study, sustainability of water and sanitation implies the ability of water supply systems to provide adequate water quantity with desirable water quality at an accessible distance for at least the design life (the period in which the physical structures are able to provide services) of a system in agreement with the following definition: '. . . water continues to be available for the period for which it was designed in the same quantity and of the same quality as was designed' Abrams et al., 1998, 4).

Water services provider and producer

These two terms are often found in water supply sector reports, publications, and programmes. Sometimes, they are interchangeable terms, which causes conceptual confusion (Katko and Hukka, 2015). Therefore, this study and its results used these terms following Ostrom (1990), who defined a 'provider' as a party that arranges for the provision of the requirement of something and 'producer' as a party directly involved in the physical implementation of things using supplied inputs by providers (Ostrom, 1990). To clarify the distinction, if a government were to provide construction materials, spare parts, and technology, and user were to implement, repair, and manage them, the government would be the provider and the user would be the producer. In some cases, the government would be a producer if it were to implement, repair, operate, and maintain systems.

Institution

My personal experience in the field suggests to me that most people consider governmental offices, schools, churches, mosques and other public gathering places as institutions. Moreover, many studies mention institutional development as an important factor to developing sustainable services (Katko, 1991; Giné and Pérez-Foguet, 2008; Eneas da Silva et al., 2013 and Spaling et al., 2014). However, without a common understanding of the term, the outcomes of efforts might be questionable. Therefore, Douglass C. North's (1990) definition was employed to assess the sustainability factors. North (1990) defined it as follows: 'Institutions are rules of the game in a society'. Institutions are built on social

norms, economic abilities, and political will (North, 1990, 3). They, in turn, influence the economy, politics, and other social matters of a society. Institutions exclude no one, and no one is expected to be passive in building efficient institutions. Every partner has a role and a responsibility. The cumulative effects determine an institution's success. The analogy of a soccer game (North, 1990) and the representation of the players in sanitation efforts (Mattila, 2005) demonstrate how an institution is the sum of the rules designed for intended organizational objectives.

Rural areas

Every country has rural and urban settings, and the availability of facilities and infrastructures signicantly vary between them. Moreover, the rural contexts of developed and developing countries are not comparable. Thus, the following paragraph highlights the situation of Ethiopia's rural areas that are the focus of this study.

As described in Chapter Three, Ethiopia's rural population accounts for about 84% of its total population (CSA, 2010). Despite the efforts of the government and people of Ethiopia, the rural areas fall short regarding a variety of services, such as schools, health posts, marketplaces, energy supplies, access to transportation, water supply systems, adequate agricultural technology, and comfortable housing. Services to rural areas might be available only after hours of walking. Women and girls focus on household activities, such as cooking, water, and firewood collecting, grinding grains, selling crops, and making household purchases; men and boys are responsible for outdoor labour needs, particularly regarding farming because agriculture accounts for about 85% of the rural population's livelihood (CSA, 2011). All of the people lack reasonable access to services and infrastructure, which has adversely influenced their involvement in developmental activities and education. This situation is aggravated by the scattered nature of Ethiopia's rural settlements, which removes proper services farther from proximity to the localities. Therefore, development in rural areas must be multi-sectorial. Integration of the relevant sectors is vital and should include agriculture, health, education, water and sanitation, and rural development.

Artisans: Local skilled labour which is commonly used in the study area and in this study.

CHAPTER 2

THEORETICAL FRAMEWORK AND PROBLEM FORMULATION

This chapter discusses the study's theoretical framework and the presence of water and sanitation problems from the perspective of service functionality. The theoretical framework begins at the historical evolution of community water and sanitation management. Furthermore, it explains the rationale of the theories related to the focus of the study. In general, the chapter addresses the question of why community management is important, particularly regarding water and sanitation. Therefore, key concepts are presented herein, such as sustainability, services, governance, social cohesion, aid efficiency, spare parts supply, and RBM.

2.1 Community management of water and sanitation services

Lack of sustainable water and sanitation services has been linked to numerous factors, including sense of ownership, financial ability to operate systems, user communities' knowledge on problems and their solutions, and full community participation (Carter et al., 1999). McCommon et al. (1988) stressed community participation and involvement at all stages of projects to facilitate better services. However, Harvey and Reed (2007) argued against the idea that community participation and involvement potentially strengthen community management. Similar to McCommon et al. (1988), Carter et al. (1999), and Huby and Stevenson (2003) the author of this dissertation argue that full community involvement in projects, along with community empowerment and continuing support, could result in better community management because community participation, involvement, and education are elements that create better understanding of services and ownership. The key focus here is on how and why community management is implemented for rural water and sanitation in Ethiopia.

The purpose of community management is to encourage users to operate and maintain their systems as part of their daily activities. In this case, the community could take responsibility for handling the management tasks and the national government and partner organizations could contribute to the development of new systems for populations without services. Thus, community management is a way to share responsibility to achieve a successful outcome.

The idea of community management emerges from the problem of extensive service non-functionality. Non-functionality causes the lifespans of built facilities to be shorter than planned, which means that those projects have increasingly insignificant effects on the lives of the citizens. Community participation and involvement in projects have developed throughout the history of water and sanitation services. Community management is meant to create management systems that require less involvement by national governments or other actors. In community management, no instruction is expected from the government or NGOs except for technical and financial assistance when necessary. The philosophy of community management has evolved as a long process in water and sanitation, but it still seems that there is no clear way to achieve sustainability.

Historical background

Although some countries (e.g. Finland, Sweden, Norway) began building water supply systems in the nineteenth century (Juuti and Katko, 2005), the water supply did not enter the wider discussion before the mid-1960s (Schouten and Moriarty, 2003). According to Schouten and Moriarty (2003), a few publications of the International Reference Centre for Community Water Supply (IRC) began discussing the issues of water and sanitation in the 1960s. Since then, the issues have gradually attracted the attention of the global community and, in the 1970s, it was introduced into the United Nations' agenda.

At the end of the 1970s, the United Nations' conferences in Vancouver, Canada (1976), and Mar Del Plata, Argentina (1977), discussed the matter of low-level water supply and sanitation. Moreover, these events became a springboard from which the IDWSSD was launched in 1981 – 1990 (Feachem, 1980; Grover and Howarth, 1991). Although the decade began by focusing on the appropriate technology and investment in physical structures, it also succeeded in creating awareness of the importance of addressing the non-engineering components of water supply and sanitation. These components are vital to understanding the users and allowing the users to understand the services. Thus, external agents, including national governments, must promote the user community by providing appropriate training, building the capacity of local institutions, incorporating gender issues, and involving users in numerous aspects of projects to create feelings of ownership (UN, 1990).

The IDWSSD is better known for revealing the elements (software aspect) omitted from the development campaign for water supply and sanitation than for achieving its original goal to provide a water supply and sanitation for all by 1990. In his book, Chambers (1983) strongly advised actors of the sector to shift from thinking 'I know for you (community)' to 'what can we do together?'. Moreover, in the late 1980s, during the International Drinking Water Supply and Sanitation Consultation, the donor community and NGOs prioritized community participation as a key element necessary to improve the operation of water supply and sanitation facilities (WHO, 1987). Thus, the IDWSSD was a fundamental decade for shifting the perceptual paradigm on the delivery of water supply and sanitation services.

During the past four decades, the focus of service delivery has changed, as shown in Figure 2.1. According to Abrams et al. (1998), the 1970s were devoted to appropriate technology (the technical aspects). However, some scholars began to think beyond the logic of appropriate technology and to seek ways to sustain services (e.g. Pacey, 1977; Feachem, 1980). The overall assumption of appropriate technology was that water and sanitation problems could be solved by installing the correct technology. However, Pacey (1977) and Feachem (1980) opposed this assumption because they had observed the importance of complementary elements, such as improved positive attitudes towards services, skills for and knowledge to manage systems, and support of the community by providing continuous services.

Using appropriate technology remained a requirement in the sector's development, and the 'community management' notion, conceived during the mid-1980s, emerged and became popular in the 1990s. Abrams et al. (1998) insisted that the 1990s was the period that focused on building capacity. Numerous studies found that community-managed concepts further bloomed in that decade, as illustrated in Figure 2.1. The need for capacity-building seems to have appeared in the decade to capacitate user communities to handle the management. This was reaffirmed in September 1990 in the New Delhi Statement on the Global Consultation on Safe Water and Sanitation, which stated that community management is an additional strength of the appropriate technology of water supply and sanitation (UN, 1990).

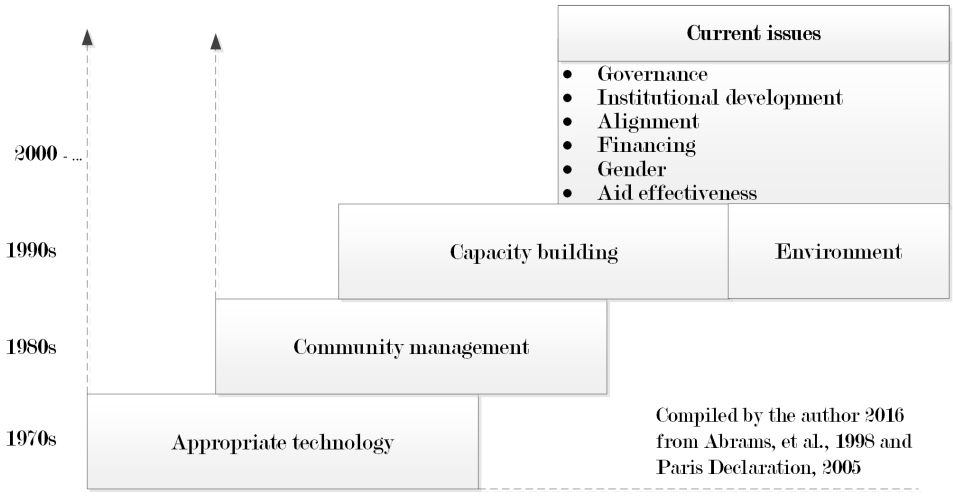


Figure 2.1: Areas of focus on water and sanitation across four decades.

Typical examples of the shift from government-centred to community-managed water supply and sanitation were observed in Kenya and some Latin American countries. During the postcolonial period, Kenya had several plans to achieve access to water supplies. One of its most ambitious targets was a plan to achieve 100% water overage by the year 2000. However, the national government understood in the mid-1980s that it was impossible

to achieve that target without the support of partners, particularly the communities (Nyanchaga, 2012). Kenya is a good example of the power of the developmental process to shift a paradigm of perspective.

The other exemplary case is community management that emerged from privatization. During the 1990s, when water privatization prevailed in world politics (Franceys, 2008), the water sector significantly suffered. In some Latin American countries, particularly Bolivia, there was public resistance to the privatization of water enterprises (Castro, 2012). Eventually, the Bolivian national government turned towards using the unity of the citizens in the opposition for better community management. In Bolivia, as in Kenya, community management emerged from the process of development.

During the 1990s, the emergence of a variety of approaches, such as the PHAST (Participatory Hygiene and Sanitation Transformation) (WHO, 1998), Demand-driven approach (World Bank Water Demand Research Team, 1993), and the participatory approach (Davis and Whittington, 1998), were ways to promote community management. Thus, the 1990s was a decade when community management became a high priority.

The new millennium has comprehensively focused in the sector. It encompasses the attention of the previous decades and further harmonizes them with the financing, integration of sector organization, gender equity in the production of the services, governance issues, and alignments (The Paris Declaration, 2005). As shown above in Figure 2.1, the areas of focus during the different decades cumulated and created the current developmental philosophies of the sector. Therefore, regardless of what was added to the developmental campaign for water and sanitation, the ultimate goal is to deliver sustainable services. Regardless of the name we give to the various approaches, if they are ways to provide sustainable services by enabling user communities to manage their systems, the objective of community management is achieved.

2.2 Key elements for community management

As described above, community management is a way to devolve the power of management to the communities that are the ultimate beneficiaries of the services. In most cases, the proportion of the population that needs new services cannot produce them. Therefore, someone should be there to help them with technical skills and financing. Thus, during support, the communities must participate to develop feelings of ownership of their systems. Moreover, communities under the same water supply scheme should act harmoniously to enable collective action because that is crucial to realizing community management. Accordingly, the important elements of community management are user participation, collective action, and community cohesion, which are discussed below.

2.2.1 User participation

The previous research suggests that citizen participation has been an issue for a long time because it has been on scholars' discussion agendas since the 1960s (Arnstein, 1969; Connor, 1988; The-North-Yorkshire-County-council, 2010; Ainger and Fenner, 2013). It is evident that user participation is an important, but insufficient, condition for solving problems of sustainability in water and sanitation services because the levels of community participation in public and community projects differ. According to Arnstein (1969), citizen or user participation depends on the body that drives the participation. The clearer the vision of the participating community, the more a sense of ownership is achieved.

Arnstein's (1969) classic citizen participation ladder discussed the subject and described the best and the democratic way to achieve community participation. The three major categories of this eight-rung ladder are shown on the left side of Figure 2.2. It begins at the least and moves up to the most desirable type of community participation. The major categories are: (1) non-participation, in which users are manipulated and participate with therapy; (2) tokenism, which comprises informing, consulting, and placating; and (3) citizen power, which enables citizens to create partnerships, delegate power, and have control. As the term 'non-participation' suggests, there is no substantial involvement to create an impact on feelings of ownership. In the second category (tokenism), the user community is approached to somewhat work together, but the community's contribution is rarely observed in the outcome. In the category of citizen control, users have full authority to do or not do things based on their preferences. Moreover, they are involved in the planning, designing, implementation, and management of their services by contributing ideas and resources.

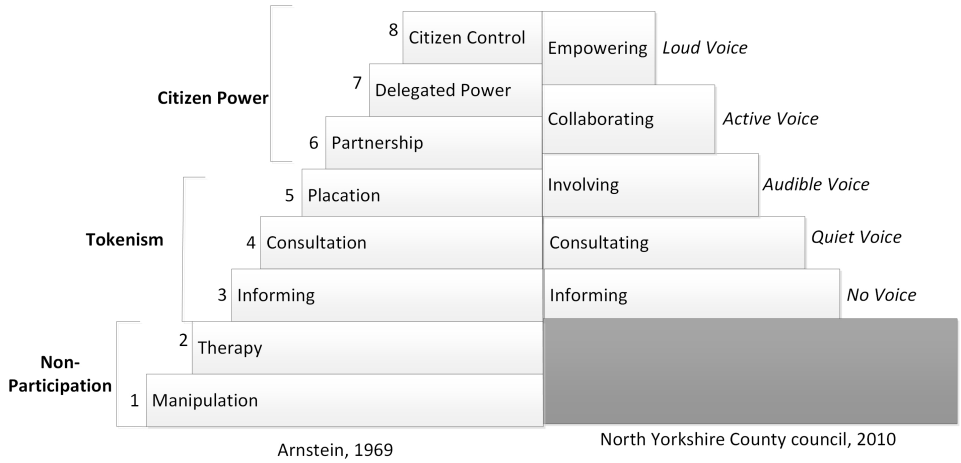


Figure 2.2: Ladder of citizen participation (Arnstein, 1969; The North Yorkshire County Council, 2010).

Recently, the North Yorkshire County Council (2010) proposed a slightly different ladder of participation using more modern terminology, which is shown on the right side of

Figure 2.2, and has fewer rungs than Arnstein's (1969) ladder. The North Yorkshire County Council ranked the elements from 'no-voice' to 'loud-voice' because participation proceeds through informing, consulting, involving, collaborating, and empowering the community. This dissertation proposes that the participation level at the top rung of both ladders is *genuine participation* because it can achieve sustainability through actual involvement of the users. On both ladders, two principal parties are involved to determine the position of a particular participation, such as a community that ultimately benefits from a project and the body that facilitates the production of the services (e.g. external agents, such as governments, partner organizations, and donors).

The role of these external agents is indispensable for handling the participation process. The objective of the primary participating community should be clear to the staff in charge of community mobilization before it engages in the participatory process. Understanding the reasons for community involvement could determine the extent of participation. Otherwise, it would be very difficult to achieve genuine participation. Thus, national and regional governments have the responsibility to deliver the goal of community involvement in projects to avoid perceptual disparities regarding the policy (Behailu and Mattila, 2016a).

Genuine community participation plays a critical part in attaining sustainable results. As mentioned above, community participation is an entry point for community management. The objective of an advocating and participating community is more about creating feelings of ownership of the system than it is about the value of the contributions during participation. Rautanen (2016, 26) agreed and described community participation as active or passive. According to Rautanen (2016), weak participation is expressed as follows.

> *"Participation can also be superficial and passive, and not give equal opportunities. It may favour those more knowledgeable about manipulating the process or those who participate over those who do not. Participation is also often discredited as a slow process, even if it is well known to instill a greater sense of ownership of the results and stronger commitment to future sustainability"*

Generally, all of the authors focused on the active aspect of community because its primary objective is to create sound community participation and feelings of ownership. In fact, participation should capitalize on the available indigenous knowledge in agreement with a traditional community to promote collective actions for sustainable services. The descriptions of collective action, community cohesion, and indigenous knowledge are presented in the following subsections.

2.2.2 Collective actions

Currently, the world is moving from societal (common) interests towards individual interests. However, in the regions where water supply and sanitation problems are chronic,

social bonds are still strong. These communities usually overcome challenges by standing together in their daily activities. For example, Ethiopians have a proverb that expresses the vitality of collective action using the metaphor of the power of a spiderweb when en masse because, although one thread of a spiderweb is weak, many of them together can achieve more things. The proverb states, 'when spiderwebs unite, they can tie up a lion'. In this old proverb, there are two extremes of power: the supposedly weak spiderweb and the strongest animal, the lion.

What is the spiderweb, what is a lion, and how does this metaphor relate to rural water supply situations? The problems in rural water supplies, such as lack of investment, lack of collective action, and poor management of systems, could be likened to the powerful lion that resists services, whereas the threads of the spiderweb represent communities, governments, and development partners. When they work individually, they are like a single thread of a web and they achieve less than their efforts and resources deserve. However, togetherness and collective action could strengthen their efforts to reduce the extent of problems in the sector. In Ethiopia, water supply and sanitation stakeholders have been working in a fragmented way without integration (WIF, 2013). Moreover, the grassroots benficiaries have developed a perception that services come from the outside, and the communities might not believe that they are potential producers of services (Katko, 1990). This practice questions the strong stands of Ethiopian communities towards collective action, which is reflected in their proverbs.

According to Ostrom (1990), collective action has two critical spheres: when common interests overwhelm individual interests and vice versa. In the first case, individuals in a group cooperate to achieve the utmost benefit of the service they aim to obtain. However, when individual interests overshadow group interests, the result is a 'tragedy of the commons', which is defined by (Ostrom, 2008) as follows: 'The tragedy of the commons' arises when it is difficult and costly to exclude potential users from common-pool resources that yield finite flows of benefits, as a result of which those resources will be exhausted by rational, utility-maximizing individuals rather than conserved for the benefit of all'. The tragedy of the commons is a disastrous side effect of collective action. It happens when every member of a group is exploiting the common resource, ignoring the needs of others, and forgetting the consequences to the shared resources. It can happen when community cohesion is loose (Harvey and Reed, 2007).

Knowing and using the available social capital is important to enhance collective action and improve cohesion in a community (Pretty, 2003). Social capital is defined by Ostrom (2000) and Pretty (2003) as a social bond, norm, expectation, and their interactions. According to these scholars, social capital is as important as physical and human capital in its value to sustainable development. When there is good social capital in a community, the transaction costs could be substantially reduced by working together, which is actually what is required of community management. Moreover, social capital could increase collective actions and decrease individual actions that adversely influence the common

rules (Pretty, 2003).

Community cohesion

In community-based management, the success of management practices for service sustainability highly depends on community cohesion (Harvey and Reed, 2007). Although Harvey and Reed (2007) argued that community participation is not particularly effective for quick successful community management, community participation is indispensable to sustainable services. As explained above, community participation expected to influence community management should be at the level of citizen control in Arnstein (1969) and of empowerment in North Yorkshire County Council (2010). Apart from the extent of participation, the size of a community influences the success of community management because small communities tend to be more cohesive than larger ones (Doe and Khan, 2004).

Community cohesion also could be influenced by social customs, political customs, gender, and leadership dynamics (Schouten and Moriarty, 2003). Schouten and Moriarty (2003) found that every community has a '*big man*', particularly where social interactions are strong. This *big man* is either an influential or traditionally accepted person, a group of persons in a community, or a dominant traditional custom. Usually, approaches introduced from the outside ignore the *big man* of a community. However, the *big man* necessarily determines the community's cohesion and collective action. Moreover, *big men* in traditional communities are directly or indirectly linked to their indigenous practices.

Indigenous knowledge

Water resources development demands that we consider a transformation of the human dimension in parallel with the advancing technologies (Pahl-Wostl, 2002). Wilderer (2004) prioritized the exploitation of the available social capital in the receiving community during the provision of services. The main purpose of collaboration with a community is to rearrange the systems to be better services through desirable institutional changes. Institutional changes tend to face resistance from the stakeholders, particularly the user beneciaries. The possible reasons for that are incompatibility between formal and informal rules of the process (North, 1990), focus on explicit factors (technologies and infrastructure), and ignoring attitude changes (Pahl-Wostl, 2002). However, traditional laws and indigenous practices are societal aspects with identities that have shaped ways of thinking and living. Therefore, communities will not want to trade their indigenous knowledge and practices for introduced ways unless adequate education is provided.

However, indigenous knowledge often is considered obsolete, despite the fact that there is much to learn from indigenous cultures in terms of human potential and tacit knowledge (Rautanen, 2016). When we understand traditional practices, indigenous knowledge of a particular society, and identify the *big man* in there, we are halfway to building successful community management and, hence, sustainable services in a community. Moreover, working with indigenous practices could be a way to develop an appropriate management

style compatible with a local situation. The traditional practices have been tested through a long process; therefore, introducing new management styles to traditional communities might be rejected because of local fears of losing the indigenous one. Thus, learning from a community's experiences during planning could enable us to develop better a management style.

To achieve community management, it is vital to target our efforts towards collective action by strengthening community cohesion and implementing technologies and management styles through contextualizing with the local situation. Economic viability, technical capacity, and spare parts supplies are crucial to maintaining good community management. These elements are discussed in section 2.3.

2.3 Sustainability of water and sanitation

2.3.1 Service levels of water supply and sanitation

Sustainability of the water supply and sanitation systems is the desired outcome of every stakeholder in the sector. A system must serve a community for its intended lifetime (design period) at full capacity (quantity and quality) (Abrams et al., 1998). Regarding water and sanitation, sustainability depends on the satisfaction of the user community and the duration of the services. The success of a water supply scheme is based on the service level provided by the scheme. The water supply service level varies from place to place depending on economic capacity and local conditions, such as climate, user behaviours, and settlement pattern. In developed countries, up to 500 litres per capita per day (lpcd) of water is used, but, in less developed countries, this figure is far too low and they are challenged to achieve even 15 lpcd (www.data360.org).

This wide gap in use could be attributed to the extent of the sanitation uses of the water. Developed countries use a signicant proportion of their water supplies for toilet flushing, gardening, car washing, and similar luxury uses. However, in developing countries, available services tend to be limited and mostly used for drinking and cooking purposes (Reed et al., 2011). Moreover, as indicated in Figure 2.3, the problem of too little water has challenged proper sanitation practices (Reed et al., 2011; Moriarty et al., 2011).

The major indicators of services are water quantity measured as per capita per day, water quality, and accessibility measured in minutes spent fetching water per capita per day (Moriarty et al., 2011). According to Reed et al. (2011), the amount of water consumed dramatically decreases when the travel and waiting time at the source exceed 30 minutes (Figure 2.4).

Thus, the sustainability of water supply schemes must be evaluated from the service level perspective. Otherwise, we cannot measure the effects of schemes and the extents of their success. Moreover, RBM should be applied to the evaluation process of schemes. The reason to mention this argument is that the functionality of water supply schemes

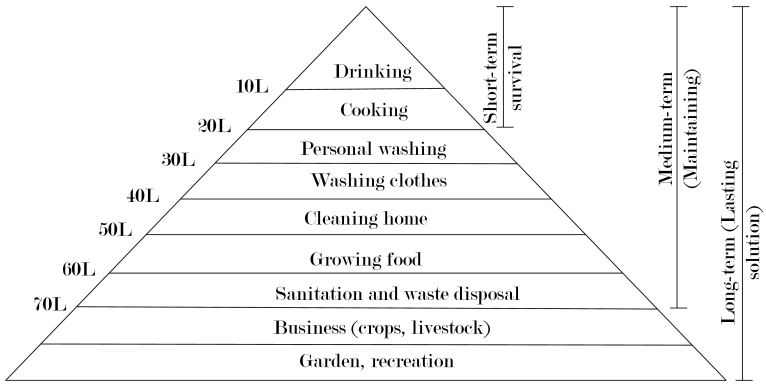


Figure 2.3: Hierarchy of daily amounts of water use with the most important uses at the top (Reed et al., 2011).

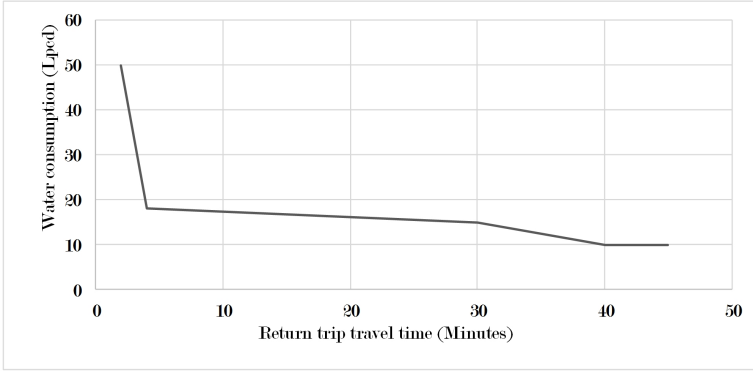


Figure 2.4: Relationship between collection travel time and domestic consumption (Reed et al., 2011).

has been found to mislead the idea of sustainability because most functionalities are not continuously measured or according to the service being provided (Lockwood and Smits, 2011). Thus, this study agrees with Carter and Ross (2016), and Lockwood and Smits (2011) that functionality and service levels define sustainability.

2.3.2 Functionality of water supply system

Most development reports aim to express the success of performance by the functionality rate of a built system. However, functionality is subject to personal biases because it lacks an unambiguous definition and criteria with which to label a system as functional or not. The Oxford Dictionary defines 'functionality' as 'the purpose that something is designed or expected to fulfill'. Therefore, the functionality of water and sanitation systems must be understood from the perspective of their service levels. However, in the context of its current application, 'functionality' cannot identify the extent to which the users benefit from so-called functional schemes.

Importantly, the timing of measurement makes functionality an unreliable indicator of sustainability. Most often, systems are only occasionally visited or evaluated. Hence, the results of these evaluations cannot identify what was in the past and what will be in the future. Lockwood and Smits (2011), and Carter and Ross (2016) pointed out that this type of evaluation is snapshot information that cannot provide information on the actual performance of a system. They unequivocally emphasised the importance of longitudinal assessments of systems' functionalities to determine whether they are sustainable or not.

Service levels, as discussed above, should be a criterion to evaluate the functionality of services. For example, beneficiaries should not be traveling to unprotected water sources when a functional water supply scheme is accessible. When people refer to 'structurally functional' as 'service functional', the logic of sustainability totally fails. Instead, system maintenance and rehabilitation should be continuous efforts to maintain the desired service level.

2.3.3 Good governance

The Oxford Dictionary defines 'governance' as 'the action or manner of governing a state, organization, etc.'. In practice, it is perplexing and difficult to have a stereotypical governance style. The world is in a state of dynamic change. Technology, climate, and behaviours are rapidly changing. Therefore, one administrative tactic cannot serve all of the people for very long. Thus, the definition of 'governance' must be broadened and expressed in terms of time and space. According to Kaufmann et al. (2011) and Kemerink et al. (2012), governance is influenced by the levels on which it will be implemented (local, national, or global), institutions, policies, organizations, and resources. Moreover, the concept of 'good governance' is widely described in terms of transparency, representativeness, accountability, and participation (Cheema and Rondinelli, 2007).

According to Stoker (1998), governance has five propositions: (1) it is a duty of institutions and actors beyond government, (2) it sets boundaries to tackle social and institutional issues, (3) it enhances collective action among stakeholders, (4) it promotes autonomous self-governing networks of actors, and (5) it is a governmental activity that steers and guides development using various techniques.

A framework for analysing the governance of infrastructure depends on numerous factors, such as policies, institutions, and actors (organizations) at the local, national, and global levels (Kemerink et al., 2012). Moreover, the collective action and advice for self-governance strongly align with the concept of community management. Accordingly, governance is beyond the concept of government. It has global, national, and local implications because the actors are different at all levels and the needs of collective actions come in a variety of forms (Kaufmann et al., 2011).

Although governance is discussed above in general terms, governance in the water sector has the same basic principles. According to Bakker (2003) and Rogers and Hall (2002), water governance is defined as follows.

'Water governance refers to the range of political, organizational and administrative processes through which communities articulate their interests, their input is absorbed, decisions are made and implemented, and decision makers are held accountable for the development and management of water resources and delivery of water services'.

In Seppälä's (2004) framework, shown in Figure 2.5, governance is illustrated using a set of eight elements. The framework was designed to apply to governance of a water supply service and, for this study, it was modied to fit the community management aspect of water supply services. Thus, five of the eight elements, which are shaded in grey in Figure 2.5 , directly or indirectly link to community management.

Figure 2.5: Characteristics of good governance (adapted from Seppälä, 2004; Rogers and Hall, 2002).

The five shaded sections of Figure 2.5 above are elaborated below regarding their contributions to community management and, hence, sustainable services. These elements are worth mentioning to explore the ways that good governance strengthens community management, particularly from the perspective of water supply and sanitation services.

Participatory, communicative, and inclusive: As discussed above and pointed out by Stoker (1998), there are many actors in water supply and sanitation development. The communities that benefit from services are particularly prominent in participation during planning and implementation. In this regard, no one should be excluded from services because the major target of good governance is improving the lives of all citizens. Moreover, it is important that stakeholders act collectively and with extensive trust

and cooperation. Thus, external agents should be committed to get the stakeholders participate with transparent procedures.

Consensus oriented: A participating user community aims for consensus among the actors and the community and among the members of the community. Individuals and the user community generally must understand the objectives of the services and their roles in the implementation and post-implementation management of the services. This should eliminate confusion that could lead to the mismanagement and frustration of the users.

Responsive: This element was emerged as the world shifts from a supply-driven to a demand-driven approach. The national government should listen to the citizens' voices and respond to their requests. In some cases, the citizens might not be aware of the importance of water and sanitation services. In these cases, the government is responsible for educating the people to generate demand.

Equitable: Equity is a critical concern that can boost community management. The services must be distributed equitably, and distribution must consider the access of all of the community members. Moreover, the most vulnerable people, disables and women, should be involved in decision-making to maintain equitable services.

Effective and efficient: To provide sustainable services, effective and efficient project performances are vital. Developing countries mostly depend on donor aid for infrastructure, particularly for water supply and sanitation investments (Lockwood and Smits, 2011). Effective and efficient uses of resources could enhance the quality of services and water coverage. Accordingly, The Paris Declaration on aid effectiveness affirmed the partner countries' and donors' commitments to each other's values (The Paris Declaration, 2005). The Paris Declaration states: 'Partner countries exercise leadership in developing and implementing their national development strategies and coordinate to improve development outcomes; donors respect partner country leadership and help strengthen their capacity to exercise it'. The donors' role is to support the policies, strategies, and procedures of the partner countries.

When we apply the issue of aid effectiveness at the community level, the money allocated to the provision of services should be used to maximize the service level that reaches the rural communities. Otherwise, sustainability is a nightmare because the users are fetching part of the domestic demand from unprotected sources.

2.3.4 Spare parts supply

When the responsibilities for O&M are vested in a user community, the provision of spare parts must be facilitated in advance. Community-managed water supply remains crucial in the rural regions of the world, particularly in sub-Saharan Africa. Moreover, the usual water supply technology of these countries is the hand pump, which is liable to frequent breakdowns and for which it is difficult to find spare parts (Lockwood and Smits,

2011). All of the sub-Saharan countries studied by Lockwood and Smits (2011), including Ethiopia, have faced challenges obtaining spare parts and establishing sustainable supply chains. However, Harvey and Reed (2004) clearly pointed to spare parts as a critical element to building a sustainable block of water supply in Africa. Moreover, technological options for water supply and sanitation services should be assessed from the perspective of spare parts' availability and access (Brikké and Bredero, 2003). Thus, sustainable spare parts' supplies are requisite to sustainable services and actors must ensure their presence so that rural communities can manage their systems.

2.4 Result based monitoring and evaluation

This section does not cover the details of RBM; instead, it describes RBM principles and explains how RBM is used to determine the success of water supply and sanitation projects. The RBM model was developed to enable the successful performance of organizations (Kusek and Rist, 2004). Its main goal is to ensure that the activities performed under certain projects or programmes have satisfied their intended goals, harvested the possible outcomes, and achieved remarkable impacts on the lives of the beneciaries. In simple terms, the goal is to focus more on the services produced than on the activities performed. It is worthless to measure implemented activities and infrastructure unless they provide the basic services for which the projects were designed.

Construction of the numerous components of a water supply project cannot be an outcome by itself; instead, the services that reach the target beneficiaries and the effects of those services are the most important achievements of a given project. Therefore, planning should relate to the overall effects of the activities, and performance should be evaluated the other way around (Figure 2.6). Projects should be evaluated and monitored from the planning perspective. However, achieving the activities must be evaluated using the output and the output according to the general outcome and, thus, the achievement of the goal is understood from the perspective of its impact on a community. For example, building a water point of access could be considered an output of certain activities, but the outcome enables a community to fetch sufficient potable water. The goal clearly intends to create a healthy environment. Thus, to be healthier, the people who benefit from a system must manage their water system and understand the reasons for the provision of a water scheme. The produced services must be sufficient so that users will not rely on unprotected water sources. Moreover, the sanitary situation of a particular community should be good to keep the water supply systems uncontaminated.

2.5 Problem formulation

After the IDWSSD, the institutional aspects of water and sanitation services received more attention (Kemerink et al., 2012). However, the world still seems to focus on the implementation of infrastructure. This focus might be manifested in the failure of services

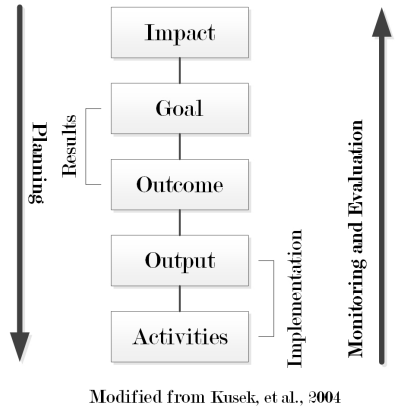


Figure 2.6: Result-Based Monitoring and Evaluation (RBM) procedures.

and the lack of adequate reactions to those failures. For example, in developing countries, the non-functionality of water supply systems is estimated as high as 50%, particularly regarding hand pumps (Carter et al., 2010). It is clear that, in the production of water supply and sanitation systems assisted by national governments and partner organizations, it is very difficult to have adequate staff to repair every service failure. Therefore, the users are expected to play an active part in the O&M of their systems.

To reach the target of assigning the user communities feel ownership and responsibility for operating their system, signicant efforts have been devoted to the sector. However, successes have not exceeded the challenges. Therefore, experts continue to advocate for community involvement in the implementation of systems from the beginning of projects. On the other hand, reports have noted that non-functionality is a frequent problem in water supply and sanitation services in most developing economies. To move forward, sufficient attention should be given to the management and implementation of new systems, which must be linked to the involvement of the user communities.

Arnstein's (1969) concept of community participation has been interpreted in numerous ways, from manipulation to empowerment of communities. Moreover, community participation is common in community-managed systems or similar components in a variety of development programmes that eventually might fail to achieve a sense of ownership in the community. Thus, this study emphasises the problem of having social components in principle that fail to be discharged in an appropriate manner.

2.6 Summary

The issues of sustainability are diverse and complex. Economic, social, and environmental factors are the most important, but insufficient, conditions. Good governance should accompany the above-mentioned factors of sustainability. For example, system management must be conducted by the user communities, which need quite competent governance to

empower and promote community management.

Community management has been a requirement of sustainable services since the 1990s. It is relatively more appropriate to developing countries with high proportions of rural populations. The involvement of user communities is important because services need significant continuous monitoring and follow-up. The communities are the direct beneficiaries, and they are proximate to their systems; therefore, it is easier for the user communities to manage their systems than to employ external support in terms of time, resources, and commitment.

However, community management cannot easily be established because the challenges are diverse. Although residents in a community have many things in common, each one has a different interest in and understanding of the service. These disparities could weaken community cohesiveness and, in turn, the collective action required of them. On the other hand, external agents working in the sector might not understand the social capital and good practices of the indigenous knowledge of a particular community. Thus, actors in the sector need design mechanisms that involve users to counteract the challenges of community management. User participation is expected to achieve a cohesive community, particularly regarding the management of water systems.

What are the practices of resistance in Ethiopia regarding water supply and sanitation that involve communities? What challenges are retarding the development of the sector, and what can be done to improve the overall sector's performance? These questions are answered in the following chapters. The next chapter describes the context of the study area and explains the research approach and methods used in this study.

CHAPTER 3

DESCRIPTION OF THE STUDY AREA AND RESEARCH METHODOLOGY

The first part of the chapter describes the study area, administrative classifications, governmental structures responsible for water supply and sanitation, the urban and rural proportions of the population, and some other vital background information of the study. The second part of the chapter discusses the research methodology, including the research approach and the methods used.

3.1 Description of the study area

Ethiopia is the second most populous country in Africa, with a population of about 100 million (World Population Review, 2016). Its official name is the Federal Democratic Republic of Ethiopia. As shown in Figure 3.1, it is located in the Horn of Africa. It borders Eritrea in the north and northeast, Sudan and South Sudan in the west, Kenya in the south, Somalia in the southeast, and Djibouti in the east. The country is located at geographic coordinates $33^0 01' 9.814" - 48^0 00' 47.318" E$ *and* $3^0 21' 30.825" - 14^0 55' 20.582" N$. Across its territory, the country has elevation variations of more than 4650 m and, hence, a variety of climatic conditions. The lowest elevation in the country is at the Danakil depression, which is 125 m below mean sea level (msl) (NMA, 2013), and the highest point of elevation is 4533 m above msl at the Peak of Ras Dashen Mountain.[5] Thus, the temperature differences in the country are wide, ranging from temperatures near zero to more than 40 degrees celsius (NMA, 2013). This wide temperature range significantly influences water occurrence and use because the weather pattern influences water demand (Dharmaratna, 2011).

3.1.1 Demography

Because the focus of this study is rural water supply and sanitation services, this section describes the rural proportion of Ethiopia's population. Of the population of the country,

[5] http://insideethiopiatours.com/tour-packages/nature-trekking-tours/

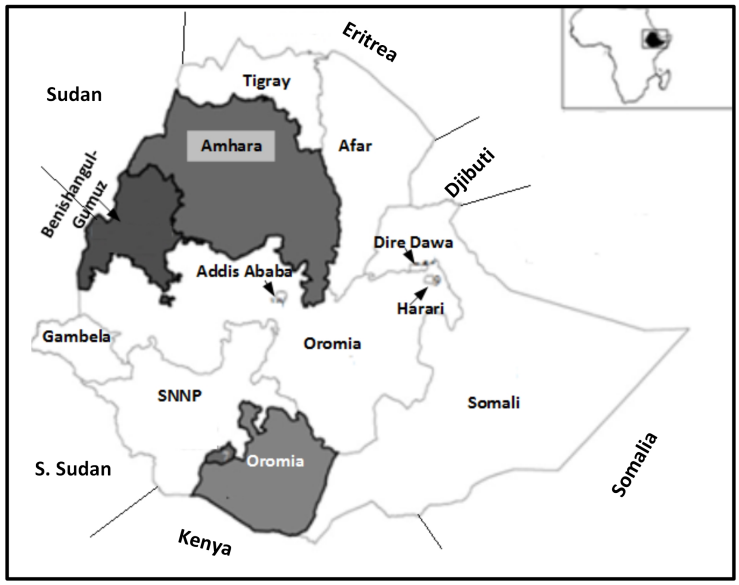


Figure 3.1: Map of Ethiopia and the study areas (dark colour).

100 million, 84% live in rural areas (CSA, 2010). As illustrated in Figure 3.2, rural residence is proportionally higher in every region of the country. Thus, national plans and strategies that target enhanced national development should be based on the needs of the rural population because any success obtained without the rural areas would be insignicant to overall achievement.

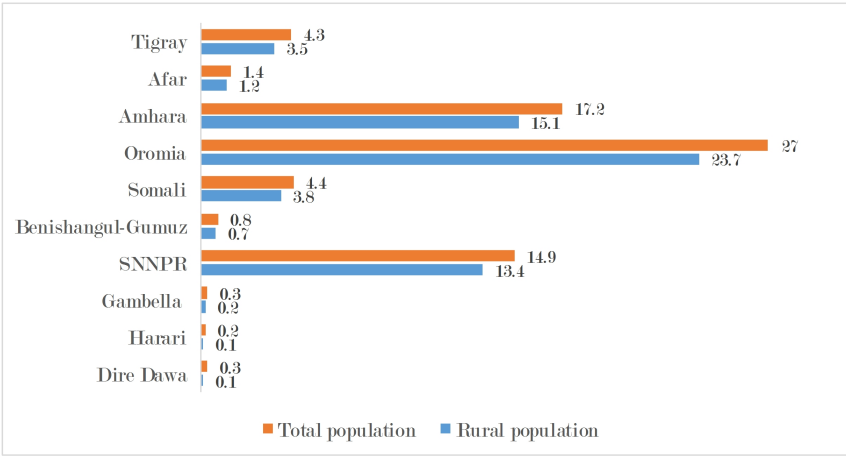
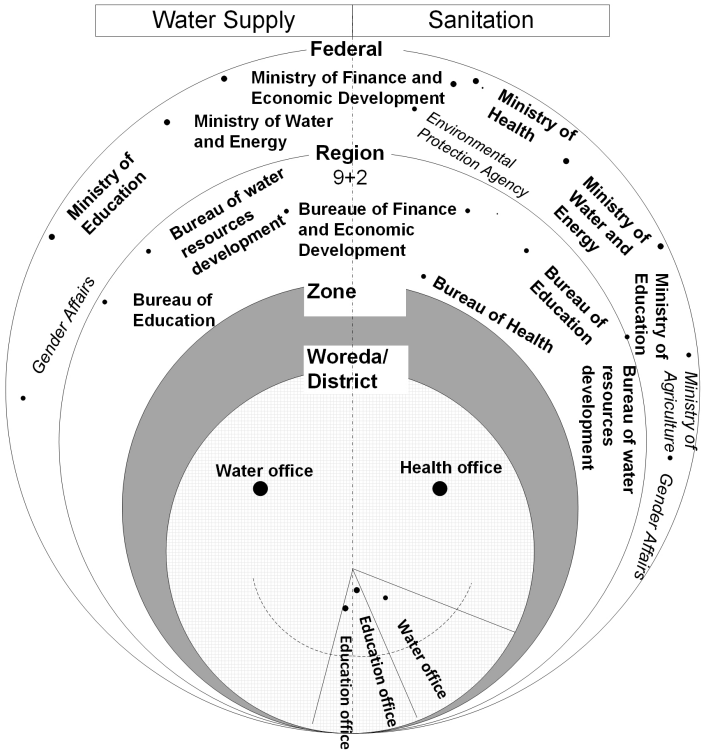


Figure 3.2: Total population (in millions) and rural proportions of regions of the country in the 2007 national census (CSA, 2010).

3.1.2 Administrative structure of Ethiopia

Ethiopia has nine regional states: Tigray, Afar, Amhara, Oromia, Somali, Benishangul-Gumuz, Southern Nations Nationalities and People Region (SNNPR), Gambella, and Harari, and it has two city administrations (Addis Ababa city administration and Dire Dawa city council) (Figure 3.1 above). Regions are often listed numerically in the above-stated order. The national regional states and the two city administrative councils are further divided into 800 woredas (districts) and, further, into about 15,000 kebeles (the smallest administrative unit) (Ethiopian-Government-portal, 2016).

The governmental administrative hierarchy flows from the federal government to the regional governments and, from there, to the zonal administrations, districts, and kebeles. Hence, development activities are linked hierarchically to counterpart offices and ministries across the structure. The governmental bodies responsible for water and sanitation services in the water supply and sanitation sector are discussed below.



- The partition of the circle that represents the district shows the relative roles of water supply and sanitation offices. They are not to scale.

Figure 3.3: Governmental structures and WASH stakeholders.

As shown in Figure 3.3 above, numerous ministries at the federal level are currently responsible for water and sanitation. In a recent memorandum of understanding entered into in 2013, the Ministry of Water and Energy, Ministry of Education, Ministry of Health, and Ministry of Finance and Economic Development agreed to act on Water

Supply Sanitation and Hygiene (WASH) activities through cooperation and integration (WIF, 2013). After a series of multi-stakeholder forums, a new platform was established with this harmonization process for one WASH (OWNP, 2014). The harmonization agreed upon by the four ministries was intended to achieve effective action without duplicating resources as per the memorandum of understanding signed after the WASH Implementation Framework (WIF). The WIF document revealed that each ministry had been independently working in the area of water supply and sanitation development and that they had sometimes invested in the same area without coordination. However, to achieve water supply coverage and sanitation services, some other relevant agencies and ministries should enter the memorandum of understanding. For example, the Ministry of Agriculture should be part of the sanitation campaign because of the interest in applying composted faeces from dry toilets as fertilizer (Behailu, 2015). Moreover, the Gender Affair Office should actively involve itself in the development of water supply and sanitation services because women perform most of the work involved in water and sanitation, which is the case in rural and urban areas alike.

In Figure 3.3, the ministries currently involved in the water supply (at left) and sanitation services (at right) are bolded and in the outermost circle. The Ministry of Finance and Economic Development and its regional counterparts are located on the dashed line that divides the left from the right side because their role is to facilitate the financing of for both activities.

The next circle represents the regions and administrative cities. These entities have the same responsibilities for the relevant activities in their regions or cities as their counterpart ministries have at the higher level. The third circle, which is shaded, represents zonal administration. The zonal structure is not as active as district regarding development because it is more of administrative structure. For example, districts rely on regions more than on their zonal counterparts for recruiting and budgeting. The zonal offices support the development of water supply and sanitation services when the projects are commissioned by the mandate of the zonal water offices.

Regarding rural water supplies, districts are the nuclei of services. As stated above, the rural population is the majority of the country and the district water offices are responsible for arranging the production of services, except in cities and towns. Thus, the districts are the key governmental entities regarding rural water supplies.

Sanitation at the district level is organized differently than it is at the higher levels in the hierarchy. Health offices perform sanitation services and water offices are devoted to water supply. The education office is involved in the sector's development to provide water supply and sanitation facilities to schools. Here, partner organizations and NGOs are not mentioned because it is assumed that they work in harmony with their corresponding governmental organizations, which have particular objectives for them.

3.1.3 Water resources

Ethiopia is known as 'the water tower of East Africa' because of the nature of the flow in its river basins. All basins, except for the Awash basin, flow radially out and across the national borders. On the other hand, Ethiopia receives no incoming flow from adjacent countries because of its higher elevation in the central part of the country that gradually declines towards the borders. The river flows are illustrated in Figure 3.4.

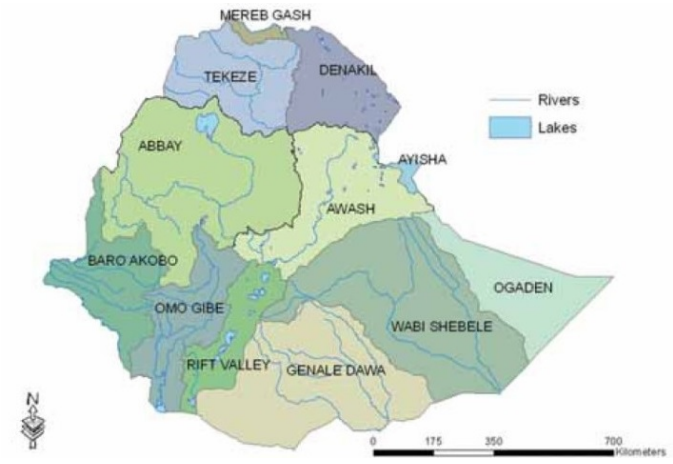


Figure 3.4: Ethiopian river basin map (Awulachew et al., 2007).

Ethiopia has 12 river basins: Abbay (Nile), Awash, Ayisha, Baro Akobo, Denakil, Genale Dawa, Mereb Gash, Ogaden, Omo-Gibe, Rift Valley, Tekeze, and Wabi Shebele. The rivers' potential as water resources decreases from west to east. Thus, Ethiopia has abundant water resources, with per capita renewable freshwater resources from 9 of the 12 river basins estimated at 1,900 m^3/year (ADF, 2005). The surface water flow is 122 billion m^3 and the quantity of annual groundwater is estimated at 2.6 billion m^3 (Awulachew et al., 2007). The estimated per capita annual water resources can rank the country water as 'stress free' according to Falkenmark Widstrand's (1989) indicators (as quoted in Perveen and James, 2011). Although water resources are abundant on a national scale, few services have been developed for domestic water supplies and other uses (Awulachew et al., 2007). One reason might be the settlement distribution of the population relative to the available water resources. According to ADF (2005) report, about 85% of the country's water resources are in the west and southwest of the country where approximately 40% of the population lives. The rest of the population lives in water-scarce areas where only about 15% of the country's water resources are located.

3.1.4 Types of rural water supply schemes in Ethiopia

Generally, about 75% of the rural water supply of sub-Saharan countries is accessed via hand-dug wells and on-spot spring development (WHO/UNICEF, 2014); the rest are gravitational distribution systems from springs, motorized systems from sources at low

elevation, and deep wells. Thus, the concern regarding the rural water supply is the fragmented small-scale water supply schemes and their management strategies. In India, the largest groundwater user in the world, it is estimated that 85% of the drinking water is groundwater dependent (Livingston, 2009). In sub-Saharan Africa, about 60,000 hand pumps are installed each year (Sansom and Koestler, 2009).

It is unclear how much of this extraction is performed using hand pumps or how many hand pumps are installed each year. However, it is evident that across sub-Saharan Africa, and much of Asia, but particularly in the former, hand-pumped water supplies will continue in the near future as a major component of rural water services.

Numerous technologies are used for water supplies, but sophisticated technologies are used only in urban areas and a few rural areas where piped systems are apportioned to a group of villages. In rural areas, water usually is supplied in a decentralized manner and via small-scale schemes. Thus, the rural water supply is technically straightforward, but it can be complex work for the government and its partner organizations because a great deal of work is required to address the varying needs of the rural population (84% of the total population).

In rural Ethiopia, improved water sources include hand-dug wells, springs, boreholes, and rainwater harvesting. However, the dominant scheme in the study area is hand-dug wells with hand pumps. This is somewhat due to the rural settlement pattern. In the 2013 national plan, about 54% of the schemes are hand-dug wells or shallow wells operated with hand pumps (OWNP, 2014, 176-177). In the second Growth and Transformation Plan of Ethiopia (2015/16 – 2019/20), about 24% of the expenditures to rural water supplies were earmarked to conventional hand-dug wells and shallow wells (GTP2, 2015, 35). Lockwood and Smits (2011) studied 13 countries, including Ethiopia, and found that the dominant technology of water supplies was hand-dug wells with the hand pump. Therefore, the term 'hand-dug well' as used herein represents hand-dug wells or shallow wells operated with hand pumps.

3.1.5 Water and sanitation implementation approaches in Ethiopia

Although the commitment of the national government since the 1990s has been positive, some aspects of the sector need to be improved. The institutional arrangements are not yet fully established (Behailu et al., 2016b). In Ethiopia, the woreda (district) is the smallest governmental structure serving rural communities. Although water departments at the district level are devoted to implementing and facilitating water supply systems, they do not have a way to attract and retain technical staff (Behailu et al., 2016b).

The water department at the woreda level was established in 2003 as the water desk, but it has been placed under different offices at different times. This movement has had an influence on the organization of activities and extent of skilled labour required. The water desk was under the agricultural and rural development office, but, after a while, it was

moved to natural resources. Finally, it became an independent office. One possible reason for the movement of the water desk (now, the water office) is that there were changes at the national level regarding the names of ministries and the occasional introduction of new ministries. For example, during the past two decades, the Ministry of Water and Energy was renamed several times: It was the Ministry of Water Resources (2007), the Ministry of Water and Energy (2010), the Ministry of Water, Irrigation and Energy (2012), and, most recently, it was named the Ministry of Water and Electricity (2015). These name changes created turbulence in the organization of the institutions at the regional and district levels, which, in turn, might have lowered the effectiveness of the services. Although these changes permeate the overall system and are continuing, careful prior studies are needed to avoid an adverse effect on the development of the services.

The introduction (section 1.1) explained that water supply implementation approaches in Ethiopia are categorized as: CMP, WMP, NGO-MP, and self-supply. Since one of their differences is funding flow, Figure 3.5 illustrates the funds flow and services arranged in each approaches except for self-supply.

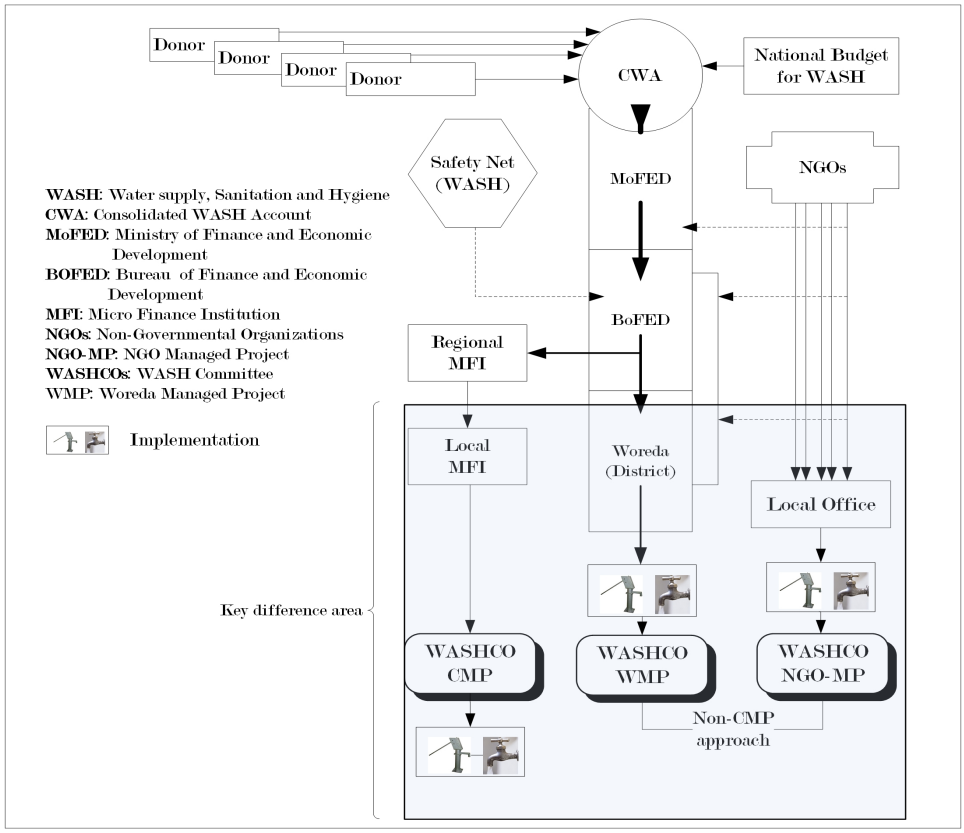


Figure 3.5: Funding flow of the Ethiopian WASH system (adapted from WIF, 2013).

Figure 3.5 illustrates that the funds for CMP and WMP are assumed to come from donors and the national treasury. The funds from donors and the national budget are

deposited into a Consolidated WASH Account (CWA) and then transferred to the Regional Bureau of Finance and Economic Development (BoFED) through the Ministry of Finance and Economic Development (MoFED). The transfers of funds are based on the annual regional plans to implement WASH facilities. However, the funds go to the Micro-Finance Institution (MFI) at the regional level in the case of CMP, whereas WMP continue to use funds from the governmental financial sources. NGOs follow a different path to reach the communities. In the cases of WMP and NGO-MP, schemes are implemented and handed-over to the user communities, whereas, in CMP, the resources for implementing the schemes are transferred to the communities and technical support is provided to support service production (Figure 3.5) before construction. Because WMP and NGO-MP are similar regarding financial administration and involvement of user communities, this study grouped them together and refers to them jointly as a 'non-CMP approach'. Thus, as Figure 3.5 above illustrates, this study analysed CMP and non-CMP approaches as the major implementation approaches in Ethiopia. Because self-supply is an approach implemented by individuals or groups of households, this study does not include it in the analysis.

3.1.5.1 The CMP approach

CMP is a relatively new idea in the water supply and sanitation services of Ethiopia. It is the renamed previous similar approach, CDF, which was operated from 2003 to 2010. The two approaches are technically similar, except for the change of name agreed on by numerous stakeholders during the sector's harmonization process (WIF, 2013). Although it has been operating only a few years, the approach has gained popularity in the regional and federal governments (Behailu et al., 2015).

The CMP documentation and field observations state that the approach has ten steps that yield sustainable services when thoroughly followed (Figure 3.6): (1) funds are committed, (2) a financial channel is established, (3) approach promotion, (4) the user community organizes and plans, (5) trainings and private sector development, (6) approval, (7) community contributions, (8) construction funds released, (9) construction, and (10) completion.

The strengths of the CMP principles are to empower the user community to produce its own services and to create an environment friendly to sustainable services through the user community's control. As described above (Chapter Two), solutions should involve all stakeholders, particularly the beneficiaries of services. Therefore, community involvement in all stages of a project could create a way to ensure ownership and, hence, sound post-construction system management.

Primarily, the approach has a good understanding of the initial investment support in the rural areas of the country. Therefore, the first and most important step establishes reliable funding sources. To date, funds have been contributed by the national government and partner organizations (Behailu et al., 2015). The next step is to create a financial channel

easily accessible to the rural user community. CMP considers MFI and credit and savings associations as strong allies for easy and efficient financial transfers. In Ethiopia's rural areas, MFIs are more accessible than banks (Behailu et al., 2015, 390-391). Moreover, during a credit relationship, the collateral demanded by MFIs is affordable for the community, which is unlike banks.

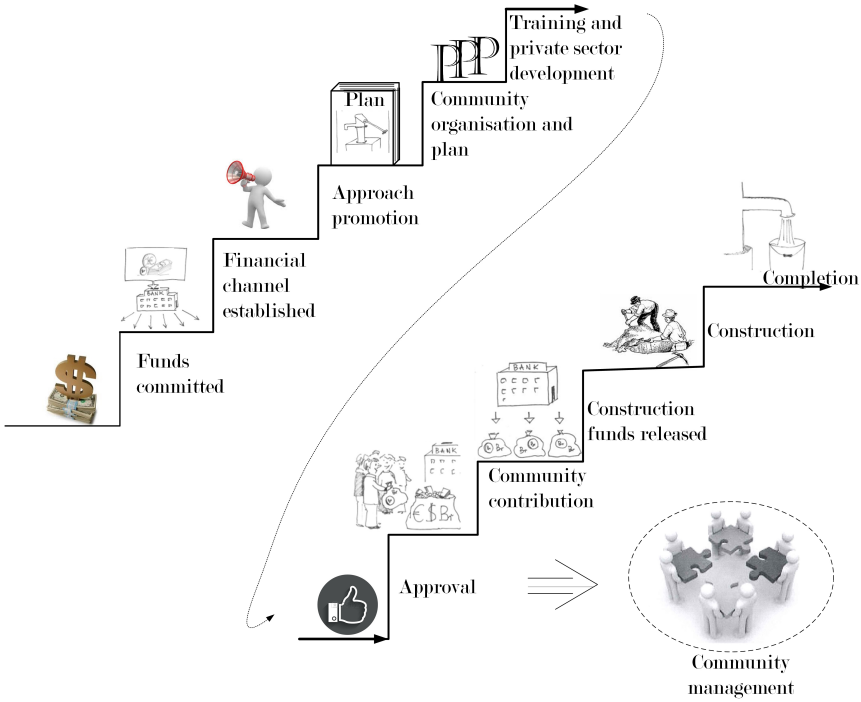


Figure 3.6: The ten steps of CMP (adapted from Butterworth, 2012).

The third step shown in Figure 3.6 above is promotion. Once funding has been secured and the financial channel is securely in place, the user community is informed of the services and the way that the community is expected to be involved in producing the services. This part of the process complies with the growing interest in the demand-driven approach. In some cases, the rural user community might not realize that they have been fetching unprotected water because they are obtaining their water from a river or spring that appears clean (Behailu et al., 2016b). In these cases, the essence of community management would not be achieved until the user community is educated, encouraged to develop a demand for the services, and genuinely involved in the service production.

The fourth step is crucial to develop community management. The user community must organize and begin planning the service projects. Representatives of the community and the Water Supply, Sanitation and Hygiene committee (WASHCO) are elected at this point. The composition of WASHCO is designed to increase the proportion of women on the committee because they are more vulnerable than men to water and sanitation problems. Training and capacity development are followed by community organization.

This step in the process are logically placed in the correct order. When the interest is to empower the community, that interest should be more than a principle; it should include a commitment to improve the users' capacities. Thus, training before beginning construction is a logically acceptable way to develop sustainable skills and master them during the implementation of the project. At this point, local artisans are trained to be involved in the construction of the water supply schemes and to provide support for gaps in O&M in terms of technical skills.

When the user community has achieved organization, and capacity training has been provided, and the village has fulfilled the requirements, and the community representative requests a project for the village. The application for a project passes through desk and field appraisals (Figure 3.7). During the desk appraisal, the procedural requirements are evaluated. One requirement in the CMP approach is that every household in the requesting community should has a toilet. Moreover, before approving the requested project, the local government determines whether another water supply project is being planned. For example, if the government or an NGO had a plan to implement a water supply project in the requesting community, CMP would not fund it to avoid duplicating resources. Another concern evaluated during the desk evaluation is the community's willingness to upfront invest a stated amount of cash to cover the O&M costs for at least for one year. Therefore, the community must demonstrate its willingness to commit to the project by depositing cash earmarked for the project into a MFI account.

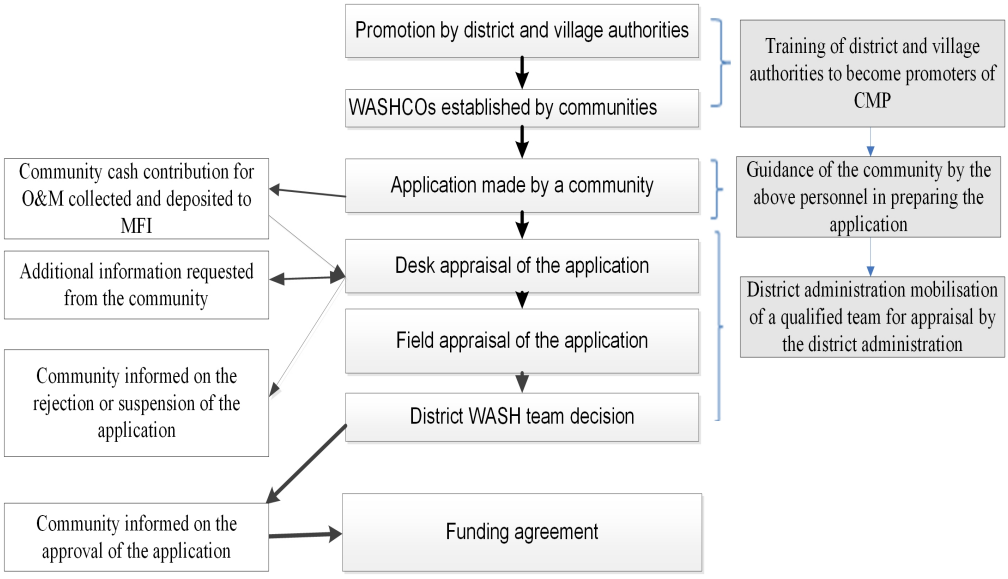


Figure 3.7: CMP project cycle at preparatory phase (Suominen and Urgessa, 2004).

The second stage of the appraisal is conducted in the field. In the field appraisal, all members of the community and the assigned water office experts are involved in selecting the site for construction. Community involvement intends to create feelings of ownership

of the project by avoiding discomfort about the location of the water point of access from the accessibility and technical perspectives.

Because CMP's primary objective is to boost community management, the step after project appraisal concerns entering an agreement with the community and releasing the construction funds. The funding directly flows to the community's bank account and the community representatives are responsible for its distribution. Moreover, in CMP, the community representatives are project managers responsible for contracts related to the project and procuring the construction materials. The district WASH Team (WWT) and the water offices coordinate and supervise the project's implementation. In some cases, WWT is delegated on behalf of WASHCO to procure the materials to be purchased from afar and that require high technical ability.

Artisans trained to deliver technical services participate in the construction of the water supply projects. With the exception of large-scale projects, in which drilling is done with machines, the contract work is given to local contractors (artisans). Because all of the activities in the CMP approach are performed with the active involvement of the user communities, there is no procedure to hand-over scheme unlike non-CMP approach. The ultimate objective of CMP is to realize collective action by the community in the management of the system during the pre- and post-construction periods. Thus, as illustrated above in Figure 3.6, the outcome of the ten steps is expected to be coherent and collective action regarding the common services. This section has described and explained the CMP steps, most of which was derived from Butterworth (2012), CMP project documents, and WIF.

3.1.5.2 WMP and NGO-MP Approaches

WMP and NGO-MP are considered conventional water supply and sanitation service provision approaches.

Woreda Managed Project (WMP): 'The distinguishing feature of WMPs is that the Woreda WASH Team, WWT, retains the responsibility to administer the funds that are allocated to a kebele (the smallest unit of local government in Ethiopia) through a grant agreement for capital expenditures on water supply. Although the kebele Administration, WASH Committees (WASHCOs), and institutional WASH committees are directly involved in project planning, implementation, monitoring, and sign-off, the WWT is the Project Manager and is responsible for contracting, procurement, quality control, and hand-over to the community. The constructions of WASH facilities are supervised by relevant experts from pertinent offices in order to monitor costs and ensure to fulfill criteria of quality and sustainability' (WIF, 2013).

NGO Managed Projects: 'Non-Governmental Organizations are the major stakeholders in the National WASH Program as nanciers, implementers, and innovators. Their funding and project management arrangements with communities vary considerably across organizations. In concert with national WASH principles and practices, they foster

community initiative, develop community leadership, and require community investment in water point projects. In some instances, the supporting NGO administers external resources on behalf of the community (as in WMPs). In other instances, they make external resources available to the community directly or through a micro-nance institution for user-group project management (as in CMPs). NGOs have great exibility and are able to pioneer other possibilities to increase community initiative, ownership, and accountability' (WIF, 2013).

3.1.5.3 Self-supply

WIF pointed to self-supply as an approach to water and sanitation services in Ethiopia (WIF, 2013). Based on WIF (2013), self-supply is defined as the production of water supply systems without subsidy. Because these systems serve few households, the technologies used are simple and affordable, including hand-dug or manually augured wells and rainwater harvesting from small catchments. The government's involvement in this approach is generally of a technical nature.

3.2 Research methodology

Sustainability of rural water and sanitation services comprises numerous factors that are measurable and non-measurable, technical and non-technical, and social. Therefore, in this study, numerous aspects, such as implementation cultures of different approaches, user perceptions, the influences of traditional customs on modern management, and other dimensions of the services were included. In other words, the research addressed social as well as technical aspects of the services. Thus, two research approaches, qualitative and quantitative, were employed. Moreover, case studies on traditional water management were conducted. The details of these approaches and the methods used are discussed below.

3.2.1 Pragmatic approach

The main approaches of scientific research are either qualitative and quantitative, and many scientific articles have discussed mixed-methods approaches to research (Bryman, 2006; Creswell, 2013). Most scholars discuss the appropriateness of mixing qualitative and quantitative approaches. However, studies have found that scientific communities do not establish the best ways to combine these approaches. According to Bryman (2006), about 60% of research articles used a mixed method. Moreover, a single discipline or approach cannot address the complexity of water management (Hukka et al., 2007).

The distinctive characteristics of these approaches are in the nature of the connections between theory and data and between research process and inferences from data. In particular, the argument against a mixed methodology is whether the goal of a study is objective or subjective. Qualitative approach is subjective by nature, and it infers

contextually, whereas quantitative approach is objective and the inference is generalizable (Marshall, 1996). Moreover, quantitative approach is to explain, simplify, deal with differentiation between science and personality, whereas qualitative approach focuses on understanding, problem orientation, and deal with similarities between science and personality (Andersson, 1982, as quoted in Hukka et al., 2007). These opposing characteristics of research approaches could hardly be integrated into a mixed method. However, Morgan (2007) concluded that scientific research has no self-contained process; instead, researchers should have the flexibility to go back and forth between subjective and objective. Hukka et al. (2007) described the limitation and inadequacy of positivistic approach to explain the complexity of water management. Morgan (2007) described mixed methods as a pragmatic approach. Moreover, Sandelowski (2000) recommended mixed-methods research for its potential value to expand the scope and analytical power of a study. To affirm Morgan's (2007) conclusion, Sandelowski (2000) pointed out the importance of the qualitative and quantitative approaches as supportive of each other. In fact, the position of the researchers should be properly delineated when using qualitative approach because it is subjective to personal bias (Axinn and Pearce, 2006).

This study used the pragmatic approach. The purpose of the pragmatic approach is to boost the completeness of a study (Bryman, 2006; Creswell, 2013). Bryman (2006) indicated that triangulation is an advantage of using the mixed approach. In triangulation, a theoretical idea is crosschecked using qualitative and quantitative evidence. In the case of this study, community management is the central theme and sustainability is the target for community management in the field. In the investigation of satisfaction with services, it was vital to carry out a semi-structured questionnaire to collect data on the community's reaction to the management of the water systems, to conduct focus group discussions with a variety of stakeholders, and conduct case studies on traditional water sources management.

Sampling: Of the nine regional states of the Democratic Republic of Ethiopia (Figure 3.1), Amhara and Benishangul-umuz were the only regions with CMP approaches in place during the data collection period. Moreover, the research focus was on CMP because it was about community management, which is signicantly different from the other implementation approaches in rural Ethiopia. Therefore, those two regions were selected. Because CMP was not implemented in every district of those regions, the districts that had CMP were the focus of the study. Accordingly, four districts in Amhara and three districts in Benishangul-Gumuz were selected. Moreover, climatic characteristics in the districts were an additional criterion of the sample selection so that districts in the highlands and districts in the lowlands were analysed. Table 3.1 provides details of the sampled districts, the numbers of water supply schemes, and numbers of households surveyed. In Benishangul-Gumuz, the data collection was performed over four weeks in November and December of 2012, and data were collected in Amhara region over 10 weeks in December 2013 and June 2014.

The sampling had three important steps following 'Multilevel Mixed Methods Sampling' by Teddlie and Yu (2007). The first step was purposive sampling to select the districts that had different implementation approaches (including CMP), the second step selected a cluster of water points of access from the selected districts, and, third, households were selected for the survey from the cluster of households. This procedure strongly agrees with Deaton (1996).

Table 3.1: Sampled districts, numbers of water supply schemes, and numbers of surveyed households.

Region	District	Number of Water schemes	Number of households
Stage one		Stage two	Stage three
Amhara	Dega Damot	20	154
Amhara	Guangua	27	372
Amhara	Fogera	32	224
Amhara	Misrak Estie	27	216
Benishangul-Gumuz	Mandura	25	298
Benishangul-Gumuz	Dibate	17	203
Benishangul-Gumuz	Pawi	31	339
	Total	179	1806

In addition to the above-described sample, case studies were conducted on traditional water systems management practices in two communities in the southern part of Ethiopia, as shown in Figure 3.1 above. These communities were Borana and Konso, which are known for their solidarity and respect for the rule of the land for managing their community resources. Thus, the study was interested in learning the reasons for these communities' successful managements that had served them for centuries.

Many scholars assume that the case study approach is weak compared to other research approaches, but there are areas where it is crucial (Flyvbjerg, 2006; Gable, 1994). According to Gable (1994), case study has a high rate of discoverability. Moreover, case study is an emerging approach for building theory (Eisenhardt and Graebner, 2007). All research approaches, such as survey, case study, and experiment have merits and demerits (Gable 1994). The extents of research generalizability, replicability, and representativeness of a study depend on the approach employed. However, that does not mean that approaches with low replicability or generalizability, such as case study, are useless to research (Flyvbjerg, 2006); on the contrary, they are vital to social work and community planning (Yin, 2003). Thus, case study is used as one of the methods in this study.

3.2.2 Data and methods

The data were collected in four steps. First, household surveys were conducted using open- and closed-ended questions. Second, interviews with WASH committee members were conducted. Third, focus group discussions with district water office staff members

were performed. Fourth, water supply schemes were personally observed. Data collectors were used in the household survey. Because questionnaires are not reasonable tools to reach everyone in a rural community, data collectors asked the questions and collected the responses accordingly. To enhance the effectiveness of the survey, the data collectors were nominated from governmental staff, such as water technicians, development agents, and health extension workers (HEWs). They were trained in data collection procedures and monitored for their effectiveness. The details of these methods and the sample sizes are presented in Table 3.2.

Table 3.2: Summary of data collection methods and their scope.

Method	**Sample size**	**Remarks**
Household surveys	1806	256 rejected during data encoding (some of them were collected wrongly)
Focus Group Discussions (FGD)	49	Water schemes visited and WASHCOs discussed of each water scheme
	4	Discussion with artisans from Dega Damot district
Questionnaire	48	A questionnaire of 20 questions were administered to and filled by staff of district water offices
	80	Zonal and district staff members (during validation)
	35	Artisans
Interviews	7	Federal and regional government officials who have a direct involvement in the CMP project
Site observations	49	Schemes, where focus group discussion was used, were visited and people were asked about the overall situation of the systems.
	20	Non-functional water supply schemes were visited
Case studies	2	Case studies were conducted on Borana and Konso communities

Literature review: The data required for this study were diverse to include as many stakeholders as possible. A literature review was key to understanding the current rural water supply and sanitation situation and to learn about the most recent developments in the sector. In addition to scientific materials (journals articles, books, online materials, and blogs written on WASH), documents from national publications were reviewed.

These national documents included project (programme) documents, reports, policies, water sector development strategies, national plans, and so on. Moreover, Master's and Bachelor's theses on the researched projects were considered (Mebrahtu, 2012; Muhumed, 2012; Sharma, 2012; Tesfaye, 2012 and Mitiku, 2013).

Household surveys: Community management is believed to yield sustainable services in water supply and sanitation. Similarly, the national government advocate it through mass mobilization (UAP, 2011). Moreover, CMP closely works with the community. Therefore, this study required analyses of the interactions between the communities and the projects. To address the core questions of the study, household surveys were considered as one of the tools to be used. In the surveys, about 1,800 households in the 2 regions, 7 districts, and 179 water supply schemes were contacted, as shown in Tables 3.1 and 3.2 above. The questionnaire asked about family size, water consumption, distances travelled, queue times, water quality perceptions, role in the implementation of the water scheme, tariff payments, reliability of sources, opinions about water scheme ownership, trust of the committee and its performance, and aspects of sanitation.

Focus groups: The focus group discussions in this study were designed to incorporate the views of the water committee (WASHCO), artisans, and district water experts. Accordingly, focus groups were held with 49 WASHCOs comprising at least 3 of the 7 members. Moreover, focus groups were conducted with 48 district water staff members, although those discussions were transformed into a questionnaire because the discussants' views were found to be easily biased by a few people during the discussions.

Interviews: Federal and regional governmental officials with direct involvement in CMP were interviewed to assess the perspectives of the national government on CMP.

Site observations: Field visits were used for qualitative data collection. These were conducted parallel to the focus group discussions.

Workshop: To validate the research results, meetings were held with the districts experts and office heads who had been interviewed. In the meetings, the results were presented and thorough discussions were used to contextualize my perceptions. The objective of these presentations was to learn the respondents' feelings on the outcome and to obtain feedback on the results. Since the research took a pragmatic approach, its results needed to be discussed with the stakeholders, including governmental officials and water experts from the area where the study was conducted. Moreover, discussions were held in August 2015 with 45 zonal and 35 district experts (total 80 experts) in the region and district water supply professionals.

Data collection process

The first step in the process was to contact the district water office for general information on the water supply and sanitation systems in their territories and obtain data collectors who are familiar with the area and who had the ability to interact with the community members. The second step was to conduct the household surveys using the data collectors

and for me to conduct the focus group discussions and water point of access observations. Third, these data were roughly summarized, particularly the focus group data and the site observations, to prepare for discussions with WWT before leaving the district.

The main objective of the discussions with the WWT was to learn from their views on situations in their districts regarding water supply and sanitation services. The aim also was to check whether I had been misled by the information from the community and water sector office. However, the discussion with WWT was successful only in two of the seven districts (Dega Damot and Guangua).

The results of the study based on the peer-reviewed articles are presented in the next chapter. A discussion and assessment of the methods is presented in 'Assessment and self-evaluation' in Chapter Five.

CHAPTER 4

RESULTS

This chapter outlines the research based on four peer-reviewed journal articles (three published and one in accepted) and one peer-reviewed international conference paper. The rural communities were underprivileged in terms of protected water supplies and safe sanitation facilities. The situation was complicated by the problem of service failures in these areas, which were serious, because of lack of correct O&M. Therefore, the study was interested in exploring sustainability factors and alternative solutions with which to alleviate sustainability problems based on the research framework shown in Figure 4.1.

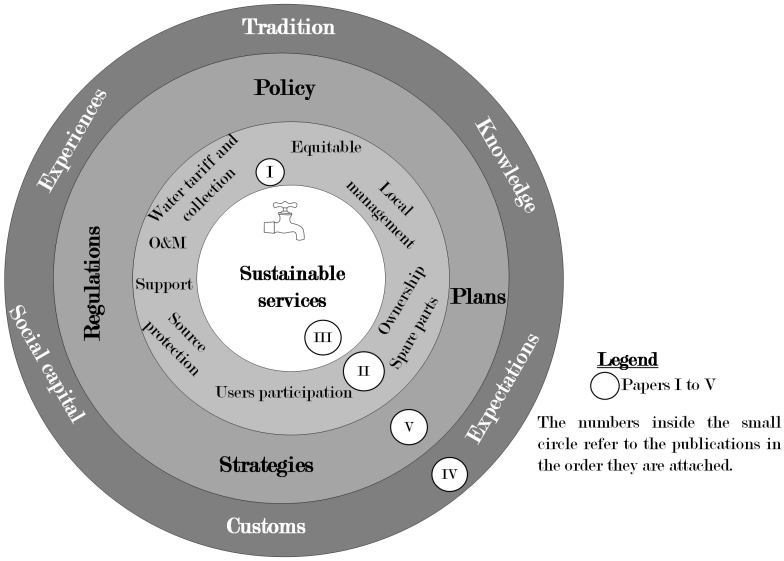


Figure 4.1: Research framework and contributions of peer-reviewed papers.

Figure 4.1 locates service sustainability at its core. Elements in the first circle from the core are enabling factors that should be facilitated and provided by the external implementers to be in harmony with the local situations. Thus, this circle is vital to achieving sustainable services. The second circle from the core includes national plans, policy, and strategies. These elements are crucial to achieving the utmost water supply coverage and sanitation services by shaping the provision of inputs and facilitation listed

the first circle. The outermost circle concerns citizens' behaviours, expectations, and opportunities related to service production. Successful polices and plans must account for these aspects in addition to technical viability.

Briefing of articles

The peer-reviewed journal articles complement each other and are harmonized with the research framework. As mentioned above, the nucleus of the research is sustainable services. To this end, the study seeks to answer this question: What are the challenges and what is being done in the sector? Article III[6] (Behailu et al., 2016b) discussed the challenges of service production of rural water supplies and the policy implications. Moreover, to ensure sustainable services, numerous factors are important, including O&M, spare parts supplies, collecting water tariffs, providing technical supports to the user communities, and so on. As explained in Chapter Two and shown in Figure 4.1, post-construction management is crucial to maintain the required service level of water supply schemes, and the success of the management depends on the extent of user involvement during the implementation of projects.

The classification of water supply implementation approaches mainly depends on the way that these elements are treated. The most distinctive differences concern the ways that user communities are involved in the process of project implementation. Thus, Article II (Behailu et al., 2016c) elaborates on the similarities and differences between water supply and sanitation implementation approaches in Ethiopia. Moreover, Article I (Behailu et al., 2015) explains the historical evolution of the CMP approach in Ethiopia along with the national water supply sector reforms.

According to The Paris Declaration (2005), development partners should act in harmony with the policy and plans of national governments. Therefore, the quality and workability of the national policy, strategies, plans, and regulations determine the effectiveness of approaches and the success of the sector. These national documents must be exhaustive and full awareness must be created for the governmental and development partners. 'The national policy should be in terms of concrete goals, not methods' (Nyanchaga, 2016, 336). From this perspective, the conference paper, Article V (Behailu and Mattila, 2016a), presents a review of the national documents. Furthermore, regarding literature, community management is key to sustainable services. There are several challenges and opportunities to this. One challenge is resistance to change by either of the stakeholders. The main reasons for resistance might include lack of correct understanding of the changes or, most importantly, conflicts of interest, customs, culture, social values, and so on. On the other hand, opportunities include the use of traditional knowledge and experiences that have been tested in practice. Therefore, Article IV (Behailu et al., 2016d, accepted) discusses indigenous water management practices and the lessons that could be learned for modern management. Thus, each paper is largely built on the shoulders of one another

[6]Roman numbers indicate the articles' order in the dissertation'

as illustrated in the circles of Figure 4.1. Considering the above-mentioned points, the synthesis of the results is as follows.

4.1 Rural water supply and its historical background in Ethiopia

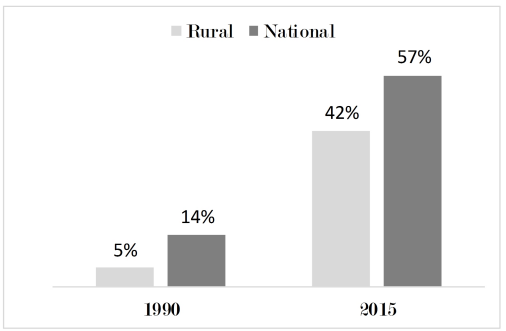
Ethiopia is one of the oldest countries in the world (Factbook, 2016). However, water supply and sanitation development does not have long histories and the sector is in its infancy stage. Water supply, particularly in rural areas, has been an important aspect of development for a few decades, as explained in Article I (Figure 1, p.385). This article aimed to highlight the historical overview of water supply in Ethiopia from the early twentieth century to the present. The first water piped into the national palace was built in 1905, and the constructions of dams for the Addis Ababa water supply in 1944 and 1970 were prominent activities in the water supply sector.

The progress of water supply and sanitation development in the country has been quite slow due to low attention in the water supply and internal matters between the 1970s and 1990s, such as wars and natural disasters. Although during the IDWSSD, the country was in a civil war, the historical records indicate that Ethiopia was on a similar footing as the rest of the world (Chapter 2 above). To confirm this, Schouten and Moriarty (2003) found that the water supply and sanitation sector received international attention in the 1960s. Their evidence agrees with the timing of the establishment of Ethiopia's first water department. The establishment of a water department in the Ministry of Infrastructure and Communication in 1956 and the establishment of a Water Supply and Sewerage Authority in the 1980s were remarkable milestones in the institutional reform of water and sanitation, as mentioned in Article I.

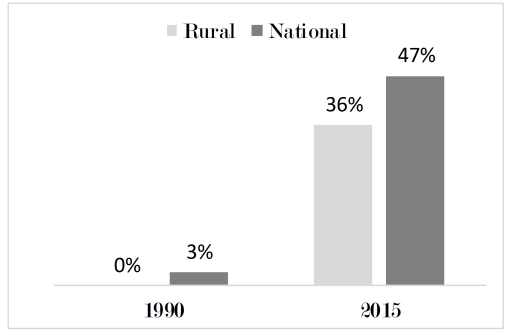
The period after the 1990s was quite significant to water and sanitation development in Ethiopia. The sector was recognized in policies, regulations, and institutions. Full-fledged departments of water supply were appointed at different levels of the national structure. Moreover, international donors and partner organizations were significantly involved in the development of water and sanitation. In the beginning of this period, water supply coverage and sanitation coverage in the country were 14% and 4%, respectively, as indicated in Figure 4.2. By 2015, coverage had increased to 57% and 47%, respectively. Although these changes are substantial, much remains to be done to reach the population currently without services.

The current water supply and sanitation of Ethiopia lacks collective action by stakeholders (OWNP, 2014). Numerous ministries in the country have only recently begun to discuss their roles and the necessary integration. Before the harmonization process, there was only loose integration and coordination among the sector's actors (WIF, 2013).

Remarkable changes have occurred in the country since the 1990s, particularly regarding rural water supply and sanitation, because the population has doubled (increased from



(a) Water Supply.



(b) Sanitation.

Figure 4.2: Improved water supply and sanitation access in Ethiopia from 1990 to 2015 (WHO/UNICEF, 2000, 2004, 2006, 2008, 2010, 2013, 2014, 2015).

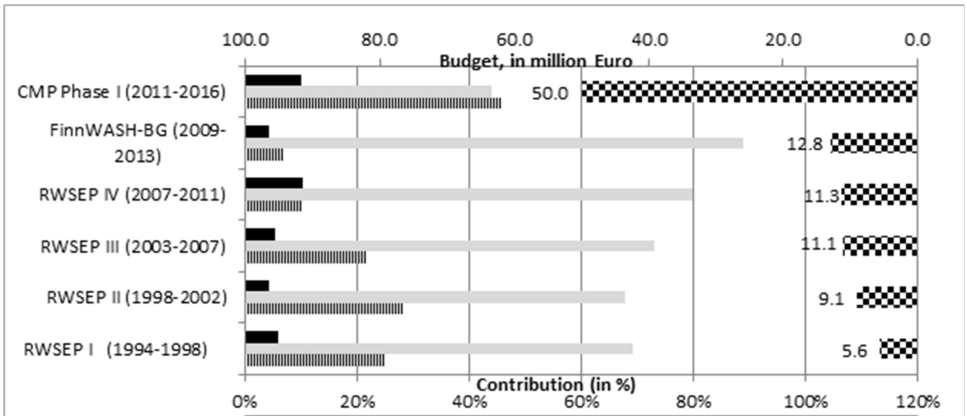
48 to 100 million between 1990 and 2015). However, the country has not reached its desired levels of service. Currently, 43% and 53% of Ethiopia's population are without water supply and sanitation services, respectively, as shown in Figure 4.2 above. Notably, rural residents account for 84% of the total population where the services fall below the mentioned figures. Mebrahtu (2012); Mitiku (2013) and Article II revealed that no more than 30% of the users of functional schemes included in the study obtained 15 lpcd, which is the amount targeted by the national plans. Therefore, the coming decades should aim to alleviate the problems of the rural population to address water and sanitation services for all. Moreover, working in line with the Sustainable Development Goals (SDGs) is crucial to Ethiopia.

4.2 Lessons learned from CMP evolution

The first research question focused on the evolution of CMP and lessons to be learned from the evolutionary process is explained in Article I. That article was published based on a literature review, secondary data, and interviews with governmental officials and personnel involved in CMP. The details of the evolution were presented in Article I and the key lessons, such as participation, consistency, and flexibility, are summarized below.

Participation: Sustainability of services cannot be achieved by just one party. Instead, the involvement of all stakeholders is crucial. Moreover, the role of the national development framework and national policies must be respected, as was pointed out by The Paris Declaration of 2005. These critical elements increase the impact on sustainability and success of involving stakeholders, particularly the national and regional governments. From this perspective, the CMP approach has passed through five phases since the start of its first project, Rural Water Supply and Environmental Programme (RWSEP), in 1994. According to Article I, each phase accompanied a shift in certain principles towards decentralization. The process began as a centralized and conventional approach in which everything was controlled at the central level.

RWSEP was initiated at the regional level and, later, it was decentralized to the local governments and the community level. Moreover, it began by involving numerous development activities in rural Ethiopia, including water and sanitation, forestry, asset generation, and gender education. Currently, the scope of the CMP approach has narrowed to cover water and sanitation development. In all of these processes, the government's interests were respected, and the federal, regional, and local governments became involved by contributing significant funds (Figure 4.3). According to the Amhara regional state water and sanitation head, in 2012, about ETB 35 million was budgeted to implement water supply projects similar to CMP. Moreover, two districts (Guangua and Yilmana Densa) modified their water users' committees to fit other projects to function similar to CMP.



	RWSEP I (1994-1998)	RWSEP II (1998-2002)	RWSEP III (2003-2007)	RWSEP IV (2007-2011)	FinnWASH-BG (2009-2013)	CMP Phase I (2011-2016)
Community	6%	4%	5%	10%	4%	10%
GOF	69%	68%	73%	80%	89%	44%
GOE	25%	28%	22%	10%	7%	46%
Budget	5.6	9.1	11.1	11.3	12.8	50.0

Figure 4.3: Governmental contributions of Finland, Ethiopia, and the communities at the phases of the bilateral project (Behailu et al., 2015).

One lesson learned from the evolution of CMP concerns the participations of the user community, the government, and the private sector (particularly the local skilled labourers referred to as artisans).

Consistency: The challenge of the WASH sector in Ethiopia is to achieve efficient use of the available resources with coordination. Previously, the sector lacked harmony among stakeholders, particularly between partner organizations and the government. Most partner organizations depended on donors for financial resources, and it was common for short-term projects to learn little from the process of their performance because of financial constraints and projects in large coverage areas.

Implementation packages introduced with the physical systems are assumed to yield sustainable services. These packages need time to improve service effectiveness. However, the nature of most projects often does not allow for stays that are long enough to observe a project's effects on community life, which influences the improvements to an implementation approach. However, the experience of the bilateral project that operates CMP demonstrates consistent efforts for longer periods in particular areas and developed procedures to implement user-oriented services.

The CMP began in the Amhara region in 1994. After a decade of experimenting in the region, the CMP expanded its interventions to include the Benishangul-Gumuz region and, since 2011, it has covered five regions of the country. The expansion steps and the classification of the project's life into five phases show that CMP is consistent in some areas and has learned from its experience and process. Based on Article I, I conclude that learning from the process and the local context is more important than designing sophisticated procedures on the desk to benefit the sustainability of services.

Flexibility: As stated above, a project might be successful in a certain locality and demonstrate the effectiveness of the constructed systems for an extended period. In some cases, flexibility is needed to change the implementation methods based on experience to improve the effects on service delivery. If something fails in a previous trial, the next effort should be modified. In most cases, the bottleneck seems to be about financial problems because funding organizations' rules are often inflexible regarding modifying the approaches. For example, the RWSEP began with self-administered project financing and then devolved to a community-managed financing mechanism. That flexibility would have been difficult for most donors or for the government.

4.3 Level of services delivered to the rural community

The second research question of this study aimed to explore the actual service levels in the user communities. In this context, Article II intended to explore the service levels of user communities and users. The article was published based on its empirical data on the perceptions of the users regarding the services provided by the different approaches.

As explained in Chapter 2, the main criteria crucial to assessing service levels are water quantity, water quality, and accessibility of services. To achieve sustainability of services, user communities must be involved at all stages of project implementation and genuinely involved in post-construction management. To achieve this, systems should serve users to the extent that they want to be served. At a minimum, a service level considers adequate quantities of water of a desirable quality retrieved with a reasonable travel distance.

Based on these elements, the effectiveness of CMP and non-CMP approaches were evaluated as follows.

Quantity and accessibility: According to the previous Growth and Transformation Plan (GTP) of Ethiopia (2010-2015), 15 litres per capita per day in 1.5 km radius was

the target of service level for water supply. Although the author of this dissertation has a reservation on the adequacy of this amount, the research has evaluated the performances of the water supply systems based on these figures. A total data of 1543 households were analysed to determine water consumption from the systems and the distances travelled to fetch water. The households included users of water systems implemented by CMP and non-CMP approaches. Figure 4.4 has a grey region representing the targets of quantity of water consumed and accessibility. However, more than 75% of the sample fell below the national requirements in terms of water quantity fetched from the improved systems. This percentage does not significantly vary for projects that were implemented using different approaches (Article II).

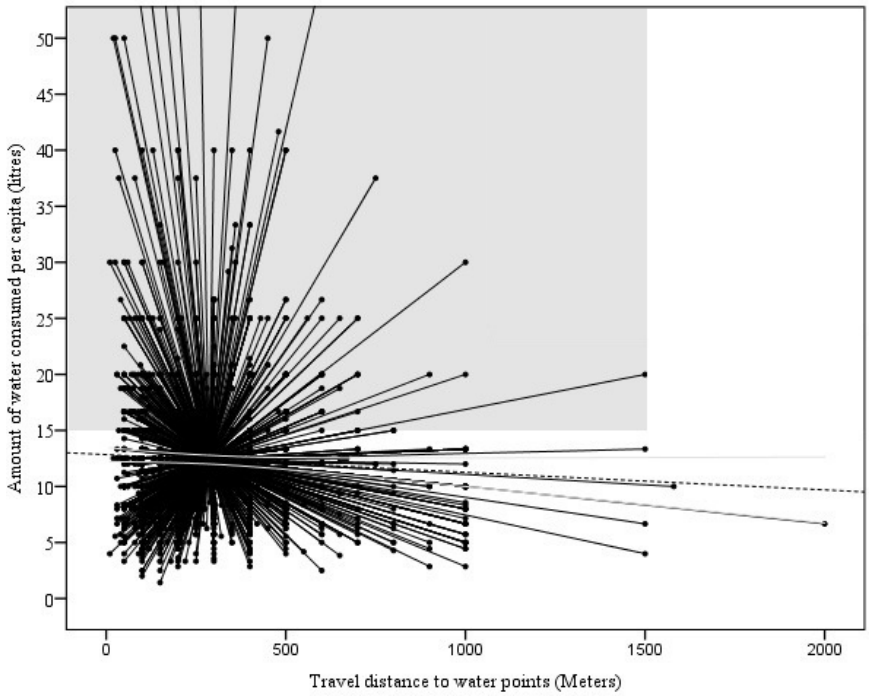


Figure 4.4: Water use (l/cxd) versus travel distance (m) (n = 1543).

Based on the sampled water supply systems and user households, the distances to water sources were not a problem because most of the water supply schemes used by the households were hand-dug wells operated with hand-pumps and they were easier to implement near the villages. However, regarding spring developments, the distances could be farther depending on the proximity of the springs to the settlement areas.

About 50% of the sample spent less than sixty minutes collecting water, which was the case for the CMP and non-CMP users, whereas 25% was signicantly different in both categories. The fourth quartile of the CMP users spent as much as three hours, whereas the non-CMP users might have used four hours per day. The observed difference in collection time was due to a large number of users per water point at the non-CMP water

systems.

Quality: A system's water quality must be satisfactory to prevent users from searching for alternative sources. Although this study did not perform water quality tests, users' perceptions of the water quality were investigated through the survey data. The majority of the sample had no objection to the water quality. However, the usual way to treat water in the rural areas was to add chlorine to a hand-dug well at the beginning of its service and, in some cases, at about six-month intervals (Article II; P. 299).

The service levels were basically similar for the two approaches. However, factors that boost feelings of ownership of water supply systems were stronger for CMP than non-CMP systems. For example, tariff setting and collection was in a better position than the other approaches and the perception of the system management duty is clearer among the CMP users. This result relates to the nature of community involvement in CMP and non-CMP systems and the diversity in the areas of community involvement, as indicated in Table 3 of Article II (P. 297).

4.4 Factors related to rural water supply service failure in Ethiopia

Every mitigation measure must start from understanding of the causes of the problem. Therefore, identifying the causes of rural water supply system service failures was a key research question. In Article III, the challenges to continuous services were found to relate to institutional and social aspects, such as institutional arrangements, financial incapability, social factors, and technical elements.

Institutions: According to North (1990), institutions are the rule of law. To investigate rural water supply and sanitation institutions, the district level offices were assessed. From this perspective, the sector had various difficulties, such as unstable staff, failure of proper supervision, and implementation follow-up.

Distances of villages from district administrations: The distances of villages from their district administrations directly link to institutions. According to Article III, the water points of remote villages were more likely than those of villages located close to administrative centres to have problems. The problem was manifested as construction quality because neither technical staff nor artisans wanted to work in the remote areas. Specifically, wages were the same, regardless of distance, but there was less effort and/or better facilities in the villages closest to the administrative centres.

User perceptions: In many cases, communities' perceptions influenced the success of the water projects. In some cases, rural communities are believed to be relatively more demanding regarding the production of services. This is encouraging from the perspective of community management. However, implementers and local governments should not trust these demands because they might relate to competition among villages to have

the same level of service regardless of the actual needs of the unprotected systems. Thus, adequate education should be given to all service receiving communities regardless of their motivation for services.

O&M: The O&M of the water supply schemes is critical to maintaining sustainable services. However, O&M was found to be the biggest factor in the failure of water supply services.

Spare parts supply: The bottleneck in maintaining community management was supplying spare parts to repair failed systems. The governmental organizations(GO) and NGOs provisions of spare parts influenced the business opportunities of private suppliers. Based on discussions with private spare part suppliers in two districts (Foger and Guangua) where suppliers existed, users and suppliers were unhappy with the situation. The private suppliers were deeply disappointed by the involvement of NGOs and the government in their businesses, and the users complained about the prices charged by the private suppliers. The spare parts supplied by the organizations were neither sufficient nor did they encourage private suppliers. Because the organizations sold less expensive spare parts (below market prices), users preferred to buy from them. Thus, the private suppliers were forced to wait until the spare parts of GOs and NGOs had been consumed. As a result, when they accessed the market, they sold spare parts at higher prices to make up for their lost compensation. On the other hand, the users felt inconvenienced regarding the costs compared to the lower costs of donated spare parts. This imbalance influenced the O&M activities of the water supply services in the study area.

4.5 Traditional water management and its lessons

Many researchers have emphasized the importance of capitalizing development based on available social capital to boost community cohesion and obtain the trust of the beneficiaries (Ostrom, 2000; Pretty, 2003). Some case studies have found that some traditional communities, such as Borana and Konso in southern Ethiopia, had successful water management practices (Article IV, Figure 1). In those two communities, the way that traditional water systems are managed and the rules for using community resources can teach valuable lessons. They all have proposed criteria of sustainable services, such as a means for O&M, sense of ownership, sound administrative structures, and mechanisms to maintain equitable services. However, the indigenous communities lack financial resources, adequate spare parts supplies, and the technical abilities to produce desirable services.

The roles of government and its partner organizations that work on water and sanitation must capitalize on traditional knowledge to develop viable systems of management because formal rules largely depend on informal rules (traditional experiences and expectations) (North, 1990). In particular, the former cannot exist without the latter, and abrupt transitions from informal to formal knowledge are difficult. The challenges of this process are traditional beliefs, people's expectations, local indigenous practices used to produce

services, and conflicts of interest with newly introduced rules (Figure 4.1).

In Borana and Konso, traditional wisdom is more powerful than management introduced by external agents (refer to Article IV). These communities are well organized and have traditional democratic administrations, which are vital for maintaining their common resources. The administrations have valuable experiences and practices on which we can build. The core valuable aspects for the sustainability of water and sanitation systems are as follows:

- Both communities have traditional administrative structures that function informally in the communities
- Both communities have rules and enforcement mechanisms
- Both communities have strong bonds that maintain solidarity to manage water systems (that could emanate from the scarcity of water or traditional belief)
- The sense of ownership in Borana and the spirit of water in Konso are vital to protecting water sources from abuse
- In both communities, every user is responsible for contributing to the O&M of water systems
- In both communities, system maintenance is a crucial aspect of survival.

Indigenous knowledge and traditional practices are obviously not absolute. However, improvements that ignore them and their social values will not be accepted by the users and will ultimately fail to create a sense of ownership and the desired post-implementation management of the system by the user community. Therefore, the starting point for changes in development should be the practices of the local people and the nature of social organizations. Moreover, paying attention to their recommendations and negotiating with the community to refine agreed-upon principles would be valuable to achieving success.

4.6 Views of district experts on CMP

CMP has attracted the interest of national and regional governments in Ethiopia and become one of the implementation approaches of the water supply and sanitation sector (Behailu et al., 2015; OWNP, 2014; WIF, 2013). Hence, this study incorporated the views of district water experts with direct contact with the project and observed the actual situations in the selected districts. The experts (n = 48) were selected from seven district water offices. Their questionnaire included 20 questions requesting responses on a scale of one to five regarding focus on the scope of CMP, users' perceptions of CMP, related operational matters, and others, as shown in Figure 4.5. The response options were 1 = strongly disagree, 2 = disagree, 3 = average, 4 = agree, and 5 = strongly agree (Figure 4.5).

As mentioned in Article II, achieving long-term services requires involving the user communities in every stage of the project. To avoid misunderstandings about the services, users must have previous knowledge of the system to be implemented and of their responsibilities in the implementation and future management of the system. This could be achieved by developing awareness at the beginning of a project. Regarding this, more than 80% of the respondents agreed regarding the presence of users' sufficient awareness in the CMP approach.

Corruption is another challenge in the development of the WASH sector (Montgomery and Elimelech, 2007). However, the problem in Ethiopia is presently at a mild stage according to Calow et al. (2012) and the district experts in this study. Approximately 70% of the respondents reported that CMP is transparent and corruption-free. However, discussions and data from the questionnaires collected from artisans (local skilled workers) indicated the presence of material misuse (22 of 35 agreed) (Article III).

On the third point from the top of Figure 4.5, approximately 50% of the respondents reported that material misuse existed at the water committee and artisan levels. This argument is strongly supported by the findings of Article III and vice versa. Moreover, as explained in Article III, WWTs are committed to support the program (50%). Because the ultimate target of water supply and sanitation development is delivery of sustainable services, local governmental and partner organization support is crucial. However, only 50% of the respondents agreed that WWT support at the district level was present or adequate. That support is vital because WWTs are key to decision-making regarding allocation of the resources needed to implement systems.

Three-quarters of the respondents agreed regarding the effectiveness of the information provided to the users, but only 60% reported that the information provided across all the kebeles[7] was uniform. In Article III, the remoteness of some villages influenced the presence of sustainable services because artisans and district staff did not want to travel long distances due to the unattractive compensation. Therefore, the opinion of the remaining 40% of the respondents apparently intended to support the arguments in Article III. Moreover, supervision to the water committees was not as satisfactory as in the past because of the shortage of staff, low motivation, and lack of support from the WWT; 40% of the interviewed experts doubted the effectiveness of the supervision.

Sustaining sanitation is vital to efforts to improve water supply systems because water supply and sanitation are not independent. As the ten steps of CMP explained in Chapter 3, toilets are required of every member of a project. Moreover, projects have platforms to support HEWs, which are assigned in every kebele to improve the community's health and involve it in the sanitation aspects of development. However, only about one-half of the responding experts agreed that the attention given to sanitation and hygiene was equivalent to that given to water supply. In practice, sanitation facilities and willingness

[7] A kebele comprises a few villages and is the smallest administrative unit in Ethiopia.

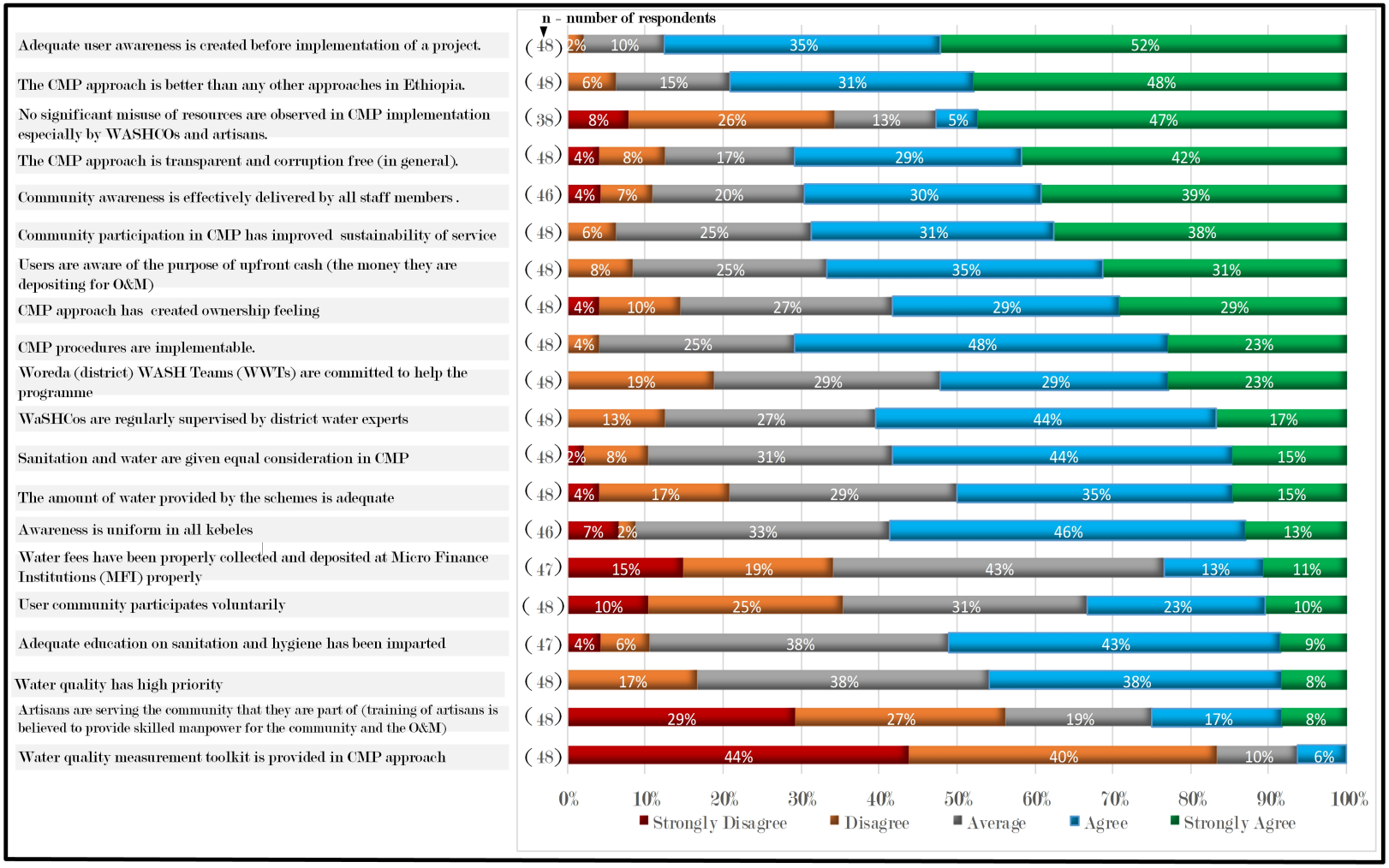


Figure 4.5: District water office experts' views on CMP.

to use them is more important than ownership. However, the way that CMP requests toilets during the application of water supply projects is insufficient to ensure a properly sanitized environment.

As explained above in the theoretical framework, community participation is central to achieve sound community management. Thus, the level of participation in CMP is the stake of this study. Moreover, the approach strongly intends to engage community participation at the outset. Accordingly, the household survey found that the user community had better participation in CMP than in the other approaches, as discussed in Article II, Table 2. Approximately 75% of the responding experts agreed that community involvement in CMP was a success. However, my field observations and the responses of the interviewed experts suggest that the participation level is not the ideal level designed by CMP. Even so, the evidence shows that the community participation in CMP was better than in the other approaches implemented in the districts, as discussed in Article II.

Forty-five per cent of the respondents stated that CMP was not giving adequate attention to water quality. To reinforce this perception, 80% confirmed an absence of water quality measuring kits and training on water quality monitoring techniques. As was clearly discussed in Article II, the quantity of water supply to the rural communities was insufficient. Only one-fourth of the population was collecting water at the national standard of 15 lpcd (Articles II and III, Mebrahtu, 2012; Mitiku, 2013). In support of this finding, 50% of the respondents agreed that the water supply obtained from the services was inadequate.

Regarding O&M, artisans were considered a backup workforce. It was considered a capacity-building exercise for a community to provide local skills as support. However, only 25% of the respondents believed that would be successful. This finding strongly supports the finding in Article II that 80% of trained artisans emigrate for better jobs. However, improving artisans' lives by providing them with work as skilled labour in the rural community, which is the primary objective of engaging them, has not been achieved. The main reason for this was that the government or partner organizations was investing more money in new developments and, for that reason, the artisans were compelled to emigrate to where the jobs were available. However, O&M did not offer job opportunities to artisans because the district offices and some NGOs provided facilities for incomplete O&M services.

In all of the approaches, water fees and their collection were insufficient. Because the user communities set the tariffs, and the community members cannot afford to pay monthly, tariffs tend to be relatively small amounts. There is a big difference between CMP and the other approaches in their responses to O&M. Although the experts reported that the users understood the reasons for requiring cash upfront (70%), only a few of them were observed to use those funds for O&M. The initial idea seemed to be missing in CMP regarding the seed money deposited at MFI for O&M. Except for two of the visited

schemes, the majority of the users never used the money earmarked for O&M. About 25% of the respondents agreed that water fee collections and deposits were in the MFIs. The findings from the household survey confirmed that the committees deposited significant funds in the MFI accounts opened for the purpose of O&M for only a few water systems.

In response to the question asking the respondents to compare CMP to other approaches regarding involving user communities and achieving sustainable services, about 80% of the respondents reported that CMP was better than the other approaches implemented in their districts. This result agrees with the findings from the experts' discussions (Article II). In Article II, experts were asked to categorize the approaches in their areas using the Arnstein (1969) classication of community participation levels. The experts categorized CMP as a citizen power, whereas they placed non-CMP in the categories of tokenism and non-participation (Figure 2.2).

4.7 Summary

This chapter discussed the key points of the CMP approach, its evolution, service levels, factors contributing to service failures, and traditional water management. The learned experiences are fundamental to implementation approaches in Ethiopia and, possibly, other developing countries. In particular, the CMP approach has many core values that are discussed in Article I and in the previous section (section 4.6). The procedure that CMP follows to involve user communities and local governments is exemplary. Moreover, the practice of documenting every water system is important to note, and it is a good example of effective practices because it is rare to observe these practices in rural Ethiopia. However, in most cases, the process of documentation ends, and the water system's files are closed, after the implementation. This aspect must be encouraged to remain open to recode life-cycle cost even after completion of the projects.

The CMP activities that create a sense of ownership in the user community were observed to be significant (Article II). Early training of water committee members and empowering representatives to administer project funds were key features of inclusiveness that demonstrated CMP's devotion to developing the responsibility of the post-construction management of systems by the user communities. However, close follow-up and continuing support after implementation should not be overlooked because the rural communities are agricultural and, therefore, relatively less exposed to administrative resources and the O&M of water systems. Moreover, the problem of spare parts supply requires attention during the implementation of systems.

Chapter 5 discusses the main results, and the conclusions are presented in Chapter 6.

CHAPTER 5

DISCUSSION

Chapter 5 explains the links between the theoretical background and the results. In Chapter 2, the theoretical background was explained as assertions regarding community-managed services, their opportunities, and the challenges. Moreover, the focus of this study was on sustainable services and the contributions of CMP to Ethiopia's water supply and sanitation services. Thus, this chapter describes the implications of the results through the lens of the theories, assesses and evaluates the research, and explains the validity and reliability of the research outcomes.

5.1 Implications of the results

This study addressed a variety of topics in the water supply and sanitation sector, such as: (1) the evolution and historical overview of water supply and sanitation development in the country and international implications; (2) a comparison of water supply implementation approaches in Ethiopia from the perspective of providing sustainable services; (3) an exploration of the factors that influence service failures of the rural water supply systems; (4) lessons for sustainability of services learned from traditional practices and social capital; and (5) a discussion on the gaps and areas of improvement in national policies, regulations, and strategies.

The above-stated topics were discussed in the results sections by linking them to the Articles I to V. The results of this study are vital to the water supply and sanitation sector in Ethiopia and other sub-Saharan countries. It is well known that the problems of water supply have not been adequately addressed over the past four decades. Moreover, sector stakeholders are experimenting with implementing sustainable services. Therefore, studies on the rural water supply are crucial to encourage these endeavours by providing basic policy recommendations and evaluating the past performances.

Ethiopia's water sector's development has a short history, and the evolution of CMP suggests that it is fundamentally different from conventional implementation approaches. What can be learned from the CMP experience is that assessing past performances is a key element to achieving present and future's targets. CMP modified its original approach from RWSEP to reach its current level (Article I). Initially, CMP implemented water supply, sanitation, and other development activities in a 1994 governmental like approach.

Later, it focused on building the capacity of regional experts along with the system implementations. These processes continually evolved until decentralization was achieved at the community level.

In practice, more than the physical structures must be sustained, and knowledge, implementation ideology, and technical skills must be transferred from generation to generation with or without the presence of external supports. The success of external agents should be measured according to the knowledge that they have transferred, in a sustainable manner, and the systems created to operate in their absence. From this perspective, CMP has significantly facilitated empowering user communities to manage their systems from inception to post-construction management.

The CMP approach has motivated districts to think differently than before. Currently, it is common to observe that water supply systems implemented by WMP and NGO-MP are customized to the CMP management style. For example, schemes constructed long ago are being asked to open MFI accounts similar to CMP so that users can deposit money for O&M. This initiative emerged because of CMP's influence. Guangua and Yilmana Densa districts are intensively implementing this experiential transfer where systems are functional. In other words, the CMP philosophy has attained acceptance from governmental officials.

The sustainability of water supply systems is directly or indirectly influenced by service failure factors. Learning the origins of problems is important for devising sustainable solutions. Thus, actors (national governments or partner organizations) must clearly understand the problems to develop solutions during system implementation. As explained in Chapter 4, service failure factors tend to be institutional and social aspects. Thus, improving the institutional capacities and knowledge of user communities could resolve frequent breakdowns of the service systems and end prolonged out-of-service situations. Apart from providing water supply schemes, improving institutions and fulfilling institutional requirements are mandatory to sustain services. Moreover, understanding the communities and helping them to understand their systems could substantially solve the problems of service breakdowns attributed to social factors. To make solutions more reliable, spare parts supplies must be provided within an accessible distance to every user community without adversely influencing private spare parts suppliers.

The case studies of Borana and Konso (Article IV) found that traditional communities can sustain their traditional water systems for centuries. However, modern systems could fail in these areas within a few years of implementation. The disparity might be caused by failure to understand the social values of a particular community regarding its community resources management. Everyone needs a better life, and obtaining clean water from house connections, yards, public taps, or from protected sources is always the citizens' dream. However, the local people have a variety of experiences with managing their systems. The shortcomings that might occur during service production happen when service providers begin imposing new systems that fail to comply with the traditional ideas

without providing sufficient knowledge to the users. To deepen community management, CMP should seek ways to incorporate traditional water management systems into its procedures.

To address the above-described gap, the national policy and directives should be developed in consultation with the user communities and by understanding them. National strategies would be inclusively formulated to accommodate the expectations of user communities.

However, well-articulated policies and strategies alone cannot guarantee the success of the sector's development; instead, for effectiveness, every civil servant should understand it. It is important to follow the RBM philosophy. Enacting policies and building systems are not the sole results to consider; observing the ways that they change citizens' lives is the most desirable result. Therefore, governmental officials, civil servants, and partner organizations must understand the real meaning of working with a community before implementation. For example, as discussed in Article V, the national policy has a set national standard of 15 litres per capita per day for rural communities. However, rural Ethiopia's climate ranges from hot to cold conditions, whereas the policy has a fixed standard quantity. This implies that policymakers are not correctly considering the disparity of demand based on climate. Moreover, technical staff and construction firms must be accountable for the quality of the services that reach the citizens rather than focusing on the accomplishment of physical structures.

5.2 Key elements to consider for sustainable rural water and sanitation services

Sustainability of the rural water supply and sanitation services is a concept of long-term services (Article II, P.296). Factors that could enable long-term services are shown in Figure 5.1. The framework is based on this study's discussions with the water committee, water experts, and field observations.

A systematic approach to obtain the acceptance of user communities is crucial to successful implementation of water supply schemes. User communities will be involved genuinely only when they trust the schemes and are empowered. It should be clearly noted that involving user communities does not guarantee a sense of ownership (Marks and Davis, 2012). As Arnstein (1969) and The North Yorkshire County Council (2010) explained, communities could be involved at a variety of levels from non-participation to empowerment. On the other hand, the important elements identied to achieve comprehensive operational rural water supply and sanitation services are adequacy of the services and proper management, as shown in Figure 5.1. To realize sustainable services, they should be inclusive and provide adequate service levels, such as quality, quantity, and accessibility, as explained by Reed et al. (2011). Otherwise, residents will feel compelled to use unimproved sources to help themselves. In these cases, residents cannot be committed to manage partially functioning water supply systems. Moreover, inadequate services might cause conflict and

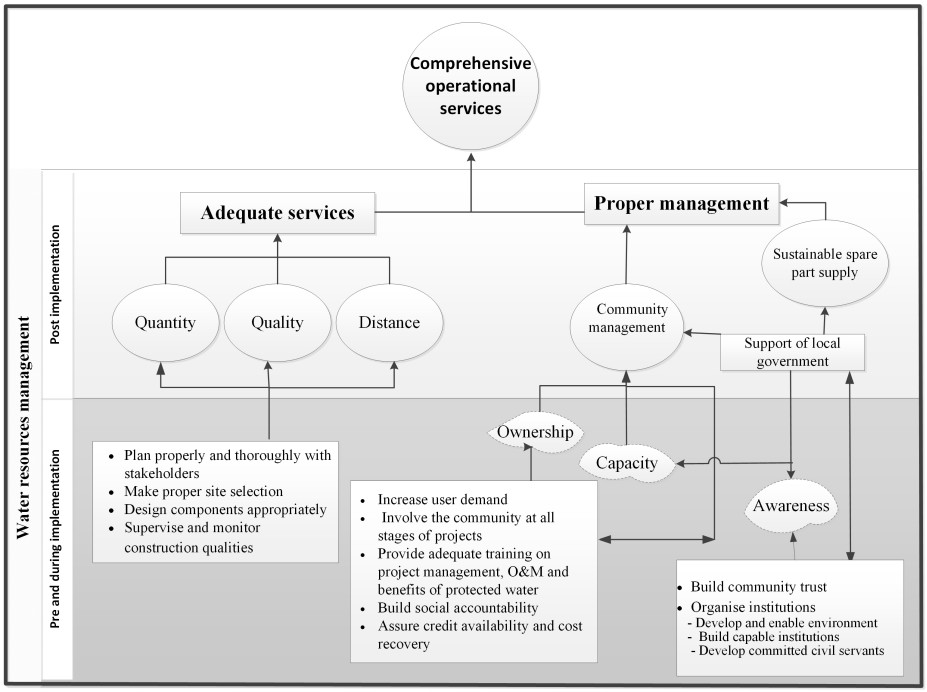


Figure 5.1: Framework for long-term services (Behailu et al., 2016c).

competition for water and, hence, damage the water supply systems.

To facilitate adequate services, such as quality, quantity, and accessibility, the following elements must be carefully included during the implementation of the water supply and sanitation services.

- Thorough and proper planning of projects with stakeholders
- Proper site selection
- Designs that consider the size of the population to be served by the system
- The quality of construction to be maintained by adequate supervision and monitoring of activities during construction and post-implementation.

From the above perspective, CMP has a strong platform from which to implement these elements. Because projects depend on the local government's technical staff, a shortage of experts is observed along with staff turnover at the district level. In some areas, the site selection procedure was challenged by the involvement of the community members, who argued that everybody must have a water point near their houses rather than selecting the most appropriate hydro-geological sites. Designing common water supply schemes in rural Ethiopia does not require complicated skills. However, the amount of water at the sources and the sizes of the local populations are not always proportional.

As discussed in Chapter 4, supervision of the construction of water supply schemes is not uniform within districts in any of the approaches. Because less attention was paid to the efforts of personnel who travelled far distances for supervision or construction, these workers did not want to be assigned to remote places. This problem has resulted in poor construction supervision in the more remote villages and, hence, the sustainability of those services has been substantially affected.

The other critical element to keep systems operational is system management. The water supply system must be operated and maintained properly to produce the desired level of service. However, the management is subjective, and it varies across communities, between implementers, and so on. To realize correct management, the local governments must ensure two things: community management of the systems and sustainable sources of spare parts supplies. Most of the time, it is challenging to enable the rural communities to operate their water supply and sanitation services in the absence of spare parts. The local governments should support community management during the pre- and post-construction stages, and development partners should develop capacity and ownership by creating awareness and other prerequisites, as shown in Figure 5.1.

5.3 Validity and reliability of results

This study employed qualitative and quantitative approaches because it is problem-oriented and a real societal study. However, discerning the inferences from the results of the two approaches was somewhat challenging. Thus, to ascertain the outcomes, I revisited the study areas after the data were analysed. The results were validated by presenting them to the zonal and district staffs, including the heads of the water supply and sanitation departments. The purpose of presenting and discussing the results was to confirm that the outcomes reflected the existing situations and that the recommended solutions would be applicable to the study areas. Three of the seven woredas (districts) were revisited in August 2015 and 80 experts were engaged to discuss the research findings. Their comments were incorporated into the results. The disagreements that arose during the discussions concerned the definition of 'non-functional' systems and the concept of 'NGO' as used in this study. Thus, the study paid special attention to defining them. NGO-MP was used to indicate an approach that fully administers a project, its finances, and that is implemented by internal staff, unlike the CMP approach.

For applicability and accuracy purposes, the study employed numerous methods, such as household surveys (n = 1806), focus groups (n = 49), field observations (n = 69), literature reviews, and in-person interviews (n = 7). The data were critically analysed to obtain accurate results.

5.4 Assessment and self-evaluation

The field study was conducted in seven districts and on a large number of households in rural Ethiopia. In terms of accuracy, the sampling distribution was not fully satisfactory because the strata used in the sampling was complex. The first step was to select districts operating with CMP and other implementation approaches. From each of these districts, kebeles with the same combinations of approaches were selected. Then, water points were selected. Last, households were randomly sampled from each water point based on population size. Therefore, the sampling process was complex and it did not fully satisfy the statistical procedures. However, it was the only practical way to obtain systematic data because projects are implemented using a governmental structure following that hierarchy.

Qualitative research is subjective by definition. I was involved in rural water supply development during my career and engaged in discussions with WASHCOs and district experts. Based on my previous knowledge on the subject, I influenced the discussants and led them towards my own perspective. However, I gradually noticed this bias and changed the data-gathering instrument to the questionnaire format. As described in Table 3.2 and Figure 4.5, I adopted a questionnaire with 20 questions to avoid influencing the results.

The other challenge of data collection in the household surveys was failing to elicit specific responses from the respondents when questions were about individual or family behaviours. To correct the problem, the questions were rewritten to be indirect to collect reasonable data. There was also the challenge of obtaining accurate results, such as the amount of water the households consumed per day, distances travelled, and the amounts of time spent collecting water, which data were collected indirectly through answers to multiple questions. Considering the available funds and time, the selected approaches were justified.

The positive side of collecting data from a variety of districts was that it was an opportunity to scan a large area and collect many experiences from the rural communities about their water supplies. Moreover, field observations, discussions, and revisiting the study area to present the results after data analysis were all good opportunities to contextualize the findings to the local situations. However, the drawback of having a large study area was that the collected data were not deep enough for rich qualitative analysis. To counteract this problem, I used a variety of methods to broaden the way that the data were obtained and to crosscheck the findings.

In any case, a single research design and disciplinary approach are not enough to delve into the complex societal problems of rural communities. Therefore, this study provides starting points for future research. However, future researchers should probably not be too ambitious and study areas this large, but, instead, they should focus on a smaller representative area for an in-depth study, become embedded in a community to understand the people's real feelings about the problems, and to uncover their causes and effects. To

borrow a phrase from Schumacher (2013), 'small is beautiful'. When a small group is the focus, the researcher is more likely to have sufficient time and funds to go deep and attain a comprehensive outcome.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Developing economies are often suffering from low water supply and sanitation service coverage and service breakdowns. The need for sustainable services and prolonged service life of schemes are vital to retain the benefits to citizens and reduce the burden of national government and development partners. Ascertaining the continuity of services for people already receiving the services is the essence of sustainability in water supply and sanitation along with the implementation of new facilities. Because of the sizes of systems that need post-construction management, the sustainability of these schemes depends on the effective involvement of stakeholders, particularly the user communities.

In many studies, community management is key to achieving sustainable services by prolonging the services of the implemented water schemes and facilitating the implementation of new systems to improve overall service coverage. This concept is crucial to countries with populations dominantly living in rural areas and national governments with few resources to address all the people's needs. In community management, users are expected to play an active part in the post-implementation management of the services. However, the effectiveness of involving user communities depends on the type of approach taken by the national governments and development partners.

In Ethiopia, all the four approaches have been playing substantial parts in the development of water supply and sanitation services in the country. However, CMP has introduced an in-depth focus on community empowerment. The flexibility of the financial administration in CMP and its procurement process that enables the systems to operate have increased community empowerment to a new level compared to the other approaches.

CMP gradually evolved from RWSEP, the conventional approach, to purely decentralized implementation. Its evolutionary process conveys a message to other implementers about ways to maintain a dynamic state to achieve sustainable services. The changing CMP process took two decades to complete. At the beginning of the 1990s, it was a typical centralized approach administering all implementation of water supply, sanitation, and other developmental activities in the Amhara region of Ethiopia. Through time and by

evaluating the effectiveness of every phase of the projects, the approach was modified into CDF in 2003 and, finally, into CMP in 2011, when CDF was renamed CMP (otherwise there is no significant difference between them).

The CMP philosophy, based on the ten steps explained in Chapter 4, is promising for driving the community management approach towards success. However, the perceptions of the user communities and the implementing personnel are contributing to slow progress and incomplete outcomes in some of the projects' aspects, such as tariff collections, upfront deposits at MFIs, spare parts supply for O&M, and the effectiveness of community representatives. Although expectations and local experiences have influenced the success of community management, engaging traditional knowledge during planning is vital to incorporating local social capital into a project's success.

Understanding and exploiting social capital in an indigenous community is crucial to reduce the transaction costs of implementing and managing the services. Harvey and Read (2007) explained that social cohesion is critical to promote successful community participation and management. However, that would be realized only when the implementers understand the local lifestyles and devise appropriate management styles that could be accepted by a particular community. In some circumstances, adopting a traditional management style could promote the success of community management.

6.2 Scientific contributions

Rural water and sanitation services in Ethiopia have not received much research attention. Thus, the outcome of this study is important to spur future research and supplement development in the sector. The scientific contributions of study can be summarised based on each of the articles, as follows. The research was based on a pragmatic approach, which is problem-oriented, bottom-up, and based on real field conditions.

Qualitative and quantitative methodological approaches were employed to explore the challenges and opportunities of the services of the focus area. Accordingly, Article I explored the water resource reforms of Ethiopia from 1905 to the present and studied the changing process of community management and the CMP approach in Ethiopia. The findings are vital in terms of background information, the key achievements of the water sector reforms of the country, and narratives on the evolution of CMP.

Article II compared water and sanitation implementation approaches and their performances in achieving the national targets. The key knowledge extracted from the article is the disparity between water service coverage and service level. Moreover, the extent of community participation, management options, and the reactions of the user community were analysed. In general, a framework for long-term services was proposed that could be used in areas where community management is indispensable.

Water system non-functionality in Ethiopia is as high as 35%, which has significantly influenced efforts towards service coverage in the rural parts of the country. Knowing the

causes of a problem is vital to solving it. Thus, Article III focused on identifying factors related to service failures of the rural water supply systems. The article presents the most prominent causes of service failures and the policy implications, which could be used for future development of the sector by professionals and policymakers.

The case studies of Borana and Konso explored experiences in traditional water management (Article IV). Traditional system management relies on maintaining equitable services, feelings of ownership, and rule enforcement mechanisms. Moreover, father (owner) of the water is key in the two case communities to protect sources from abuses. Therefore, the article is crucial to traditional water management and the ways to cooperate with modern management to enhance sustainable services in rural areas. Moreover, national policy, strategies, and plans in line with rural water and sanitation were reviewed in this study and recommendations were forwarded to help policymakers recognize the gaps.

In general, the research addressed a broad topic and explored rural water and sanitation in Ethiopia from different perspectives, background studies, service levels, factors influencing service, traditional experiences and their benefits to the modern approaches, policy, and strategies. I believe that the findings could be a basis for further study, policymaking, and the development of water and sanitation in Ethiopia as well as other countries in sub-Saharan Africa with similar situations.

6.3 Recommendations and policy implications

The CMP approach has demonstrated remarkable achievements for rural water and sanitation development, including procurement procedures, engaging communities in the projects before inception, training water committees and caretakers before construction begins, and involving users in wider activities to create feelings of ownership. However, the approach must establish systems of continuous monitoring and support and it must incorporate a way to include traditional management into its procedures. As elaborated by the theories, citizen participation is a way to involve user communities and safeguard community resources and services. In community management of rural water and sanitation, the users must be convinced about the services and management mechanisms to internalize the culture of self-administration. Moreover, the skills and technical abilities required to operate and maintain the systems must be provided by the relevant governmental body. Regarding the communities, they are not expected to be responsible for everything, no matter how community management is promoted at any level. Rural communities are not much convinced by introducing development philosophies and management that lack local context. Introducing new ideas in rural areas without actively engaging the community is like writing a book about a person without consulting him or her.

Based on this study, specific recommendations are provided as follows.

- Policymakers must be concerned about the services reaching the users rather than the quantity of constructed systems by using RBM
- Procurement policies of non-CMP approaches should be revised to speed up construction and create trust within the community
- The national governments should be devoted to harmonizing efforts, platforms to level the playing field, and attracting skilled labour
- The sector's development strategies should be supported by the development of staff in terms of technical capacities, and collective measures should be taken to reduce staff turnover and attract staff to the district level because districts are central for improving rural water supply and sanitation coverage in the country
- Traditional knowledge should receive attention and be accounted for when formulating and designing new approaches and policies.

6.4 Need for further research

This study was conducted in rural Ethiopia, where livelihoods are based on agriculture. Moreover, water supply problems in these areas were observed to be deep and wide. However, the pastoralists that seasonally move in search of water and rangeland for their cattle rarely find protected water supplies, and they are not beneficiaries of built water supply and sanitation services. In the future, a study could be conducted on these people and the ways that water supplies are provided to these communities, and to investigate the possibility of CMP involvement in pastoral areas.

In rural areas, water supply systems use simple technologies, but there are many of them. Moreover, the available technical support at the district level is insufficient to provide adequate monitoring of the water quality of the schemes. However, in this study, the water quality aspect was not studied. Therefore, thorough future studies are required to investigate the water quality of the rural water supply. For example, a study should be conducted to assess the possibilities of implementing a water quality safety plan to achieve better services.

History really matters! The pasts and presents have something to share with the futures, at least regarding cumulated experiences and knowledge. However, development endeavours are hardly documented in Ethiopia. Therefore, in-depth study of the historical evolution of water supply and sanitation in developing countries is vital so that the future could benefit and built on past and present knowledge.

BIBLIOGRAPHY

Abrams, L., Palmer, I., and Hart, T., "Sustainability management guidelines," *Pretoria: Department of Water Affairs and Forestry, South Africa*, 1998.

ADF, A. D. F. (2005) Rural water supply and sanitation programme. [Online]. Available: http://www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/ET-2005-135-EN-ADF-BD-WP-REV.1-ETHIOPIA-AR-RWSSP-REV-1.PDF

Ainger, C. and Fenner, R. A., *Sustainable Infrastructure-Principles into Practice.* ICE publishing, 2013.

Arnstein, S. R., "A ladder of citizen participation," *Journal of the American Institute of Planners*, vol. 35, no. 4, pp. 216–224, 1969.

Awulachew, S. B., Yilma, A. D., Loulseged, M., Loiskandl, W., Ayana, M., and Alamirew, T., *Water resources and irrigation development in Ethiopia.* IWMI, 2007, vol. 123.

Axinn, W. G. and Pearce, L. D., *Mixed method data collection strategies.* Cambridge University Press, 2006.

Bakker, K., *Good governance in restructuring water supply: A handbook.* Federation of Canadian Municipalities, 2003.

Behailu, B. M., Pietilä, P., and Katko, T. S., "Indigenous practices of water system management for sustainable services case of borana and konso, ethiopia," *SAGE open*, 2016d, accepted.

Behailu, B., "Dry toilet sanitation as an alternative solution to the rural ethiopia," in *5th International Dry Toilet Conference*, 2015.

Behailu, B. and Mattila, H., "Need of services and understanding of service providers in water and sanitation: A case of ethiopia," in *Proceedings of the CIB World Building Congress 2016 Volume IV*, Nenonen, S. and Junnonen, J.-M., Eds. Tampere University of Technology, 2016a, pp. 431–440.

Behailu, B. M., Suominen, A., and Katko, T. S., "Evolution of community-managed water supply projects from 1994 to the 2010s in ethiopia," *Public Works Management & Policy*, vol. 20, no. 4, pp. 379–400, 2015.

Behailu, B. M., Hukka, J. J., and Katko, T. S., "Service failures of rural water supply systems in ethiopia and their policy implications," *Public Works Management & Policy*, p. 1087724X16656190, 2016b.

Behailu, B., Suominen, A., Katko, T., Mattila, H., and Yayehyirad, G., "Comparison of community managed projects and conventional approaches in rural water supply of ethiopia," *African Journal of Environmental Science and Technology*, vol. 10, no. 9, pp. 292–306, 2016c.

Biswas, K., "Future of the world's water," 2013.

Brikké, F. and Bredero, M., "Linking technology choice with operation and maintenance in the context of community water supply and sanitation," *Reference document for planners and project staff. Geneva: WHO and IRC*, 2003.

Brown, C. and Lall, U., "Water and economic development: The role of variability and a framework for resilience," *Natural Resources Forum*, vol. 30, no. 4, pp. 306–317, 2006.

Brundtland, G., Khalid, M., Agnelli, S., Al-Athel, S., Chidzero, B., Fadika, L., Hauff, V., Lang, I., Shijun, M., de Botero, M. M. *et al.*, "Our common future (\'brundtland report\')," U.N. General Assembly created the World Commission on Environment and Development, Tech. Rep., 1987.

Bryman, A., "Integrating quantitative and qualitative research: how is it done?" *Qualitative Research*, vol. 6, no. 1, pp. 97–113, 2006.

Butterworth, J. (2012) Effective aid for sustainable wash service. [Online]. Available: http://www.cmpethiopia.org/page/258

Calow, R., MacDonald, A., and Cross., P., "Rural water supply corruption in ethiopia," in *Diagnosing Corruption in Ethiopia : perceptions, realities, and the way forward for key sectors*, Plummer, J., Ed. World Bank, 2012, pp. 121–180.

Carter, R., Harvey, E., and Casey, V., "User financing of rural handpump water services," in *Pumps, Pipes and Promises: Costs, Finances and Accountability for Sustainable WASH Services*. IRC Symposium, 2010.

Carter, R. C. and Ross, I., "Beyond 'functionality'of handpump-supplied rural water services in developing countries," *Waterlines*, vol. 35, no. 1, pp. 94–110, 2016.

Carter, R. C., Tyrrel, S. F., and Howsam, P., "The impact and sustainability of community water supply and sanitation programmes in developing countries," *Water and Environment Journal*, vol. 13, no. 4, pp. 292–296, 1999.

Castro, J. E., "Issues of governance and citizenship in water services: a reflection on latin american experiences," in *Water Services Management and Governance: Lessons for a Sustainable Future*, Juuti, P. S., Schwartz, K., and Katko, T. S., Eds. International Water Association (IWA), 2012, ch. 12, pp. 133–143.

Chaka, T., Yirgu, L., Abebe, Z., and Butterworth, J., "Ethiopia: Lessons for rural water supply; assessing progress towards sustainable service delivery," *The Hague: IRC International Water and Sanitation Centre*, 2011.

Chambers, R., *Rural development: Putting the last first.* Essex, UK: Longman, 1983.

Cheema, G. S. and Rondinelli, D. A., *Decentralizing governance: emerging concepts and practices.* Brookings Institution Press, 2007.

Connor, D. M., "A new ladder of citizen participation," *National Civic Review*, vol. 77, no. 3, pp. 249–257, 1988.

Creswell, J. W., *Research design: Qualitative, quantitative, and mixed methods approaches.* Sage publications, 2013.

CSA, "Population and housing census report-country. 2010," Ethiopian Centeral Statistics Agency, Tech. Rep., 2010.

———, "Ethiopia demographic and health survey," Ethiopian Centeral Statistics Agency and ICF International Calverton, Tech. Rep., 2011.

Davis, J. and Whittington, D., "'participatory' research for development projects: A comparison of the community meeting and household survey techniques," *Economic Development and Cultural Change*, vol. 47, no. 1, pp. 73–94, 1998.

Deaton, A., *The analysis of household survey: A Microeconometric Approach to Development Policy.* Published for the World Bank, The Johns Hopkins University Press , Baltimore and London, 1996.

Declaration, T. P., "Organisation for economic co-operation and development. "the paris declaration on aid effectiveness and the accra agenda for action." (2005)." UN, Tech. Rep., 2005.

Dharmaratna, D., *Demand, supply and welfare aspects of pipe-borne water in Sri Lanka.* Cambridge Scholars Publishing, 2011.

Doe, S. R. and Khan, M. S., "The boundaries and limits of community management: Lessons from the water sector in ghana," *Community Development Journal*, vol. 39, no. 4, pp. 360–371, 2004.

Eisenhardt, K. M. and Graebner, M. E., "Theory building from cases: opportunities and challenges," *Academy of Management Journal*, vol. 50, no. 1, pp. 25–32, 2007.

Eneas da Silva, F. O., Heikkila, T., de Assis de Souza Filho, F., and da Silva, D. C., "Developing sustainable and replicable water supply systems in rural communities in brazil," *International Journal of Water Resources Development*, vol. 29, no. 4, pp. 622–635, 2013.

Ethiopian-Government-portal. (2016) Regional states. [Online]. Available: http://www.ethiopia.gov.et/web/pages/regional-states

Factbook, T. W. (2016) The world factbook. [Online]. Available: https://www.cia.gov/library/publications/the-world-factbook/fields/2088.html

Feachem, R. G., "Community participation in appropriate water supply and sanitation technologies: The mythology for the decade," *Proceedings of the Royal Society of London B: Biological Sciences*, vol. 209, no. 1174, pp. 15–29, 1980.

Flyvbjerg, B., "Five misunderstandings about case-study research," *Qualitative Inquiry*, vol. 12, no. 2, pp. 219–245, 2006.

Franceys, R., "Gats,'privatization'and institutional development for urban water provision future postponed'?" *Progress in Development Studies*, vol. 8, no. 1, pp. 45–58, 2008.

Gable, G. G., "Integrating case study and survey research methods: an example in information systems," *European Journal of Information Systems*, vol. 3, no. 2, pp. 112–126, 1994.

Giné, R. and Pérez-Foguet, A., "Sustainability assessment of national rural water supply program in tanzania," *Natural Resources Forum*, vol. 32, no. 4, pp. 327–342, 2008.

Gleick, P. H., *Water in crisis: a guide to the world's fresh water resources.* Oxford University Press, Inc., 1993.

Grover, B. and Howarth, D., "Evolving international collaborative arrangements for water supply and sanitation," *Water International*, vol. 16, no. 3, pp. 145–152, 1991.

GTP2, "Growthe and transformation (gtp-2) for the water sector," Ministry of water, Irrigation and Electricity, Programme document, 2015.

Harvey, P., "Poverty reduction strategies opportunities and threats for sustainable rural water services in sub-saharan africa," *Progress in Development Studies*, vol. 8, no. 1, pp. 115–128, 2008.

Harvey, P. and Reed, B., *Rural water supply in Africa: Building blocks for handpump sustainability.* WEDC, Loughborough University, 2004.

Harvey, P. A. and Reed, R. A., "Community-managed water supplies in africa:sustainable or dispensable?" *Community Development Journal*, vol. 42, no. 3, pp. 365–378, 2007.

Huby, M. and Stevenson, S., "Meeting need and achieving sustainability in water project interventions," *Progress in Development Studies*, vol. 3, no. 3, pp. 196–209, 2003.

Hukka, J. J., Katko, T. S., Mattila, H. E., Pietila, P. E., Sandelin, S., and Seppala, O., "Inadequacy of positivistic research to explain complexity of water management," *International Journal of Water*, vol. 3, no. 4, pp. 425–444, 2007.

Jones, S., "Participation as citizenship or payment? a case study of rural drinking water governance in mali," *Water alternatives*, vol. 4, no. 1, p. 54, 2011.

Juuti, P. S. and Katko, T. S., *Water, time and European cities-History matters for the futures.* Eds, 2005.

Katko, T. S., "Cost recovery in water supply in developing countries," *International Journal of Water Resources Development*, vol. 6, no. 2, pp. 86–94., 1990.

———, *Paying for water in developing countries.* Doctoral Dissertation, vol. 74, Tampere University of Technology, 1991.

Katko, T. S. and Hukka, J. J., "Social and economic importance of water services in the built environment: Need for more structured thinking," *Procedia Economics and Finance*, vol. 21, pp. 217–223, 2015.

Kaufmann, D., Kraay, A., and Mastruzzi, M., "The worldwide governance indicators: methodology and analytical issues," *Hague Journal on the Rule of Law*, vol. 3, no. 2, pp. 220–246, 2011.

Kemerink, J., Mbuvi, D., and Schwartz, K., "Wgovernance shifts in the water services sector: a case study of the zambia water services sector," in *Water Services Management and Governance: Lessons for a Sustainable Future*, Juuti, P. S., Schwartz, K., and Katko, T. S., Eds. International Water Association (IWA), 2012, ch. 12, pp. 157–167.

Kusek, J. Z. and Rist, R. C., *Ten steps to a results-based monitoring and evaluation system: a handbook for development practitioners.* World Bank Publications, 2004.

Livingston, M., "Deep wells and prudence: towards pragmatic action for addressing groundwater overexploitation in india," *Report, World Bank*, 2009.

Lockwood, H. and Smits, S., *Supporting rural water supply: moving towards a service delivery approach.* Practical Action Publishing, 2011.

Marks, S. J. and Davis, J., "Does user participation lead to sense of ownership for rural water systems? evidence from kenya," *World Development*, vol. 40, no. 8, pp. 1569–1576, 2012.

Marshall, M. N., "Sampling for qualitative research," *Family Practice*, vol. 13, no. 6, pp. 522–526, 1996.

Mattila, H., *Appropriate management of on-site sanitation.* Doctoral Dissertation, vol. 537, Tampere University of Technology, 2005.

McCommon, C., Warner, D. B., and Yohalem, D. I., "Community management of rural water supply and sanitation services," NA, WASH Technical Report. WASH Project 4, 1988.

Mebrahtu, M. (2012) Assessment of the cmp approach in developing rural water supply schemes, benishangul-gumuz region. [Online]. Available: http://www.cmpethiopia.org/media/meron_mebrahtu_m_sc_thesis_assessment_of_the_cmp_approach_in_developing_rural_water_supply_schemes_benishangul_gumuz_region

Mitiku, M. (2013) Evaluation of the level of service rendered by functioning rural water supply schemes: case of farta woreda. [Online]. Available: http://www.cmpethiopia.org/media/mebit_mitiku_m_sc_thesis_evaluation_of_the_level_of_service_rendered_by_functioning_rural_water_supply_schemes_case_of_farta_woreda

Montgomery, M. A. and Elimelech, M., "Water and sanitation in developing countries: including health in the equation," *Environmental Science & Technology*, vol. 41, no. 1, pp. 17–24, 2007.

Moriarty, P., Batchelor, C., Fonseca, C., Klutse, A., Naafs, A., Nyarko, K., Pezon, C., Potter, A., Reddy, R., and Snehalatha, M., "Ladders for assessing and costing water service delivery," IRC, Tech. Rep., 2011.

Muhumed, A. (2012) Sustainability of rural water services implemented using cmp approach in amhara region. [Online]. Available: http://www.cmpethiopia.org/media/ahmed_muhumed_b_sc_thesis_sustainability_of_rural_water_services_implemented_using_cmp_approach_in_amhara_region

NMA. (2013) National merteology agency annual climatic bulletins. [Online]. Available: http://www.ethiomet.gov.et.2013.http://www.ethiomet.gov.et/bulletins/view_pdf/348/2013___annual___bulletin.pdf

North, D. C., *Institutions, institutional changes and Economic performance.* Cambridge University Press, 1990.

Nyanchaga, E. N., "Water services management and governance: past lessons for a sustainable future," in *Water Services Management and Governance: Lessons for a Sustainable Future*, Juuti, P. S., Schwartz, K., and Katko, T. S., Eds. International Water Association (IWA), 2012, ch. 12, pp. 157–167.

———, *History of Water Supply and Governance in Kenya (1895-2005):Lessons and Futures.* Tampere University Press, 2016.

Ostrom, E., *Governing the commons: The Evolution of Institutions for Collective.* Cambridge University Press, 1990.

– – –, "Social capital: a fad or a fundamental concept," in *Social capital: a multifaceted perspective*, Dasgupta, P. and Dasgupta, I. S., Eds. World Bank Publications, 2000, pp. 172 – 214.

– – –, "Tragedy of the commons," *The New Palgrave Dictionary of Economics*, pp. 3573 – 3576, 2008.

OWNP, "One wash national program: Program operation manual (pom) for the consolidated wash account," Ministry of Water, Irrigation and Energy, Addis Abab, Ethiopia, Programme document, 2014.

Pacey, A., "Technology is not enough: The provision and maintenance of appropriate water supplies," *Aqua*, vol. 1, no. 1, pp. 1 – 58, 1977.

Pahl-Wostl, C., "Towards sustainability in the water sector – the importance of human actors and processes of social learning," *Aquatic Sciences*, vol. 64, no. 4, pp. 394 – 411, 2002.

Perveen, S. and James, L. A., "Scale invariance of water stress and scarcity indicators: Facilitating cross-scale comparisons of water resources vulnerability," *Applied Geography*, vol. 31, no. 1, pp. 321 – 328, 2011.

Pretty, J., "Social capital and the collective management of resources," *Science*, vol. 302, no. 5652, pp. 1912 – 1914, 2003.

Rautanen, S.-L., *Access to Water? Dynamic Capacity Change for Sustainable Rural Water and Sanitation Services for All.* Doctoral Dissertation, vol. 1373, Tampere University of Technology, 2016.

Reed, R., S, G., S, K., B, R., J, R., J, F., and F., V. K. O., "Technical notes on drinking-water, sanitation and hygiene in emergencies," in *WEDC*. WHO, 2011, pp. 9.1 – 9.4.

Rogers, P. and Hall, A. W., Eds., *Effective water governance. TEC Background Paper*, no. 7. Stockholm: Global Water Partnership, 2002.

Sandelowski, M., "Focus on research methods combining qualitative and quantitative sampling, data collection, and analysis techniques," *Research in Nursing & Health*, pp. 246 – 255., 2000.

Sansom, K. and Koestler, L., "African handpump market mapping study," *UNICEF, NY*, 2009.

Schouten, T. and Moriarty, P., *Community Water, Community Management: From System to Service in Rural Areas.* Practical Action Publishing, 2003.

Schumacher, E. F., *Small is beautiful.* Crane Memorial Library., 2013.

Seppälä, O. and Katko, T. S., "Appropriate pricing and cost recovery in water services," *Journal of Water Supply: Research and Technology – Aqua*, vol. 52, no. 3, pp. 225 – 236, 2003.

Seppälä, O. T., *Visionary Management in Water Supply Services: Reform and Development of Institutional Frameworks.* Doctoral Dissertation, vol. 457, Tampere University of Technology, 2004.

Sharma, N. (2012) Cmp in implementing rural water supply in amhara region (msc. thesis). [Online]. Available: http://www.cmpethiopia.org/media/nabin_sharma_m_sc_thesis_cmp_in_implementing_rural_water_supply_in_amhara_region

Spaling, H., Brouwer, G., and Njoka, J., "Factors affecting the sustainability of a community water supply project in kenya," *Development in Practice*, vol. 24, no. 7, pp. 797 – 811, 2014.

Stoker, G., "Governance as theory: five propositions," *International Social Science Journal*, vol. 150, no. 155, pp. 17 – 28, 1998.

Suominen, A. and Urgessa, M., "Community development fund approach in rws financing," in *30th WEDC International Conference: People centered approaches to water and environmnetal sanitation.* WEDC, Vientiane, Laos: PDR, 2004, pp. 315 – 318.

Teddlie, C. and Yu, F., "Mixed methods sampling a typology with examples," *Journal of mixed methods research*, vol. 1, no. 1, pp. 77 – 100, 2007.

Tesfaye, Y. (2012) A comparative study on woreda managed and cmp rural water supply projects. [Online]. Available: http://www.cmpethiopia.org/media/yewondwossen_tesfaye_m_sc_thesis_a_comparative_study_on_woreda_managed_and_cmp_rural_water_supply_projects

The-North-Yorkshire-County-council, "What is the community engagement 'ladder of participation'?" The North Yorkshire County council, Report, 2010.

UN, "The new delhi statement, global consultation on safe water and sanitation." United Nations, New Delhi, Tech. Rep., September 1990.

WHO, *PHAST Step-by-step guide: A participatory approach for the control of diarrhoeal disease.*, World Health Organization, 1998.

– – –, "International drinking water supply and sanitation consultation," World Health Organization, Interlaken, Switzerland, Tech. Rep. 17, 13-16, October 1987.

WHO/UNICEF, "Global water supply and sanitation assessment 2000 report," WHO/UNICEF, Tech. Rep., 2000.

– – –, "Meeting the mdg drinking water and sanitation target: A mid-term assessment of progress," WHO/UNICEF, Tech. Rep., 2004.

– – –, "Water for life: Making it happen," WHO/UNICEF, Tech. Rep., 2005.

– – –, "Meeting the mdg drinking water and sanitation target: the urban and rural challenge of the decade," WHO/UNICEF, Tech. Rep., 2006.

– – –, "Progress on drinking water and sanitation: Special focus on sanitation." in progress on drinking water and sanitation: special focus on sanitation. ." WHO/UNICEF, Tech. Rep., 2008.

– – –, "Progress on sanitation and drinking-water: 2010 update," WHO/UNICEF, Tech. Rep., 2010.

– – –, "Progress on sanitation and drinking-water," WHO/UNICEF., Tech. Rep., 2013.

– – –, "Progress on sanitation and drinking water: 2014 update," WHO/UNICEF, Tech. Rep., 2014.

– – –, "Progress on sanitation and drinking water: 2015 update and mdg assessment. geneva," WHO/UNICEF, Tech. Rep., 2015.

WIF, "The national wash implementation framework (wif)," Ministry of Water, Irrigation and Energy; Ministry of Health; Ministry of Education; and Ministry of Finance and Economic Development, Tech. Rep., 2013.

Wilderer, P. A., "Applying sustainable water management concepts in rural and urban areas: some thoughts about reasons, means and needs," *Water Science and Technology*, vol. 49, no. 7, pp. 7–16, 2004.

Yin, R. K., *Case study research: Design and methods*. Sage, 2003.

Original Publications

PUBLICATION I

Behailu B. M., Suominen A., Katko, T. S. "Evolution of Community Managed Water Supply Projects (CMP) from 1994 to the 2010s in Ethiopia", *Public Works Management and Policy.* 20(4), 379-400, 2015.

Public Works Management & Policy
2015, Vol. 20(4) 379–400

DOI: 10.1177/1087724X15593955
pwm.sagepub.com
SAGE

Evolution of Community-Managed Water Supply Projects From 1994 to the 2010s in Ethiopia

Beshah M. Behailu[1,2], Arto Suominen[3], and Tapio S. Katko[2]

Abstract

This article discusses the evolution of community-managed projects (CMPs) along with the global community-based management of water supply and sanitation services since the 1960s, particularly the evolution of Ethiopian water resources development in the last century. The study was conducted with intensive reviews of journals, reports, project documents, and discussions with the people involved in CMP implementation, including many Ethiopian government officials. The article presents the various development phases of the water and sanitation sector in Ethiopia together with national and global influences. Currently, in the 2010s, the CMP financing mechanisms and the national development of water supply and sanitation are more organized and integrated, and are in the stage of scaling up. The recently agreed national water, sanitation, and hygiene strategic framework is expected to have significant impacts on the rural water supply and sanitation development in Ethiopia.

Keywords

community-managed projects (CMP), sustainability, evolution, water sector reforms, Ethiopia

Introduction

It has been over three decades since the concept of community management in water supply and sanitation has become well known in development policies worldwide

[1]Arba Minch University, Ethiopia
[2]Tampere University of Technology, Finland
[3]Community-Led Accelerated WASH (COWASH) Project, Addis Ababa, Ethiopia

Corresponding Author:
Beshah M. Behailu, Tampere University of Technology, P.O. Box 541, FIN-33101 Tampere, Finland.
Email: behailu@student.tut.fi

(Dewan et al., 2014). It is a crucial component to rural water supply and sanitation development (Doe & Khan, 2004). Due to the inefficiency of the top-down approach, community development and sustainability are becoming highly important. Therefore, involving the users at all stages of a project is considered mandatory for well-functioning community management. Having the users participate in the selection of appropriate technology, the site and level of service, and encouraging them to pay part of the investment, operation and maintenance costs are very crucial in winning over the hearts of the community.

Although community leadership in the planning and implementation stage of projects is an asset to realize the community ownership of their own systems, it is not an easy task to abruptly have the intended community leadership without thorough awareness raising among the community and local government officials. In the past water supply implementation, operation and maintenance were considered the responsibility of governments in developing countries (Rouse, 2013), and users were expecting to have water service for free (Moriarty, 2003). Such thinking still exists in the rural parts of the developing economies. In this respect, a lot needs to be done to make those rural communities that suffer most from problems in water supply and sanitation realize their key role in the sector. Thus, the focus has been shifted more toward community management in the last decades.

The idea of community management of water supply systems was conceived when the targets set during the 1980-1990 International Drinking Water Supply and Sanitation Decade (IDWSSD) were challenged. In the decade, more attention was given to the appropriate technology and physical construction of systems and finally the role of the social aspects given recognition as an important element to meet the goals (Kalbermatten, 1991). According to the lessons learned during the decade, the hardware and software aspects of water supply and sanitation systems are strongly tied together, and the latter should not be ignored while working with the former to maintain the longevity of service delivery (Cairncross, 1992). This was reaffirmed during the second United Nations Conference on the least developed countries in 1990 (United Nations [UN], 1990b), the World Summit for Children (United Nations Children's Fund [UNICEF], 1990), and the New Delhi Statement, Global Consultation on Safe Water and Sanitation in September (United Nations, 1990a), stressing the need for community management to improve water and sanitation sustainability in developing countries. In particular, the New Delhi Statement requested the full participation of women and promoted the introduction of community management and the adoption of workable financial practices.

Based on feedbacks and recommendations drawn in the early 1990s, donors, nongovernmental organizations (NGOs), and national governments have mainstream community management into their development strategies (Manor, 2004). Various parts of the developing world initiated and started the practice in the 1990s. Similarly, in 1994, Ethiopia introduced a community-focused multi-sector project in the Amhara regional state in collaboration with the government of Finland (GoF). The project has grown and changed its implementation approach toward a more decentralized and community-led implementation called the community-managed project (CMP).

Now, CMP is one of the four water supply and sanitation implementation approaches in the country, the other three being the Woreda (District) Managed Project (WMP), the NGO Managed Project, and Self-Supply (WASH Implementation Framework [WIF], 2013). All these approaches have their own distinct features of water supply schemes implementation. However, this article intends to discuss only CMP as it is favored by national and local governments and has evolved through different phases and changes in implementation principles.

Thus, a study was conducted on the suitability of the approach for alleviating the problems of the rural water supplies of developing economies, in particular in the Ethiopian context. This article is one of four articles intended for publication. The forthcoming studies will present a comparative view of CMP with other approaches applied in the country, the reasons for frequent service failures of the rural schemes, and the importance of local management practices for sustainable rural water supply.

Objectives and Methodology

The objective of this article is to provide better understanding and knowledge of CMP from its evolution in relation to national and international water service development. To attain its main objective, the article explored community management's historical background, Ethiopian water resources reforms, and the national water sector strategy and frameworks.

Based on the background and objective, we will first determine how the problems in rural water supply have contributed to the changes in implementing the principles of the approach. Second, we will evaluate the extent to which the approach has been influenced by the national water sector policy and strategy. Third, we will find out how and why the Ethiopian government has supported the approach.

Method

The study is mainly qualitative research involving little quantitative data. Although qualitative research may be criticized for its generalizability, and possible lack of objectivity and reliability of its findings, it can still be considered explorative research (Borrego, Douglas, & Amelink, 2009; Flyvbjerg, 2006). Contextual analysis allows avoiding the problem of generalizability. As this particular study is about exploring the approach, we prefer qualitative study. The data were contextually analyzed taking into account how the national situation has influenced the changes in the principles of implementation and to what degree the approach is incorporated into the national water sector policy and strategy recommendations. Moreover, the article tries to analyze whether the national government supports the changes both politically and financially.

The article includes reviews of published literature, project documents, official reports, and interviews of seven Ethiopian government officials (of different levels) and five project staff members directly involved in the projects.

The structure of the article is as follows: The first section explains the rationale of the research, research question, objectives, and methodology. The second section shows the evolution of the concept of community management in the last six decades since the 1960s and related challenges. The third and fourth sections deal with Ethiopian water resources and services' history and evolution of CMP, presenting the actual results of the article.

Community-Managed Rural Water Supply

The start of community involvement in water and sanitation development dates back to the 1960s and 1970s when community involvement started influencing the sector to make effective interventions (Moriarty, 2003; Cohen & Uphoff, 1980, as quoted in Cornwall, 2002). The Mar Del Plata Conference (World Water Conference) in 1977 was certainly influenced by the introduction of community concerns into the sector because it sets the ground for IDWSSD to put more emphasis on community involvement in the sector (Moriarty, 2003). The United Nations Conferences held in Vancouver (1976) and Mar Del Plata (1977) gave due attention to the low levels of water and sanitation in developing economies (Feachem, 1980). The latter conference called for IDWSSD to readdress the situation (Grover, 1991).

After a series of assemblies of the United Nations (Grover, 1991), following the World Water Conference in 1977, the IDWSSD (1981-1990) was proclaimed in November 1980 (Christmas, 1991). The objective was to bring full access to water and sanitation for all residents in developing countries by the end of the decade. Although the decade did not achieve its objectives, it was quite successful in creating awareness of community management and devising a strategy to improve sustainability (Christmas and de Rooy, 1991). According to Christmas and de Rooy (1991) and Cairncross (1992), the bottlenecks in the decade were the passive involvement of women and low community participation in the management of water and sanitation, as well as a lack of effective means of accelerating coverage in a sustainable manner. Community management was also challenged by the absence of cost recovery, lack of trained personnel, and unaddressed issues of operation and maintenance (Cornwall, 2002).

The slogan "Water and sanitation for all" was designed because of the different interests in the services among the users (IDWSSD, n.d.). The poor lacked services, while the rich wanted more services. It was obvious that the majority of the population in developing economies fell into the former category. The problem was unattainable unless there was a focus on the low-cost approach of service delivery to answer the question of the majority. Moreover, community participation was accepted in the early stages of the decade when the focus shifted to small NGO-led projects and low-cost technology. In this approach, users were encouraged to take an active role in providing inputs such as labor, materials, and/or cash. However, this model did not contribute greatly to the ambitious goals of the IDWSSD because they were small in number and scattered (Moriarty, 2003).

In 1983, Chambers wrote a book titled *Rural Development: Putting the Last First*. In this, he stressed that the community (village) is the center of rural development. In

other words, users should define and prioritize their needs through a bottom-up model. The process of community engagement in water supply and sanitation was in line with Arnstein's (1969) citizen participation ladder, from manipulation to tokenism, that is, from non-participation to user control. This is an indicator of how the community role has been rising gradually. Later in 1987, during the International Drinking Water Supply and Sanitation Consultation, the donor community and NGOs focused on community participation as one of the six basic prerequisites for improved operation of water and sanitation sector (WHO, 1987). Adhering to the conclusion of the consultation, many projects started to involve men and women in trench excavation, system care, and water committees (Moriarty, 2003). The community consultation and participation in the preparation and selection of technology was believed to convey a holistic impact on the service level. Consequently, the decade ended serving 1.2 billion and 770 billion people with potable water supply and access to sanitation facilities, respectively (Moriarty, 2003), and the concept of community management was created.

After the IDWSSD, the concept of community management has been widely applied. Yet, after two decades of working with communities, we are still concerned about sustainable service delivery. The objective of community management is to instill a feeling of ownership of schemes to keep them functional through their lifetime. Accordingly, different approaches have been emerged taking the community as a focal point. The bottom-up approach—where the community participates in all stages of projects and can choose its own development preference as concerns implementation—demands responsiveness, and demand-driven approaches have replaced supply-driven conventional implementation approaches. The motivation is sustainability, which makes all actors, partner organizations, governments, politicians, and user communities to work for long-lasting services (Cleaver & Toner, 2006). The concept of community management requires that the grass roots transform "from users and choosers to makers and shapers" (Chambers, 1983; Cornwall & Gaventa, 2001).

Community management has been accepted in most parts of the world, and community participation, user empowerment, and community representatives have become part of the vocabulary of the development sector (Cornwall, 2002). However, policies are not enough to address all issues related to different groups in a community (Cleaver & Nyatsamb, 2011). Poor and rich, men and women, and other groups can have different interests. Therefore, user committees rarely represent all (Cleaver, 1998; Manor, 2004). Manor (2004) as well as Harvey and Reed (2007) discussed the challenge of community management in rural development. Because user committees rarely represent the voice of the poorest (Manor, 2004), and men and women may have different interests, the interests of a household may differ from those of a community (Cleaver, 1998), which requires other measures. Thus, community management alone is not the solution, and we need to explore inter- and intra-community differences to be able to devise more participatory ways.

First, this article introduces the reader to Ethiopia and illustrates how the community management concept has been developed and how it has progressed in the country by linking it with national policy, water resources development reforms, and evolution of CMP in the following sections.

Table 1. Boom in Hydropower Dam Construction in Ethiopia 1960-1988.

Sr. no.	Hydropower dam	Completion year
	Koka	1960
	Tis Abay	1964
	Awash II	1966
	Awash III	1971
	Fincha	1973
	Melka Wakena	1988

Source. Kloos (2010).

Ethiopian Water Resources and Services History

Ethiopia, the only uncolonized state in Africa, has its own historical development. In fact, there was no adequate documentation practice in the country, especially in terms of the challenges and successes of the development endeavors. Thus, it is somewhat difficult to find organized evidence for the first half of the 20th century and earlier. However, a few findings from the literature indicate that the first piped water supply system in Ethiopia was introduced during the rule of emperor Menelik II (in power from 1889-1913). According to Gnogno (1984), pipes were transported over 500 km from Dire Dawa, the town connected with Djibouti by railway, to Addis Ababa and carried by human labor, installed and brought into operation in 1905 in the Imperial Palace of Addis Ababa. It was a surprise among the elites of the country to see water flowing in an unnatural way. At the time, water was abundant from various springs and shallow hand-dug wells, and water treatment was not a concern until 1938.

The construction of a treatment plant for the Addis Ababa water supply in 1938 (Sime, 1998) and the Aba Samuel dam for hydropower in 1932 (Shinn, 2013) could be considered the first major effort toward the development of water resources for the benefit of the public. The construction of the *Gefersa* and *Legedadi* dams in 1944 and 1970 (Sime, 1998), respectively, was a significant effort made in the water supply sector. Moreover, many hydropower dams were constructed in the 1960s and later, as displayed in Table 1. This indicates that the 1960s were the beginning stage of the sector development in the country. Subsequently, during the Ethiopian People's Revolutionary Democratic Front (EPRDF) regime (in power since 1991), intensive efforts have been made toward the development of water resources, especially hydropower dams: The Tekeze, Gilgel Gibe I-III, Tana Beles, Grand Renaissance Dam, and others are among the developmental efforts of the present regime.

The more recent history of Ethiopian water resources development can be linked with the modern constitution of 1955, which placed greater priority on water development. A year after the ratification of the constitution, the first Water Resources Development Department was created in 1956 under the umbrella of the Ministry of Public Works and Communication (Assefa, 2008; Ministry of Water & Energy [MoWE], 2014). The role of the department was to conduct investigations in the Blue

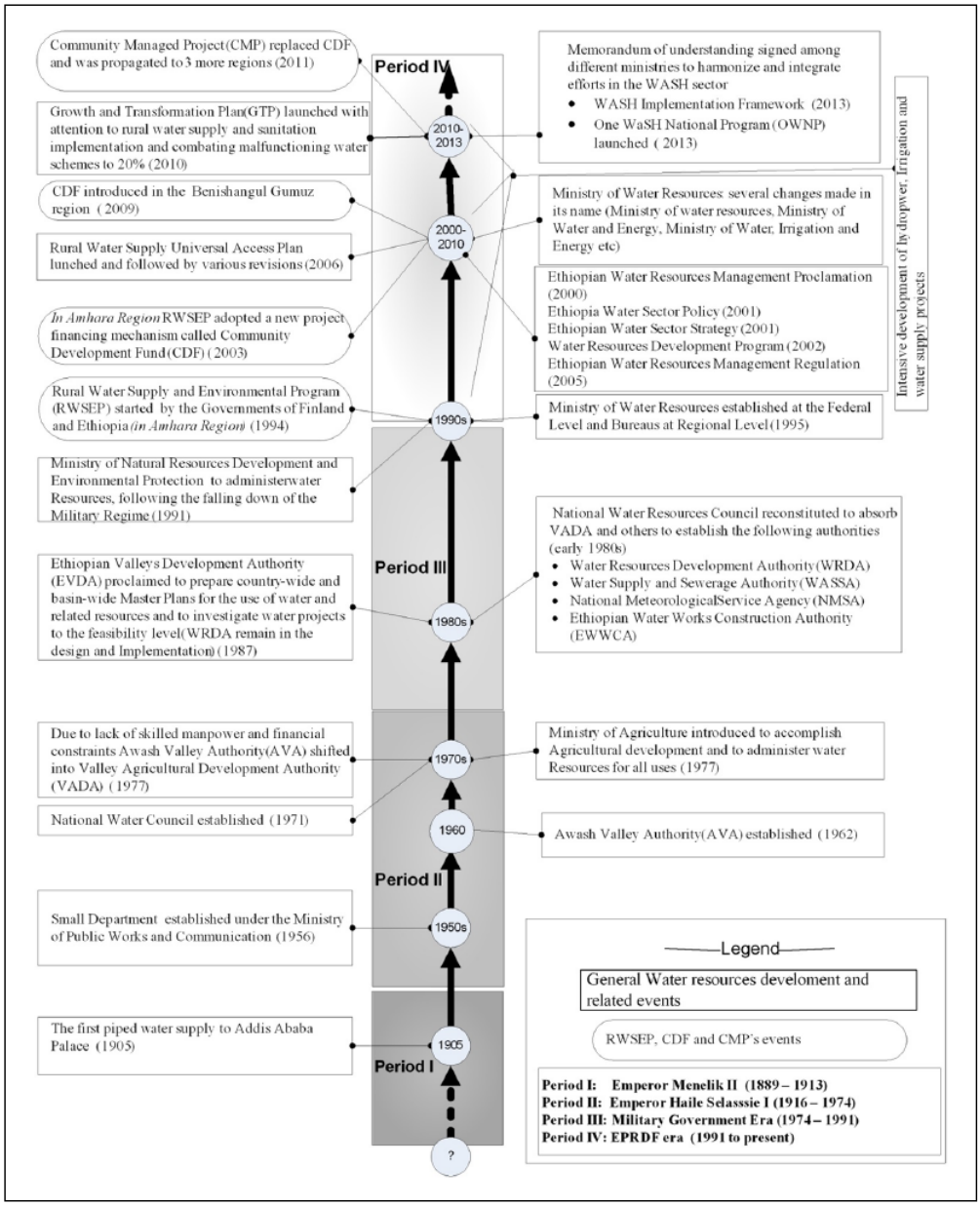


Figure 1. Major events in Ethiopian water resources development from the early 20th century to 2013.

Nile Basin for multiple uses (Assefa, 2008). However, due to the mission of the department to focus solely on this basin, it did not cover other basins. Figure 1 highlights the major events that took place in water sector development in Ethiopia.

In 1962, the Awash Valley Authority (AVA) was established to plan, design, and manage development in the Awash Valley (MoWE, 2014). In 1971, the National Water Resources Commission (NWRC) was established to administer water resources development in all basins of the country to overcome the basin-limited development activities by the AVA and the first department assigned in 1956. In the 1970s, the water sector was confronted with a lack of skilled manpower and financing. As a result, in 1977, the AVA was forced to merge with the newly organized Ministry of Agriculture (MoA; MoWE, 2014). The goal of the latter was to accomplish all development activities. The administration of water resources by the MoA continued until the year 2000 at the district (Woreda) level. Agriculture, water supply, and irrigation are all related to rural development, but under the umbrella of the MoA, the former took advantage of the others and received the major portion of human and financial resources in addition to the attention from high officials.

The Water Supply and Sewerage Authority (WSSA) emerged in the 1980s after the NWRC was reorganized by dissolving the Valley Agricultural Development Authority (VADA) to establish new fully fledged authorities for different responsibilities. These included the Water Resources Development Authority (WRDA), the WSSA, the Ethiopian Water Works Construction Authority (EWWCA), and the National Meteorological Service Agency (NMSA; Arsano, 2007; Assefa, 2008). Later in 1987, a new structure appeared to share the responsibility of the WRDA (MoWE, 2014). The Ethiopian Valley Development Authority (EVDA) was established to prepare country-wide master plans for water-related developments and studies on the feasibility level (MoWE, 2014). The institutional reforms in Ethiopia in the 1980s were able to bring about the WSSA as a developmental entity, which was certainly influenced by the IDWSSD in the 1980s. However, the decade was tragic for Ethiopia due to the several droughts that caused millions to die. Therefore, the goals set for the decade could not be achieved.

The years from 1974 to 1991 were stagnant in terms of implementation partly because the country was in a deadly civil war and experiencing severe famine. Thus, all the attention and resources of the county were devoted to regime safeguarding and combating the famine. Nevertheless, the regime achieved a considerable institutional reform, unlike its precursors; WRDA, WSSA, NMSA, and EWWCA were established during the period to perform respective roles in the sector (Arsano, 2007). Moreover, the establishment of the Arba Minch Water Technology Institute (AWTI) in 1986 was also evidence of the ambition of the regime to encourage water resources development.

However, the 1990s brought about a new era for the country, when the military government fell in 1991. The national constitutions, institutional arrangements, and administration systems were changed. The centralized governing structure was decentralized, and nine ethically delineated administrative regions were formed. Moreover, the responsibility of the sector authorities cascaded down to the regional levels. The interim government established the Ministry of Natural Resources Development and Environmental Protection in 1991 to handle the development of water resources and other natural resources activities. In 1995, following the enactment of the new

constitution, it was renamed as the Ministry of Water Resources (MoWR) with counterpart bureaus at the regional level.

After the military regime (1974-1991), the EPRDF government has intensively invested in water resources development, especially for hydropower, irrigation, and water supply. During the last 10 years, special attention has been given to rural water supply and sanitation compared with the previous regimes. Ethiopian Water Sector Policy (Ministry of Water Resources [MoWR], 2001a), Ethiopian Water Sector Strategy (MoWR, 2001b), National Hygiene and Sanitation Strategy (Ministry of Health [MoH], 2005), and other sector documents have been produced from 2001 to 2014 (Arsano, 2007; MoWE, 2014). Because of the fragmented nature of the development efforts in the sector, the European Union Water Initiative in 2005 with the government of Ethiopia (GoE) made a series of thorough discussions, which culminated into the first Multi-Stakeholder Forum organized in 2006. As a result of this start, the sector development partners with four line ministries of Water, Finance, Health, and Education signed the WIF and developed the One WaSH National Program (OWNP) in 2013. These two major sector development documents had significant impacts on the sector as a consequence of collective action.

In 1994, the Rural Water Supply and Environmental Program (RWSEP) was established. It started functioning in Amhara, one of the nine regional states. The RWSEP was a bilateral program operated by the regional government with financial assistance from the Government of Finland [GoF]. The main objective of the program was to improve the access of the rural population to water and sanitation. To comply with the national policies, it was shaped in a similar fashion to the Ministry of Natural Resources Development and Environment. The word "environment" in the program's name also gave emphasis to environmental sanitation.

Focus of the Ethiopian Rural Water Supply Policy and Strategy

As indicated in Figure 1, the currently used policy and strategies of the water sector came into force in 2001. They boldly state that all funding for the water sector from any source should be utilized based on national objectives, policy, and strategy. Moreover, both the national water sector policy (MoWR, 2001a) and strategy (MoWR, 2001b) take into account some non-direct developmental activities. Beyond the implementation of a main development component, any development measure requires dealing with the conservation and protection of resources and the environment, creation of an adequate platform for future operation and maintenance, and rehabilitation and replacement of developing systems. Training and human resources development, adequate information and documentation as well as other means of enhancing and ensuring sustainability of systems are also very vital.

Stakeholder involvement, capacity building, cost recovery, and appropriate financial management are considered very important for bringing into effect the abovementioned requirements in water resources development. Accordingly, the policy and strategy have been devised to take them into account adequately as summarized below (MoWR, 2001a and MoWR, 2001b):

- Being participatory and demand driven, and recognizing social equity and respecting their norms.
- Enhancing the ownership feeling.
- Enhancing the role of women during planning, implementation, and decision making.
- Promoting self-financing of programs and projects at the local level with special provisions for subsidies to communities that cannot afford to pay for basic services, being only able to cover investment costs.
- Seeking cost recovery, transparent financial management, public accountability and financial sustainability of water supply systems.
- Promoting the participation of local banks, other investors as well as popular and traditional self-help social associations (Idirs, rural credit services, etc.) in the development of water supply through appropriate incentive mechanisms.
- Developing coherent and streamlined institutional frameworks for the management of water supply at the Federal, Regional, Zonal, Woreda, and Kebele levels and clearly defining the relationships and interactions between them.
- Building technical capacity in terms of water source investigation, design, engineering, water quality control, operation and maintenance, construction technology and facilities.
- Promoting objective-oriented training with special emphasis on trade-level training, community participation, administration and finance, and operation and maintenance.

Evolution of CMP

The CMP approach has not evolved spontaneously; rather, it has developed through several steps and the experience of two solid decades. Initially, it emerged as the RWSEP in Ethiopia in 1994. The RWSEP was implemented for two 4-year phases using the Woreda Managed Project approach in financing the projects, with minor changes in the project implementation approach until the third phase brought a paradigm shift. The Community Development Fund (CDF) was introduced into the financing mechanisms of the water and sanitation systems by 2003. At this stage, all responsibility for the implementation was bestowed on the user community. After 8 years of CDF implementation (2003-2011) in Amhara and 7 years in the Benishangul Gumuz regional states (2009-2013), the CMP replaced it with the same philosophy and working principles. The name CMP was preferred to CDF after thorough discussions with WASH stakeholders while drafting the WIF in Ethiopia. One reason not to adopt the CDF name directly was that the CDF has a strong link with the bilateral project supported by the governments of Finland and Ethiopia. It was also important to separate the name from the other approaches implemented by the districts.

To track the development route of the RWSEP program, let us observe the changes exhibited in each phase. In total, the program has passed through four phases: Phase I (September 1994-June 1998), Phase II (July 1998-June 2002), Phase III (January 2003-December 2006), and Phase IV (July 2007-June 2011). Even if the objective of

the program is specific to water and sanitation implementation for the rural community, each phase has its own characteristics in terms of the issue addressed. The WSP (2010) describes them as follows:

- Phase I (1994-1998): Capacity building at the regional level;
- Phase II (1998-2002): Capacity building at the zonal and Woreda (district) levels;
- Phase III (2003-2007): Decentralization of the engagements to the community level and introduction of the community-level funding mechanism, the CDF; and
- Phase IV (2007-2011): Institutionalized capacity (at all levels) to implement and maintain sustainable community-managed water supply facilities with CDF funding.

Because Phases I and II were more focused on capacity building and Phases III and IV on the decentralization and institutional aspects, we will now discuss them and provide some highlights of the CMP.

RWSEP Phases I and II (1994-2002)

During the first two phases, the implementation of the RWSEP used the directly funded rural water supply implementation approach. In this approach, construction administration and management was carried out by the government bodies of the district (Woreda) following the priorities and demand expressed by the communities (Suominen and Urgessa, 2004). RWSEP used in its development need identification the Participatory Rural Appraisal (PRA) method. The PRAs revealed that the basic needs of the communities were many, including the improvement of water supply, schools, health posts, rural roads, grinding mills, and so on. It was also clear that household workload was imposed mainly on women. Women worked long days in extremely difficult conditions and were not provided any opportunity to lead the development work. Therefore, RWSEP Phases I and II focused on women empowerment using water supply and sanitation as an entry point.

In response, the program was focused on those developmental activities which helped the reduction of the women workload. Furthermore, the program provided seedling nurseries, especially at schools, to cope with environmental degradation and resource depletion and introduced energy-saving stoves to reduce female labor and deforestation, helped to train women to become active role-players in their community development and social affairs. This awareness and behavioral change in women participation at development work was done through the Information, Education, and Communication (IEC) and community training centers (Suominen, 2001). Here, the leading role of women was crucial for the development activity of the country.

Environmental protection was a great interest of the program. Therefore, to channel it to the grassroots level, awareness and education were believed to be important, and hence, the project environmental part was mainly addressed through the IEC. Capacity

building at the regional and zonal levels was the main target of the two phases of the project. The construction of water supply systems and ventilated improved (VIP) latrines for institutions was also carried out. SanPlat slab was introduced for the household level sanitation by using Contact Women approach (one Contact Woman is in charge of five households). Moreover, various social, technical, institutional, and environmental activities were also undertaken by the project (Suominen, 2001).

During the first two phases of the project, the regional organizational structure that accommodates water supply and sanitation was not well established, as water sector activities were performed under the Bureau of Agriculture and Natural Resources. However, the program was operated in conformity with national policy and the existing structure.

The capacity building of local artisans and regional human resources, water supply construction, the management of operations and maintenance, sanitation and hygiene education, the IEC, watershed management, energy, gender, enabling and supporting women through grinding mill provision by using credit schemes were some of the core responsibilities of the RWSEP. The approach was problem oriented and multi-sectoral. One of the most successful accomplishments of the two phases was the exploitation of the advantages of the traditional organizations of the community for the purpose of community mobilization and the development of skills in the area of water supply and sanitation at all levels. The lack of skills was one of the most serious problems in the sector next to the absence of a well-structured stand-alone organization to administer the activities.

RWSEP Phases III and IV (2003-2011)

Phase III was administered from 2003 to 2007 and Phase IV from 2007 to 2011. In general, the period from 2003 to 2011 was an era of CDF. These two phases are unique compared with the earlier phases because the former two phases were operated in a similar way to government investment in the sector (WSP, 2010). Although the community was permitted to take responsibility of the development in Phases I and II, the communities' capacity to manage the financing and construction of water schemes in general was questionable because of limited capacity building at the community level in this regard. Nevertheless, the CDF emerged with a special working platform, as discussed in the principles of the CMP previously, to empower the community more through practical training and experience sharing to manage the project.

The major changes from the conventional implementation of the project are related to the financial management, the project management, and the level of community involvement. The lengthy and bureaucratic government procurement was one of the driving factors to establish this new financial mechanism.

In 2003, banking coverage in the rural districts was less than 50%. However, the Amhara Credit and Savings Institution (ACSI) that was founded in 1997 offered banking access to each district and even to the sub-district levels. ACSI also provided service to government pension payments in the rural districts due to the lack of commercial banks. Nearly all of the individual savings accounts of the rural communities were

opened in the Micro-Finance Institution (MFI) sub-branch offices. Therefore, the selection of the local MFI for managing the financial transfers to the community projects was a logical decision.

CMP From 2011 to 2014

In 2010, the GoF asked the World Bank's Water and Sanitation Program (WSP) Africa to undertake an independent study to evaluate the achievements of the CDF and to recommend concrete and feasible measures for scaling up (WSP, 2010). The evaluation concluded that the CDF is highly efficient, cost-effective, and sustainable compared with other WASH implementation and financing modalities. Because of the added values of this approach, the GoE has taken the initiative of scaling up with the intention of including CMP-based implementation into the OWNP for its wider application, and the GoF decided to add financial support to the CMP scaling up. As a result, a 3-year Community-Led WASH (COWASH) Project was formulated, and it was launched in June 2011. The RWSEP program was terminated in November 2011, and COWASH took over the CMP implementation in all RWSEP districts in Amhara.

Since the launch of the COWASH, the WASH sector in Ethiopia has developed rapidly, and the cornerstone documents of the WaSH, such as the revised WaSH Memorandum of Understanding (MoU), were signed in November 2012; the Universal Access Plan II (UAP II) for rural and urban water and sanitation was completed in December 2012; the WIF was signed in March 2013; and the OWNP document was launched in September 2013. Later on in 2014, all regional states signed their own specific MoU for the WASH coordination. The COWASH document was revised and streamlined with the new WASH corner documents in September 2013. The revised COWASH became a 5-year project (2011-2016), with a 22 million EUR contribution from the GoF, a 23 million EUR contribution from the GoE, and a 5 million EUR contribution from the communities (COWASH, 2013b).

Regarding the planned scaling up of the CDF approach in the Project Document of COWASH, the situation has evolved, and the CDF funding mechanism has been incorporated into the WIF as the CMP approach. There is strong support among WaSH stakeholders for streamlining their programs, plans, and operations, according to the signed MoU for WaSH and WIF. This is manifested by the vivid communication for WaSH coordination between the various WaSH financiers. Many of the former barriers to joint efforts have faded in terms of the challenges of the WaSH development to reach the targets of the Growth and Transformation Plan (GTP; WIF, 2013).

COWASH has scaled up from 31 districts of three regions in 2011 to cover 67 districts of five major regions in 2014 (COWASH, 2014). In addition, the separate bilateral project (FinnWASH) supported by the GoF and operated in 5 districts in Benishangul Gumuz region was extended for an additional 2 years and will now be completed in July 2015 (FinnWASH-BG, 2014).

To implement OWNP effectively and according to the principles of WIF, several other relevant sector documents have been prepared, such as,

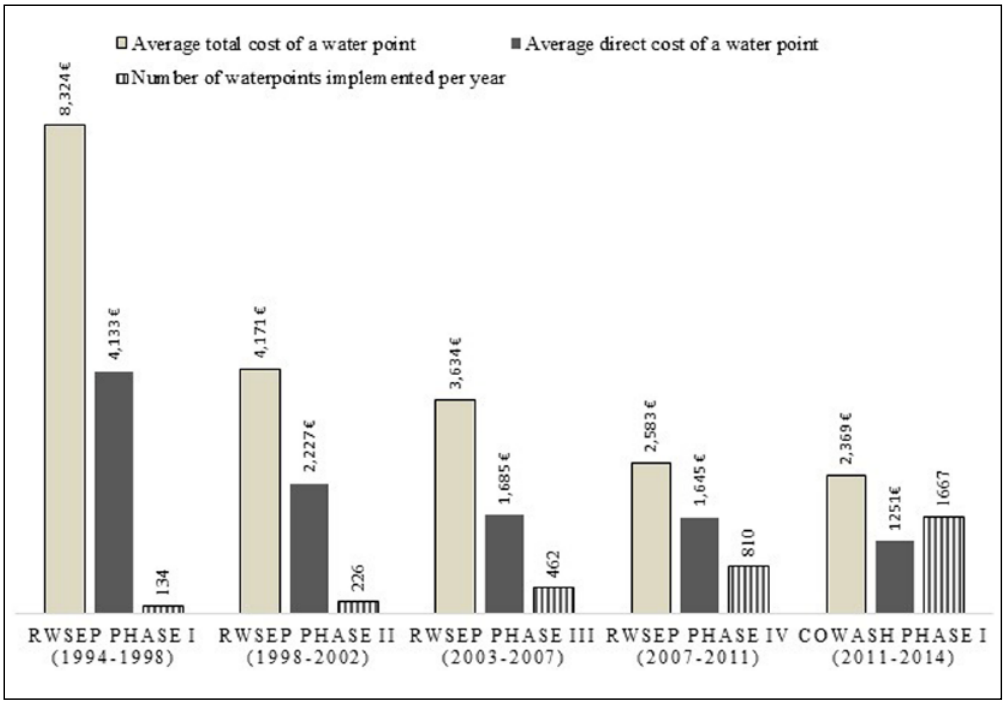


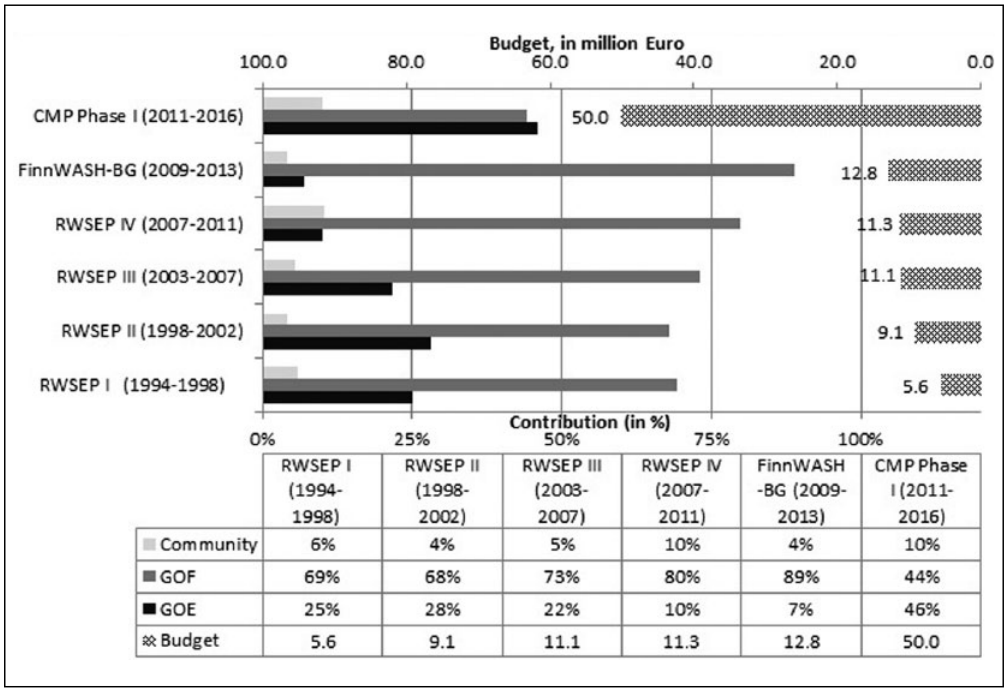
Figure 2. Decline of average unit cost of water points and improvement of annual implementation efficiency from phase to phase.

- Fiduciary Risk Assessment (October 2013)
- Environmental and Social Management Framework (October 2013)
- Social Assessment of the OWNP (October 2013)
- OWNP Operational Manual (September 2014)

Core Values of the CMP Approach in Ethiopia

Efficiency. As shown in Figure 2, the average unit cost of a water point has decreased from phase to phase while the annual implementation efficiency of the program has increased. Moreover, various studies by the World Bank and completed master's theses show that the functionality of schemes implemented by the CMP approach is much higher than the national average ranging from 94% to 98% (Mebrahtu, 2012; Mitiku, 2013; Sharma, 2012; Tesfaye, 2012; WSP, 2010).

Participatory. The term *participatory* is usually applied to the user community, but all other stakeholders also need to take part (Pineo & Subrahmanyam, 1975). In the case of the Ethiopian government, the CMP approach has achieved a lot. As shown in Figure 3, political willingness is expressed by the size of the contribution of the GoE to capital costs. Moreover, the user communities' contribution in cash, labor, and construction



	RWSEP I (1994-1998)	RWSEP II (1998-2002)	RWSEP III (2003-2007)	RWSEP IV (2007-2011)	FinnWASH-BG (2009-2013)	CMP Phase I (2011-2016)
Community	6%	4%	5%	10%	4%	10%
GOF	69%	68%	73%	80%	89%	44%
GOE	25%	28%	22%	10%	7%	46%
Budget	5.6	9.1	11.1	11.3	12.8	50.0

Figure 3. Contributions of the government of Finland, Ethiopia and the community in different phases of GoF WASH support.
Sources: RWSEP, 1998; RWSEP, 2004; RWSEP, 2007; FinnWASH-BG, 2013; RWSEP, 2012; and COWASH, 2013a.

materials is also substantial. This might be the main reason why the implementation cost per unit dropped by a quarter from the 1990s to the 2010s as shown in Figure 2.

Figure 3 indicates how the GoE is working with the development of the CMP approach to have a significant positive impact on rural community life through improved water supply and sanitation. This can be viewed as one of the major achievements of the GoF's support for Ethiopia. To ensure stakeholder participation in CMP implementation, political acceptance is significant (Pineo & Subrahmanyam, 1975) in addition to the environmental, social, and economic viabilities. The share of the contribution of the Ethiopian government to the project ranges from 10% to 46%. In COWASH, the GoE budget allocations contribute merely from the so-called regional block grant budget. The commitment of the government to adopt the new style is an indication of the increasing focus on the sector and the acceptance of the CMP financing mechanism.

Community empowerment. Involving user communities at each stage of projects is at the heart of CMP. Local government awareness is assumed to help the beneficiaries organize into a group, request projects that serve their interests, and save money for operation and maintenance. Training at an early stage is behind the quality of the CMP approach.

Providing local construction materials and labor during construction and control of the construction process is the responsibility of the user community. Community representatives manage the project implementation by contracting works to local artisans and delegating tasks to the Woreda (district) WaSH Team when things are beyond the capacity of the committee. Therefore, the CMP approach includes no handover process since the community owns the project from the very beginning. All these preconditions are meant to enable the users to manage their system after implementation.

Capacity building. Community-Led Accelerated WASH (COWASH) is a government project that follows the CMP approach. Capacity building in COWASH follows the cascading principle, whereby trained regional-level professionals transfer their knowledge down to the zone and district (Woreda) staff, and the district staff then trains communities to implement their own projects. Supervision and capacity building are led by a regional support unit (RSU) employed by the regional government with a Finnish contribution through the Regional Water Bureau. Capacity building focuses on project cycle management and improvement of the technical and financial management capacity of the communities to manage the whole project cycle.

Finance and procurement procedure. In the CMP approach, COWASH purchases the construction materials and subcontract artisans for the construction. Yet, the local government finance office periodically informs COWASH of changes in prices of construction materials, so that they can take them into account.

The financing mechanism is decentralized and managed at the community level. The investment funds of the regional government are transferred to a community account in a local MFI following the approval of a requested community water supply project (Suominen and Urgessa, 2004). The approval of the projects and funds passes through a desk and field appraisal for the purpose of investigating the commitment of the users, the inclusion of all, the seriousness of the problem, the technical feasibility of the project, the availability of local materials for construction, understanding of the responsibilities, and avoiding duplication efforts by other implementers. After the approval of the project, the community representatives and the district administrator sign a financing agreement. Thereafter, an account is opened by the local MFI office for the project, and the funds from the district CMP account are transferred to it. The district CMP account at the MFI is managed by the District Finance Office (WoFED). The funds to the district CMP account are replenished either by the Bureau of Finance and Economic Development (BoFED) or the Regional Sector Office according to the modality decided by the region.

As mentioned above, the target communities are checked for their readiness to undertake the responsibility for the project's operation and management. Mandatory requirements include the ability to pay cash upfront for operation and maintenance and to make a deposit in the account opened by the community at the local MFI. The amount of the upfront cash contribution, which is deposited at the initial stage of a project, varies from scheme to scheme but should be sufficient to cover maintenance of the scheme for a year.

Discussion

Water resources development in Ethiopia is quite young, and the water supply, sanitation, and hygiene sector in rural areas has recently received more attention than during earlier development endeavors. In the 1980s and 1990s, development efforts were greatly challenged by the civil war, and the water resources development governance structure could not have a significant impact. Furthermore, sector development was influenced by the IDWSSD and later by the New Delhi Statements. This is evidenced by the institutional reforms begun in the 1980s and the attention given to environmental protection and the start of the bilateral project that works at the community level. The RWSEP track record was also shaped by national and international policies and declarations. For example, the Paris Declaration (2005) became the benchmark for the RWSEP service improvements through COWASH.

As illustrated in Figure 2 and explained in the policy and strategy section of this article, the shift of RWSEP to the CDF implementation approach in 2003 was influenced by national policy. It can be justified by the inclusion of the core values of the policy documents into the approach: promoting a local bank (MFIs), focusing on capacity building, empowering the user community, facilitating better operation and maintenance, and so on.

After the new constitution of Ethiopia in 1995, water resources development and water supply in particular have received attention. Hygiene and sanitation have for a long period of time remained marginalized, and only recently in the process of developing the sector-wide approach, they have gained adequate attention in terms of finance and political recognition.

According to the film titled CMP, higher officials from the Ministry of Water, Irrigation, and Energy and from the Ministry of Finance and Economic Development blessed the success of CMP/CDF (Finland, 2012). They stressed that by following and strengthening the CMP approach, it will be possible to achieve the Millennium Development Goals as well as those of the National GTP. Moreover, as observed during the first author's fieldwork in the Amhara regional state in 2013, the commitment of the regional government proves that the CMP gained substantial attention, although financial regulations blocked its scaling up. The other indicator for CMP acceptance by the Federal government and other WASH actors is the inclusion of the CMP as one of the four implementation modalities in Ethiopia to the WIF.

The interest of regional governments in developing a financing mechanism of their own has increased from year to year. Keeping in mind that the GoF is not funding 100% of the cost, the regional governments should contribute some proportion as indicated in Figure 3. Therefore, the interest of the regional governments in contributing their share indicates something about the acceptance of the project. From Phases I to III, it was administered in the Amhara region; during Phase IV, CDF was introduced to the Benishangul Gumuz region by the FinnWASH-BG (Rural Water Supply, Sanitation and Hygiene Program in Benishangul Gumuz regional state), and in the COWASH Phase, the regions working with the bilateral project increased to five. These project success stories help to gain positive interest from the regional governments.

Conclusions and Policy Implications

This article has explored the development of community management in water supply and sanitation, water resources development, and the evolution of the CMP in Ethiopia. Despite the somewhat slow progress of the country's water resources development, it indicates how government policy favors the development of a country in addition to the roles of the national political situation and the opportunities offered by technologies.

Emperor Menelik II built the first water pipe to his palace in 1905; Emperor Haile Selassie (in power from 1930-1974) introduced the treatment plant to Addis Ababa and constructed two water supply dams and many hydropower dams in his era. Mengistu Hailemariam's military regime (1974-1991) succeeded in reforming institutions and putting plans. Here, we cannot judge the regime as being passive to the development of water resources; rather, a positive outlook toward the development of the sector was observed in the establishment of various authorities and the first water technology institute at Arba Minch for training water resources professionals. EPRDF, the ruling government since 1991, has had a better position in water resources development, particularly paying attention to the rural water supply and sanitation. Although much remains to be accomplished in the sector in terms of both water and sanitation, the effort observed in the last two decades is appreciable. The country has produced a number of policies and strategies, regulations and periodic development plans and has harmonized and aligned documents and approaches to bring about an impact on the sector development.

The lessons learned from the evolution of the CMP are the importance of designing implementation approaches based on national or regional policies, testing them on small scale, and if proved successful, their wider adoption. This development process may take time and, therefore, it is important that the partner organizations are committed and patient enough to wait for changes that may take some time to happen. In this regard, the route that CMP has emerged from RWSEP through different implemention style can be good example.

The CMP approach of involving national and regional governments and the user community has resulted in political will, increased the annual implementation rate, and substantially reduced the unit costs of water points. CMPs have several elements that make community management more successful: capacity building at different levels, new financing and procurement regulations, empowerment of local users as Chambers (1983) pointed out by making the last first, gender sensitive user representation, and exploitation of local banks as encouraged by the national policy. This article has presented the evolution of the CMP approach to the readers. Therefore, we recommend a further study to show how successfully the elements discussed above have been contributing for service sustainability and how it differs from other implementation approaches in the rural water supply of Ethiopia.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: Scholarships from Maa- ja vesitekniikan tuki ry and CIMO in Finland as well as the logistical support from the COWASH project in Ethiopia for fieldwork are gratefully acknowledged.

References

Arnstein, S. R. (1969). A ladder of citizen participation. *Journal of the American Institute of Planners*, *35*, 216-224.

Arsano, Y. (2007). Ethiopia and the Nile: Dilemmas of national and regional hydro-politics (PhD thesis). ETH Zurich, Switzerland.

Assefa, T. (2008). Digest of *Ethiopia's national policies, strategies and programs.* Addis Ababa, Ethiopia: African Books Collective.

Borrego, M., Douglas, E. P., & Amelink, C. T. (2009). Quantitative, qualitative, and mixed research methods in engineering education. *Journal of Engineering Education*, *98*, 53-66.

Cairncross, S. (1992). *Sanitation and water supply: Practical lessons from the decade*. London, England: London School of Hygiene and Tropical Medicine.*Water Alternatives*, *7*,342-366.

Chambers, R. (1983). *Rural development: Putting the last first*. Essex, UK: Longman.

Christmas, J., & de Rooy, C. (1991). The decade and beyond: at a glance. *Water International, 16*(3), 127-134.

Cleaver, F. (1998). Choice, complexity, and change: Gendered livelihoods and the management of water. *Agriculture and Human Values*, *15*, 293-299.

Cleaver, F., & Nyatsambo, R. (2011). Gender and integrated water resource management. In R.Q. Grafton & K. Hussey (Eds.), *Water resources planning and management* (pp. 311-330). Cambridge, UK: Cambridge University Press.

Cleaver, F., & Toner, A. (2006). The evolution of community water governance in Uchira, Tanzania: The implications for equality of access, sustainability and effectiveness. *Natural Resources Forum*, *30*, 207-218.

Community-Led Accelerated WASH. (2013a). *CMP Ethiopia*. Retrieved from http://www.cmpethiopia.org/page/146

Community-Led Accelerated WASH. (2013b). *Support to Community-Led Accelerated WaSH in Ethiopia: Revised project document for COWASH*. Retrieved from http://www.cmpethiopia.org/media/cowash_revised_project_document_sep_30_2013

Community-Led Accelerated WASH. (2014, September). *CMP regions*. Retrieved from http://www.cmpethiopia.org/page/146

Cornwall, A., & Gaventa, J. (2000). From users and choosers to makers and shapers repositioning participation in social policy1. *IDS Bulletin*, *31*(4), 50-62.

Cornwall, A. (2002). Locating citizen participation. *IDS Bulletin*, *33*(2), i-x.

Cornwall, A., & Gaventa, J. (2001). *From users and choosers to makers and shakers: Repositioning participation in social policy* (IDS Working Paper No. 127). Brighton, UK

Dewan, C., Buisson, M. C., & Mukherji, A. (2014). The imposition of participation? The case of participatory water management in coastal Bangladesh. *Water Alternatives, 7*(2), 342-366.

Doe, S. R., & Khan, M. S. (2004). The boundaries and limits of community management: Lessons from the water sector in Ghana. *Community Development Journal*, *39*, 360-371.

Feachem, R. G. (1980). Community participation in appropriate water supply and sanitation technologies: The mythology for the decade. *Proceedings of the Royal Society of London. Series B. Biological Sciences*, *209*, 15-29.

Finland, M. O. (Director). (2012). *Community managed project: Financing WASH service through the communities* [Motion picture]. Retrieved from http://www.cmpethiopia.org/page/177

FinnWASH-BG. (2013, October). Rural Water Supply, Sanitation and Hygiene Programme Annual Report of 2012 – 2013, FinnWASH-BG, Assosa, Ethiopia.

FinnWASH-BG. (2014). Rural Water Supply, Sanitation and Hygiene Programme Annual Report of 2012 – 2013, FinnWASH-BG, Assosa, Ethiopia.

Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative Inquiry*, *12*, 219-245.

Gnogno, P. (1984). *Atse Minilik* [Amharic]. Addis Ababa, Ethiopia: Emai Printing Press.

Grover, B. (1991). Evolving international collaborative arrangements for water supply and sanitation. *Water International*, *16*, 145-152.

Harvey, P., & Reed, A. (2007). Community-managed water supplies in Africa: Sustainable or dispensable? *Community Development Journal*, *42*, 365-378.

International Drinking Water Supply and Sanitation Decade. (n.d.). *International drinking water supply and sanitation decade*. Retrieved from http://www.who.int/water_sanitation_health/idwssd.pdf

Kalbermatten, J. M. (1991). Water and sanitation for all, will it become reality or remain a dream? *Water International*, *16*, 121-126. doi:10.1080/02508069108686104

Kloos, H., & Legesse, W. (2010). *Water resources management in Ethiopia: implications for the Nile basin*. New York, NY: Cambria Press.

Manor, J. (2004). User committees: A potentially damaging second wave of decentralisation? *The European Journal of Development Research*, *16*, 192-213.

Mebrahtu, M. (2012). *Assessment of the CMP approach in developing rural water supply schemes, Benishangul-Gumuz Region* (Master's thesis). Addis Ababa University, Ethiopia. Retrieved from http://www.cmpethiopia.org/page/500

Ministry of Water & Energy. (2014, March 18). *Federal democratic republic of Ethiopia Ministry of Water and Energy*. Retrieved from http://www.mowr.gov.et/index.php?pagenum=1.2&;pagehgt=1080px

Mitiku, M. (2013). *Evaluation of the level of service rendered by functioning rural water supply schemes: Case of Farta Woreda* (Master's thesis). Addis Ababa University, Ethiopia. Retrieved from http://www.cmpethiopia.org/page/500

Ministry of Health. (2005). *National hygiene* and *sanitation strategy*. Addis Ababa, Ethiopia: Emai Printing Press. Retrived from www.cmpethiopia.org/media/national_hygiene_and_sanitation_strategy_for_ethiopia_oct_2005

Moriarty, T. S. (2003). *Community water, community management: From system to service in rural areas*. London, England: ITDG Publishing.

Ministry of Water Resources. (2001a). *Ethiopian water sector policy*. Addis Ababa, Ethiopia: Emai Printing Press. Retrieved from http://www.mowr.gov.et/index.php?pagenum=10&pagehgt=1000px

Ministry of Water Resources. (2001b). *Ethiopian water sector strategy.* Addis Ababa, Ethiopia: Emai Printing Press. Retrieved from http://www.mowr.gov.et/index.php?pagenum=10&pagehgt=1000px

Paris Declaration. (2005). *The Paris Declaration on aid effectiveness and the Accra Agenda for Action*. Retrieved from http://www.oecd.org/dac/effectiveness/34428351.pdf

Pineo, C. S., & Subrahmanyam, D. V. (1975). *Community water supply and excreta disposal situation in the developing countries*. Geneva, Switzerland: WHO.

Rouse, M. (2013). *Institutional governance and regulations: The essential elements* (2nd ed.). London, England: IWA.

Rural Water Supply and Environmental Program. (1998). *The rural water supply and environmental program in Amhara Region: Phase I completion report*. Bureau of Planning and Economic Development. Amhara Regional State, Ethiopia.

Rural Water Supply and Environmental Program. (2004). *The rural water supply and environmental program in Amhara Region: Phase II completion report*. Bureau of Planning and Economic Development. Amhara Regional State, Ethiopia.

Rural Water Supply and Environmental Program. (2007). *The rural water supply and environmental program in Amhara Region: Phase III completion report*. Bureau of Planning and Economic Development. Amhara Regional State, Ethiopia.

Rural Water Supply and Environmental Program. (2012). *The rural water supply and environmental program in Amhara Region: Phase IV completion report*. Bureau of Planning and Economic Development. Amhara Regional State, Ethiopia.

Sharma, N. (2012). *CMP in implementing rural water supply in Amhara Region* (Master's thesis). Tampere University of Technology, Finland. Retrieved from http://www.cmpethiopia.org/page/500

Shinn, D. H. (2013). *Historical dictionary of Ethiopia*. Lanham, MD: Scarecrow Press.

Sime, I. (1998). Addis Ababa water supply stage III: A project. *EACE Bulletin*, *1*(1). Retrieved from http://www.mediaethiopia.com/Engineering/addis_watersupply.htm

Suominen, A. (2001, July 6). *Sustainability in rural water supply: Mini Workshop Paper. Environmental support project component 3: Sustainability in rural water supply*. Addis Ababa, Ethiopia. Retrieved from http://www.ircwash.org/sites/default/files/824ET-17117.pdf

Suominen, A., & Urgessa, M. (2004, October). Community development fund approach in RWS financing. In Proceedings of 30th WEDC *International Conference: People-centered approaches to water and environmental sanitation* (pp. 315-318). Vientiane, Laos: PDR.

Tesfaye, Y. (2012). *A comparative study on Woreda managed and CMP rural water supply projects* (Master's thesis). Indira Gandhi Open University, Addis Ababa, Ethiopia. Retrieved from http://www.cmpethiopia.org/page/500.

United Nations. (1990a). *The New Delhi statement, global consultation on safe water and sanitation*. New Delhi, India: Author. Retrieved from http://www.ielrc.org/content/e9005.pdf

United Nations. (1990b). *Second United Nations Conference on the least developed countries*. Paris, France. Retrieved from http://www.un.org/en/development/devagenda/ldc.shtml

United Nations Children's Fund. (1990). *World declaration on the survival, protection and development of children*. New York, NY: Author. Retrieved from http://www.unicef.org/wsc/declare.htm

WASH Implementation Framework. (2013). *Federal democratic republic of Ethiopia the WaSH implementation framework*. Addis Ababa, Ethiopia. Retrieved from http://www.cmpethiopia.org/media/signed_wash_implementation_framework_scanned

Water and Sanitation Program. (2010, July). *Mainstreaming the community development fund financing mechanism: Final evaluation report*. WSP-Africa. Retrieved from http://www.cmpethiopia.org/media/mainstreaming_cdf_wb_research_paper

World Health Organization. (1987). *International drinking water supply and sanitation consultation*. Interlaken, Switzerland: Author. Retrieved from http://apps.who.int/iris/handle/10665/61515#athash.49ZgH7ul.dpuf

Author Biographies

Beshah M. Behailu holds an MSc in Water supply and Environmental Engineering from Arba Minch University (Ethiopia) in 2010. In his 11-year career he has served as practitioner engineer and academia in the area of water supply and sanitation. Now, he is a doctoral student at Tampere University of Technology with research focus of sustainable services of rural water supply.

Arto Suominen holds an MSc in Civil Engineering from the Tampere Technical University in 1979. Special areas of expertise are water supply and sanitation projects design and implementation, monitoring and evaluation, leadership, strategy and policy development, training, coordination and technical issues in WASH. Countries worked: Iraq, Kenya, Vietnam, Namibia, Nepal and Ethiopia. Currently (2015) leading Community-Led Accelerated WASH Project (COWASH) in Ethiopia.

Tapio S. Katko (Civ. Eng.) holds the UNESCO Chair in Sustainable Water Services at Tampere University of Technology. His career of 35 years covers 4 years abroad. He has authored or co-authored 36 monographs and many publications on water services evolution, management, institutions, policy and governance (www.cadwes.com).

PUBLICATION II

Behailu B. M., Suominen A., Katko, T.S., Mattila H., Yayehyirad G. "Comparison of Community Managed Projects and Conventional Approaches in Rural Water Supply of Ethiopia" , *African Journal of Environmental Science and Technology.* 10(9), 292-306, 2016.

academicJournals

Vol. 10(9), pp. 292-306, September 2016
DOI: 10.5897/AJEST2016.2132
Article Number: 04AF23059936
ISSN 1996-0786

http://www.academicjournals.org/AJEST

African Journal of Environmental Science and Technology

Full Length Research Paper

Comparison of community managed projects and conventional approaches in rural water supply of Ethiopia

Beshah M. Behailu[1]*, Arto Suominen[2], Tapio S. Katko[1], Harri Mattila[3] and Gashaw Yayehyirad[4]

[1]Department of Civil Engineering, Tampere University of Technology, Tampere, Finland.
[2]Community-Led Accelerated WASH (COWASH) Project, Addis Ababa, Ethiopia.
[3]Bioeconomy Research Centre, Sustainable Development, HAMK University of Applied Sciences, Hameenlinna, Finland.
[4]Addis Ababa Institute of Technology (AAiT), Addis Ababa University, Addis Ababa, Ethiopia.

Received 29 April, 2016; Accepted 18 July, 2016

This study aimed to compare Community Managed Projects (CMP) approach with the conventional approaches (Non-CMP) in the case of Ethiopia. The data collection methods include a household survey (n=1806), community representative interviews (n=49), focus group discussions with district water experts (n=48) and observations of water systems (n=49). The data were collected from seven districts of two regions of Ethiopia. The study shows that CMP have a better platform to involve the community than non-CMP. In terms of reducing distances to water points, all approaches succeeded. However, the intended amount of water supplied is not achieved in all the cases: only 25% of CMP users and 18% of non-CMP users are able to get water according to the national standard, 15 L per capita per day. Fee collection in the approaches has a high disparity in favour of CMP. To keep long-lasting services, three requirements need to be particularly fulfilled: quantity, quality and accessibility.

Key words: Long-lasting services, rural water supply, Community Managed Projects (CMP), conventional, Ethiopia.

INTRODUCTION

The past few decades have significantly intensified the efforts to improve the coverage and access to potable water supply and sanitation worldwide. Yet, the situation has not been improved substantially in the Sub-Saharan countries. The access to water supply in the region only increased from 48% in 1990 to 64% in 2012 (WHO and UNICEF, 2014). Several factors such as population growth, climate change (Howard et at., 2010), high rate of

*Corresponding author. E-mail: beshah.behailu@tut.fi, beshahnb@gmail.com.

non-functional schemes (Harvey, 2008) and the lack of cost recovery systems or their ineffectiveness (Harvey, 2007) have contributed to the insufficient coverage of water supply, sanitation and hygiene (WASH) in the region.

Yet, national governments or donors alone cannot address the water demands of the alarmingly increasing population and the multi-faceted challenges of the sector in developing countries. Therefore, involving the user community is vital for long-lasting services. The participation of the community should be included in the planning and implementation the systems, contribution and utilization of investment funds, as well as operation and maintenance of the systems. Empowering of the users is essential since it is difficult to obtain adequate attention to repair and upgrade failed systems in countries with scarce resources. Thus, participating users from the beginning of a project is crucial in sustaining water service delivery (Rautanen et al., 2014). In the sustainable services, delivery quantity, good quality and a reasonable distance to water points are key monitoring indicators (UN, 2003). Moreover, the existence of the services mentioned above will boost the involvement of the users in the system management.

In addition to low success in improving coverage, non-functionality of systems has posed additional challenges in the sector. Many studies estimated that non-functionality of rural water supply schemes could reach 60% in sub-Saharan Africa (Harvey, 2008; Jones, 2011; Taylor, 2009). The causes of the service breakdowns could be under the technical, social, environmental or economic categories (Brunson et al., 2013). However, the technical and economic aspects usually override to shadow the others. For instance, financing is assumed to solve the problem of water supply. Of course, with money, a physical asset can be implemented; however, it will not bring a long-lasting result without the community involvement. Users are immediate stakeholders of a project and they could facilitate the achievement of functional schemes by tackling system-retarding factors. The customs of a community determine the process of change in institutions (North, 1990), in combating non-functionality. Contextualizing institutions with the local situation and involving users can increase credibility and the chance of institutional changes. Moreover, during implementation of new systems, paving ways for post-construction management is prominent in reducing non-functionality. Thus, to address water supply, it is crucial to deal with both implementation and post-implementation management.

In Ethiopia, four implementation approaches have been used in the rural water supply and sanitation sector. The first is the Woreda (District) Managed Project (WMP) approach that is administered and managed by the district water office. The second is the Non-Governmental Organization Managed project (NGO-MP) approach that has similar nature with WMP in most cases – centralized administration. The third is the Community Managed Projects (CMP) approach, which decentralizes power to the community level; the user community controls the financials as well as project management. The last one is the self-supply approach, which is implemented by individual households or a group of a few households with only technical support from external actors (WIF, 2013).

WMP and NGO-MP projects are independent water supply implementation approaches owned by Government and Partner organizations, respectively. CMP is a bilateral project that is operated by the government of Ethiopia with technical assistance from the government of Finland. In the project, both countries have contributed cash for investment and capacity building.

WMP and NGO-MP have been practiced for long since the establishment of water sector development in the country and in this paper they referred to it as conventional approaches and represented by Non-CMP in this paper. However, CMP have evolved from Community Development Fund (CDF) in 2011 to finance projects in more decentralized ways (Behailu et al., 2015). Therefore, this paper aimed to compare CMP and non-CMP (WMP, NGO-MP) approaches in the context of long-lasting WASH services in Ethiopia. The self-supply approach is not included in this study as it is still in its initial stages.

The background of the research area

This study was conducted in Ethiopia, the second most populous country in Africa. The country has nine ethnically demarcated regions (Figure 1) and two administrative cities. According to the World Population Review (2016) estimate, the population of the country is approximately 99 million, out of which 84% live in rural areas (CSA, 2010). The study was carried out in two northwestern regions of Ethiopia; namely, Amhara and Benishangul-Gumuz (Figure 1), with the populations of 17.22 million (rural 15.11 million) and 0.78 million (rural 0.68 million), respectively (CSA, 2010). In the Amhara region, 36 districts were using the CMP financial mechanism in June 2012 (in 2013, the number increased to 40 districts in Amhara, and in 2014 to 72 districts in the country). The population of the districts varies from 35,000 to 2,250,000 in the study area.

The number of people served under a water supply system depends on the nature of sources and technologies used. For instance, deep wells could support more people than spring development. Moreover, hand-dug wells and shallow wells with hand pump are able to serve fewer residences than any other sources. Since the majority of water systems in the rural Ethiopia are hand-dug wells and spring developments, the

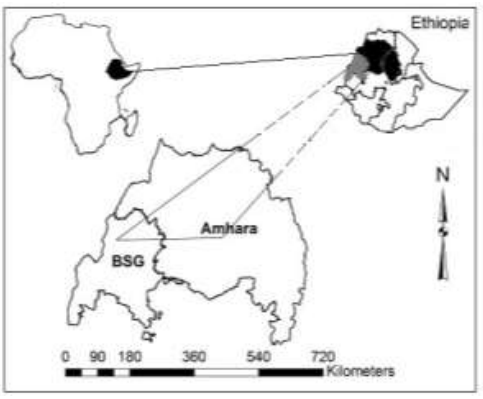


Figure 1. The map of the study area (drawn by the first author).

average population over a water point could reach 250 people (the equivalence of 50 households).

National standards

World Health Organization (WHO) has set minimum standards for per capita water supply (20 L) and distance to travel to collect water (1 km) (WHO and UNICEF, 2000). The government of Ethiopia has adopted a gradual improvement policy to reach these levels. Therefore, for the period from 2010 to 2015, per capita demand in rural areas was designated to be 15 lpcd (liters per capita per day and in a radius of 1.5 km (UAP, 2011). Moreover, a draft of the second growth and transformation plan (GTP2) has proposed 25 lpcd in a radius of 1.0 km for rural residences (GTP, 2015). In this paper, the former national standard is considered for analysis, since the research was carried out before the launch of the new plan, GTP-2.

Committee

Improved water sources are managed and operated by communities' representatives called WASHCO (short for WASH Committee). It consists of five to seven members depending on the approach. In this committee, a 50% involvement of women is mandatory as they are the ones who mainly suffer from the water and sanitation problems. In CMP, three out of five WASHCO members must be women. However, the composition and number of WASHCO members depend on national and regional interest. The role and responsibility of the committee do not vary between CMP and non-CMP except for the arrangements of training and degree of empowerment.

METHODOLOGY

This study was conducted with both qualitative and quantitative approaches. Despite the difficulty in integrating the results of qualitative and qualitative data in mixed method, it is more practical to investigate a pragmatic nature of a social development, both from the perspective of service providers and producers (Bryman, 2006; Creswell, 2013). Thus, this approach is termed as a pragmatic approach and it is vital in studying the nature of different water and sanitation implementations and perceptions of the receiving community on the output (Bryman, 2006).

Methods employed in data collection were household surveys, focus group discussions and observations. The household survey was designed to collect information from the users. In the survey, users were asked about family size versus daily water use, distance travelled, queuing time, water quality perceptions, users' role in the implementation of the water scheme, water fee payment, the reliability of sources, feelings about the water schemes, and the trust that users have toward WASHCO members and their performance. The focus group discussions were done with water committees and district experts. Moreover, the focus of site observation is to synchronize the findings obtained by the other two methods with practical practices, accordingly the strategy of site observations was selected from the selected water schemes.

Data was collected from two regions of Ethiopia: namely Amhara and Benishagul-Gumuz regions. The reason for selecting these regions was the prior implementation of Community Managed Projects Approach (CMP) well in advance to the data collection period of this study. Data collection from Amhara region was done between December 2013 and June 2014, and from Benishangul-Gumuz between November and December 2012. Sampling process cascaded down from districts to water supply schemes and then to households to implement the above mentioned research methods. Thus, it has three stage sampling in agreement with the multilevel mixed methods sampling described by Teddlie and Yu (2007) (Table 1).

In the first stage of the sampling, districts were selected. Criteria of the selection were the presence of projects implemented by different approaches of CMP and Non-CMP. The second stage of sampling was selecting clusters of households based on the water supply schemes. Collected data can be used as individual household behavior and investigate perception of the users on implemented schemes (as a group of users), sticking to the scheme based clustering was considered appropriate in this study (Deaton, 1997). The cluster was also made for CMP and Non-CMP schemes to assist the comparison of the approaches.

The third stage of household sampling was also in agreement with Deaton (1997), selected with simple random technique from a fresh list prepared by water committee of the respective schemes. The reason for making the fresh list was the absence of organized record of users at each water supply scheme. In this sampling, at least a third of the households from a water supply scheme were surveyed with a repeated visit to missed households in the previous visit.

Moreover, the data collection process had two categories. The first one was conducting surveys of the selected households by the trained enumerators and the second was group discussions with district water offices staff, water committee and site observation by the first author. The data collection was made in district bases and all the above data collection processes were done in parallel. The first author was in the same district where data collection was active to facilitate the household survey and follow up the process while

Table 1. Sampled water schemes and households.

District	Number of water schemes	Surveyed households (CMP)	Surveyed households (Non-CMP)	Total households
First stage	Second stage		Third stage	
Dega Damot	20	102	52	154
Guangua	27	256	116	372
Fogera	32	212	12	224
Misrak estie	27	88	128	216
Dibate	25	142	61	203
Mandura	17	108	190	298
Pawi	31	312	27	339
Total	179	1209	597	1806

doing the side discussions and visits.

In addition to the household survey, focus group discussions were conducted with water committee (n=49) and district water offices of staff members (n=48). Moreover, field observations were made for water supply schemes where the focus group discussions were conducted (n=49). In the data collection, 179 water schemes were addressed. The schemes were implemented by different organizations such as Non-CMP (including Catholic Church, CISP Ethiopia, Comunita' Volontari Per Il Mondo (CVM), Salini, UNICEF, CARE, Tikuret Legumuz, Tana Beles from local and international NGOs, Government implemented projects) and CMP. The analyses of the data are as follows:

1. The reported distance travelled is based on personal estimates. Since the users were unable to report the precise distance from their home to the water sources, they were asked to report estimate of the water scheme into the visible direction so that the enumerators made their estimates.
2. Time spent to collect water was estimated on the basis of many different questions. There were several questions that contributed for the calculation of time spent. These include the number of trips per day, waiting time at sources, and travel time from house to source and source to house for a single trip and calculated time for all trips per day. Finally, the sum of these is considered as time spent collecting water.
3. The water use was calculated from indirect inquiries. Family size, the number of the trips per day, and the type of container and its volume was considered during the interviews. Based on these elements, the per capita demand was analyzed using SPSS software.
4. For community involvements under each category of the implementation approach, the users were asked if they were involved in the participation components. The users were considered involved if at least 50% of the responses from the same system confirmed their participation.

RESULTS AND DISCUSSION

Long-lasting services

The 1987 Brundtland Commission's definition of sustainability has a broader prospect in the time frame. However, in water supply and sanitation, putting a system into operation and maintaining its service at least for the design life of the facilities is challenging since some parts of the facilities may wear out earlier than others. Thus, replacing and repairing are inevitable to maintain the systems to serve the communities. However, the need for sustainability is crucial to WASH services, and operating systems in full capacity in the design period is top priority. Therefore, this paper prefers to use the phrase long-lasting services rather than sustainability.

Long-lasting services include both the physical and service functionality of the water supply and sanitation facilities. This study found two key elements that are necessary to maintain long-lasting services; adequate services and proper management (Figure 2).

Adequate service implies sufficient quantity, good quality and reasonable distance to water points. The systems that cannot fulfill any one of these conditions may fail due to conflicts caused by water shortages, be abandoned as a result of poor water quality, or unprotected sources may be used instead of travelling a long distance. Appropriate quality control activities are valuable during pre-implementation of the schemes in providing enough and desirable quality of water at a reasonable distance (Figure 2). The critical activities, which are deemed to be executed during the pre-implementation phase, were identified during the fieldwork. These activities include: sound planning, proper site selection, good design, supervision and construction monitoring. All these factors are required to be user-inclusive and drive for genuine community participation. These factors facilitate the user community engagement in the post-implementation management of the WASH schemes.

For proper management, external supporters should assist the users in fee collection, protecting systems from damage, operating, maintaining and rehabilitating until the community has developed a capacity to do these activities itself (Careter et al., 1999; Harvey, 2007). According to the discussions with the district staff members, some service breakdowns are due to repairable faults and misuse. This implies that sufficient support is not rendered to improve the capacity of the

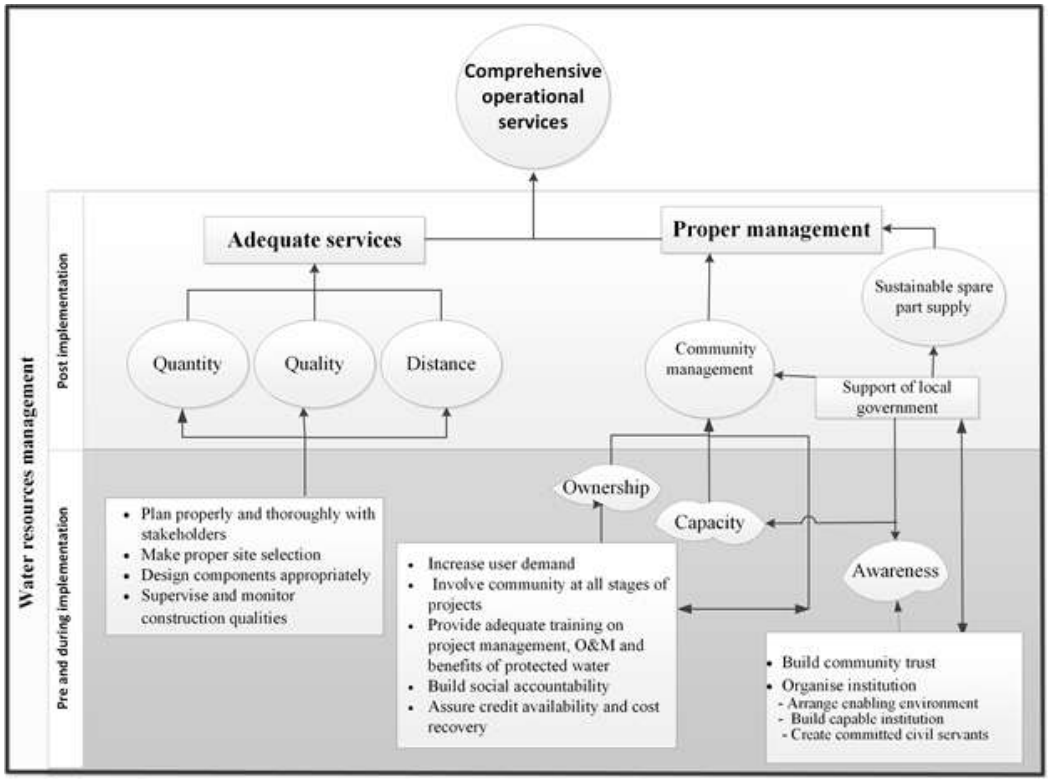


Figure 2. Framework for long-lasting services (by the first author).

user community, and so thoughtless mistakes lead to system failure. To mitigate the problem, user awareness and responsibilities in relation to the protection and management of the system should be established. Yet, it is obvious that a rural community cannot take care of the overall management without the support of the local governments, private actors and NGOs. These external supporters should establish an enabling environment for post-implementation management activities.

Provision of spare parts by Governmental Organizations (GOs) and Non-Governmental organizations (NGOs) is weakening the business opportunities of private suppliers. Based on the discussions with private spare part suppliers in two districts (Foger and Guangua) where suppliers exist, both users and suppliers were unhappy with the situation. The private suppliers were highly disappointed by the involvement of GOs and NGOs in the business, whereas the users complained about prices of private suppliers. The spare parts supplied by the organizations are neither sufficient nor do they encourage private suppliers. Since the organizations offer the spare parts with lower costs than the market price, users prefer to rely on them. In this respect, the private business owners are forced to wait a long time until the donation has been consumed. As a result, when they do find the right market they sell their goods at higher prices to compensate. The users, on the other hand, feel inconvenienced regarding the costs when compared with the lower cost of donated spare parts. This imbalance affects the operation and maintenance activities of the water supply services in the study area.

Developing a more sustainable spare part system and community management is prominent in achieving long-lasting services; however, the appropriate role of local people and private suppliers must be taken into account. The local governments and external supporters have to enhance the technical and managerial ability of the community by building capacity and awareness and developing an ownership feeling at grass roots level (Figure 2).

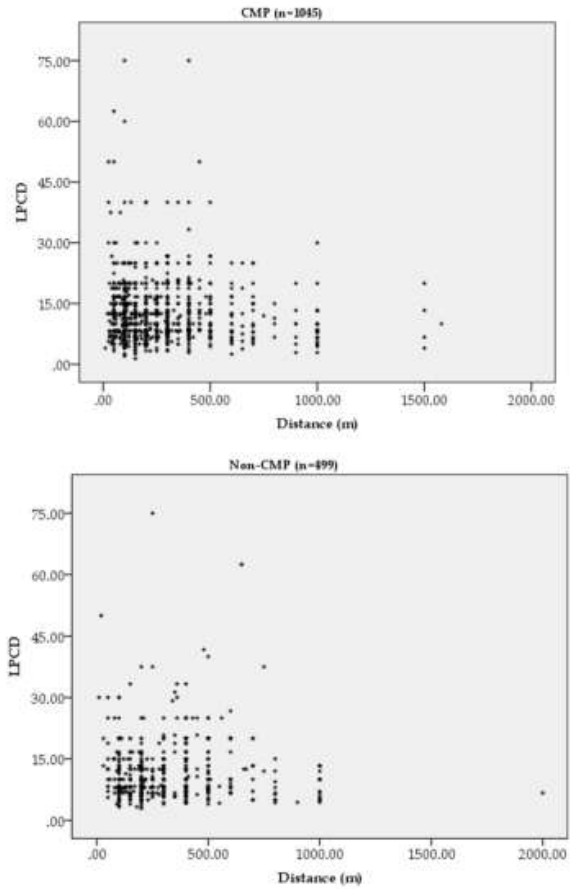


Figure 3. Water use (lpcd) versus travel distance (m) for CMP and non-CMP approaches.

Quality, quantity and distance as service indicator

Water quantity and distance to water sources

The quantities of water available at water points and the travel distance to fetch water determine the interest of people in using protected sources. If the distance is too long, or the available water supply is not adequate for daily consumption, the probability of users resorting to unprotected sources is high. The concept of a reasonable distance varies from country to country based on local conditions. For instance, fetching water from a distance of 0.5 km is a luxury in the rural Africa; luxury in countries with a developed economy is somewhat different (Caircross and Valdmanis, 2006). Moreover, the UN recommendation for a reasonable distance is 0.2 km for urban dwellings (UN, 2000). Currently, the provision of water within a radius of 0.5 km in urban and 1.5 km in rural areas (UAP, 2011) are the short-term targets in Ethiopia. In addition, travel distance alone cannot ensure the intended outcome out of water services. If the yield of sources is too low to support all users, women and girls must wait for their turn at the sources. They sacrifice their productive time, schooling and social life in general. Therefore, the benefits hoped to be gained by improving water systems (Harvey, 2008) are unlikely realized.

Figure 3 shows that the average distance to improved water sources is 278 m (standard deviation 228 m) and

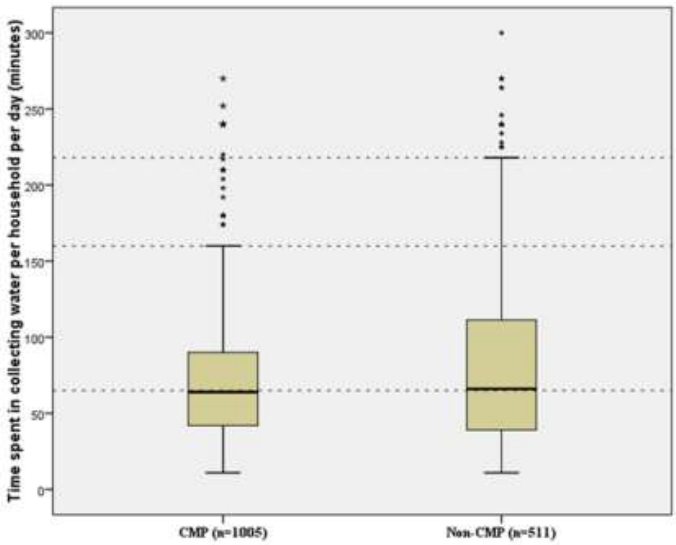


Figure 4. Time spent collecting water per household per day under non-CMP and CMP approaches (* = Outlier values; n is the number of households).

313 m (standard deviation 281 m) in the case CMP and non-CMP, respectively. In terms of the GTP-1 standard, maximum recommended distance to water sources is 1.5 km both for the schemes of CMP and non-CMP approaches. However, the daily water demand target of the country has not been achieved by the approaches, they have performed right in terms distances to water points. Only a few people consume over 20 lpcd as recommended by the UN. The pattern of consumption in Figure 3 indicates that the majority of the surveyed households consume between 10 and 15 lpcd regardless of the distance travelled to water points. Moreover, 82% of users who consume below 15 lpcd are traveling less than 400 m and 95% of them are in the range of 800 m. Contrary to the conclusion by Mellor et al. (2012), water quantity at source affects daily consumption more than the distance travelled. Therefore, distance is a secondary variable in determining the daily consumption of water when compared with the yield of sources in the study area.

As shown in Figure 4, the first two quartiles of the surveyed households spent less than sixty minutes collecting water both in the non-CMP (WMP and NGO-MP) and CMP users, whereas the fourth quartile is significantly different for both categories. In this quartile, CMP users spent up to three hours while non-CMP users could need four hours per day. In fact, the difference in collection time is observed in the upper quartile, which is due to a number of users per water point. The average household size is 42 for CMP and 56 for non-CMP. The spent time refers to a round-trip travelling time including waiting time at the water source for all trips in a day.

In developing economies, the existence and functionality of water supply schemes usually seem to take precedence over supplying an adequate amount of water. If a scheme is working and has some kind of water flow, the users under the scheme are considered adequately served. In Ethiopia, most official figures on water supply coverage are based on the assumption that all users under a functional scheme are satisfied at least to regarding national standard. Such reporting, however, hides the deficiency of service even under functioning schemes. For instance, only 18% of non-CMP users and 25% of CMP users are getting at most 15 lpcd as shown in Figure 5. This corresponds quite closely with the finding by Rautanen et al. (2014) in Nepal. In the study area, the situation is even worse in the dry season when the wells run short of water. According to the survey of 66 water schemes, 83% experienced water shortages for 2.2 months per year on average.

One of the factors affecting water supply service is overpopulation. This means that the number of users on a water supply system is beyond its carrying capacity. This kind of situation can be due to extra users being made aware of the water point after its construction or constructed systems failing to provide adequate service to all users. These cases were observed during the fieldwork in the study area. It is obvious that knowing the

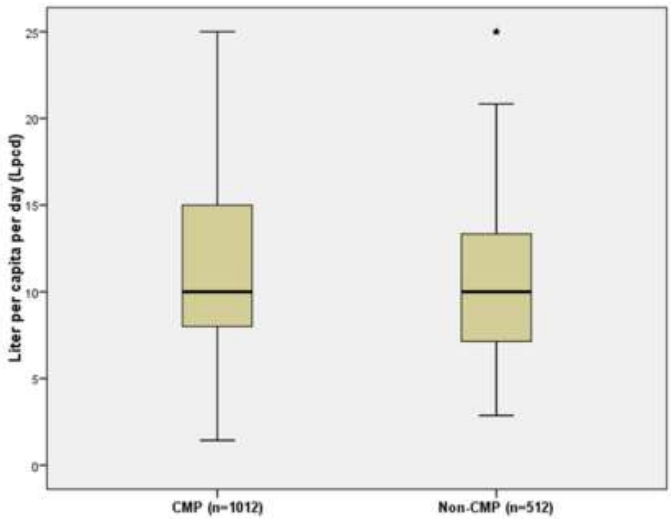


Figure 5. Water use under CMP and non-CMP approaches (* = Outlier values; n is the number of households).

size of the likely number of users during the planning stage is significant to design an adequate scheme. In the study area, the household is the unit of the population with the assumption of five people per family. Even though the five people family size is the national average, it is difficult to consider this figure for small-scale projects as it varies from place to place: in some areas, especially in the rural, the family size is much higher than the national average. Thus, household-based population representation and immigration into a community for different reasons are a few of the factors that overburden water systems. Immigrants may be seeking permanent residence or may just need to find water due to a service breakdown in neighbouring water schemes. Therefore, insufficient access to adequate water discussed above is not only because of lack of efforts in the sector, but also a lack of proper planning with local situations.

Another factor that contributes to the inadequate quantity of water supply is the yield of water sources. This factor depends on the technique and capability of yield determination before designing a system. In this aspect, local government (district) staff members, who had possible contact with such projects, have limited capacity to determine the yield, particularly for groundwater sources. This is not to undermine the individual; rather, institutions at the district level are not supporting the provision of skilled staff to carry out the yield determination. The number of beneficiaries needs to be determined before the project to estimate the yield of the sources that is enough for them. In the case of the hand-dug wells, excavating to a depth that is sufficient to harvest the required amount of discharge is a solution. On the other hand, during spring development, neither the number of beneficiaries nor the yield is determined by the technical staff. This is because no household can be excluded from using a developed spring which they used to getting water from, and the yield of spring sources cannot be significantly improved. However, in the case of non-CMP, limiting the size of the beneficiaries of a water system is not an issue at the beginning of the projects, they serve all based on proximity. In this case, it is very difficult to achieve the quantity requirement.

Water quality

In the sub-Saharan region, 75% of improved water supply systems are not piped (WHO/UNICEF, 2014). The dominant schemes are hand-dug wells, protected springs and private wells. Similarly, the hand-dug wells with hand pumps and spring developments are common in the rural parts of Ethiopia, as they are simple technologies and affordable for sparsely settled rural communities. In the recent plans, hand dug wells and shallow wells have taken the line share in terms of number and budget allocation (OWNP, 2014; GTP, 2015). Thus, the water quality of these schemes depends on the protection of sources from animal interference, anthropogenic activities upstream of sources and stagnant water around a system; avoiding the point and non-point contamination

Table 2. Additional facilities to protect sources from contamination.

Approach	Functional Drainage	Fences	Cloth washes facility	Cattle watering through
CMP (n=90)	50%	73%	43%	30%
Non-CMP (n=45)	51%	66%	13%	9%

CMP- Community Managed Projects approach; Non-CMP- WMP project and NGO managed project.

of sources is crucial. Furthermore, quality problems that arise from the geological formation of an aquifer, such as arsenic and fluoride in the water, cannot be solved by the mentioned protection measures. In fact, fluoride is a serious problem for approximately 14 million Ethiopians in the central rift valley. Keeping this in mind, the study investigated the perception of the sample households and the provision of platforms to accommodate water quality issue by CMP and non-CMP.

As per the field observations and discussions with WASHCOs, water quality is mostly maintained in the study area by chlorination at the beginning of the system use (for hand pump wells). Otherwise, it depends on WASHCO members' consciousness and access to the district water office. Altogether, 39% of the water points visited (n=49) were applying chlorine every six months, while the rest did it once a year, biannually, or never after the first application right after completion of the system construction. The problems with this practice are that the application of chlorine in large quantities may alter the taste of the water at the beginning and that after the chlorine depletes the wells will be without chlorine for long periods. Moreover, neither of the implementation approaches has accounted for the hydrogeological contamination into their actions. They mainly focus on the water quality problem of the human and animal interferences. In this regard, both CMP and non-CMP have shown the same performance in providing adequate drainage facility and fencing the systems as indicated in Table 2. However, the approaches have differences in providing additional facilities, including cloth washing basins and cattle watering troughs.

The water quality issues are the same with all implementation approaches because of two important factors. First, the groundwater is assumed to have less contamination in rural areas. Second, the knowledge-ability in the community concerning water quality is poor: in some parts of surveyed areas, the traditionally flowing water has been considered potable if it tastes good and is clean to the eyes. The people of the study area were observed to use unprotected water although they have a protected source, especially in the highland areas where there are plenty of springs in the rainy season. Some communities are more concerned with water supply projects securing their water requirement during dry periods than what is the primary objective of protected sources. Similar attitudes were observed commonly during the fieldwork at various places. This finding enforces the point by Caircross and Valdmanis (2006) who stated that the end users prioritize their accessibility to water sources over the health benefits of water supply schemes.

Community Involvement

As shown in Figure 2, the other key element needed to maintain a long-lasting water supply system is proper management. The prerequisite for realizing this target is to have strong community management and sustainable spare parts supply. This requires an interaction of external agents, like local governments, donors, partner organizations, etc., as well as the user community being involved in the implementation of water supply projects. The user communities may be eager to have the services; yet, they may not pay attention to the post management. On the other hand, the other stakeholders, external agents are expected to develop the sense of ownership of the water schemes to the communities, to capacitate for management, operation and maintenance of the water supply systems.

In principle, successful community management is achieved through community participation. According to Doe and Khan (2004), the participation could be in the service establishment, community meeting attendances, and ownership of services and community coherence. Furthermore, participation also contributes to the sense of ownership of systems. The clearer the vision of the participating community, the more the sense of ownership increases. According to Arnstein (1969), the ladder of citizen participation has eight levels that generally fall into three categories such as nonparticipation, tokenism and citizen's power as shown in Figure 6. The worst level, in this regard, is manipulation in which users reported as participated without their involvement and the ideal one is citizen control. In the citizen control, users have full authority to do or not to do things based on their preference. The others are intermediate indicators that gradually improve from the worst to the best scenario. Thus, Arnstein's classical ladder is used here to assess the WASH implementation approaches in Ethiopia. Based on the participatory discussions made with government employed staff (n=80) in Amhara region, community participation in CMP fell on the citizen power of 72% and

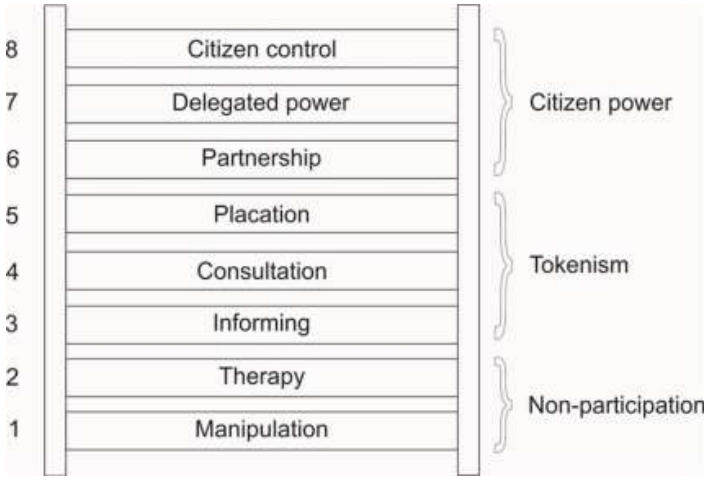


Figure 6. Ladder of citizen participation (Arnstein, 1969).

tokenism of 23%, whereas non-CMP placed between tokenism and non-participation (42 and 42%, respectively). In the discussion of the evaluation, the experts dominantly pointed out the reasons to assess the approaches in the mentioned way, based on the nature of community involvement in many aspects of a project.

Systematic involvement of users in all stages of a project cycle can ease the management process and result in a sense of ownership. In the Ethiopian context, community participation is a formal requirement for the implementation of public projects. Formally, the community should cover at least 10% of the project in kind, in cash, in labour or a combination thereof (UAP, 2008, p45). The same principle also applies to each approach in the country. However, the ways of implementation vary. Based on the experts' discussion, in non-CMP users seem to be manipulated, superficially consulted without their opinions showing up in the outcome, based on the participation ladder in Figure 6. The reasons are the same in both cases. The users' lower interest in participation may be due to their thinking that Governments and NGOs have enough resources to embark on the projects without the support of the community or the lack of awareness and appropriate consultation. In any case, the sense of ownership is debatable. The purpose of community involvement is to ensure a sense of ownership of the water supply systems. Yet, the level and ways of community involvement have an impact on the degree of sense of ownership among the users.

Another problem affecting effective community participation, for all approaches, is the multi-sectoral burden. For example, in the rural Ethiopia, citizens are asked to work for soil conservation, road construction, watershed management, community policing and attend frequent political meetings and other activities besides tending to their own business. Participation in all these activities is mandatory for community members since the by-laws of the local administration penalize non-participation. As a result, participation may easily be considered a burden. Therefore, community participation in water and other sectors to meet the 10% requirement is usually not successful in terms of creating an ownership feeling. The government has the power to push a community to participate, and the NGOs have the incentive to pay them for their participation. Both pretend to participate in order to meet the required level of participation (according to the view of the experts), whereas in reality, achieving genuine community participation requires an absolute involvement. In fact, since in CMP the members of the community request for the project themselves, they know the requirement of their participation. Thus, the ownership feeling in CMP is unique as compared to other approaches. Still, the communities need attention after the project completion.

The household survey (n=1806) revealed that there are disparities among different approaches to pre- and post-implementation support. As shown in Table 3, only a few of the approaches made the community involved in problem identification, site selection, consultation of the users on design options, and technology selection. The rate of participation in labour and cash is the same despite the differences in the timing and motivation of the contributions. Although, the differences are quite narrow,

Table 3. Community involvement in water supply and sanitation projects under different implementation approaches. The check mark (√) indicates that at least 50% of the respondents are involved in the various tasks.

Implementer	Non-CMP*									CMP
	Catholic Church (N=48)	CISP (N=55)	CVM (N=12)	Salini (N=20)	UNICEF (N=48)	CARE (N=96)	SLM (N=45)	Tikuret Legumuz (N=12)	Tana Beles (N=32)	WMP (N=52)	(N=1062)
Problem identification										√	√
Site selection	√				√	√					√
Design											√
Technology selection											√
Service level					√	√					√
Cash	√	√	√	√	√	√				√	√
Labour	√	√	√	√	√	√	√		√	√	√
Local material provision	√	√	√	√	√	√	√		√	√	√
Committee election				√	√	√	√		√		√
Procurement											√

*Organisations in the first nine columns are NGOs; CISP- A Canada based NGO; CVM - Comunita' Volontari Per Il Mondo; CMP- Community Managed Projects approach; Non-CMP- WMP project and NGO manged Project; SLM – Soil and Land Management – a GTZ project; WMP- Woreda Manged Project.

the practicality and impact of participation are strong inCMP. The main difference between the CMP and non-CMP approaches is scheme handover. CMP works by empowering the community from the beginning so that the project assists the community in order to make them feel the project is their own; hence, no handover in CMP, whereas, Non-CMPs celebrate scheme handover after implementation. In the case of CMPs, users' committee elections and training take place before implementation. In the other approaches, including the district-managed projects, caretaker training and committee elections occur after implementation and during scheme handover.

Institutionalization and capacity building

A capacity building is the core component of long-lasting services. Thus, local staff and the community need to have the capacity and a compatible institution to run systems even in the absence of external support. Thus, the two basic requirements for the GOs and NGOs involved in the sector are to develop water systems and build the capacity to extend the services beyond the projects.

Many NGOs and governmental organizations have tried to create long-lasting services by incorporating the capacity building into the development of water supply schemes. Yet, very few have been successful and able to produce a true sense of development in the sector by doing physical construction and capacity building hand in hand. From this point of view, the CMP financial mechanism can be seen as a positive example among the approaches used in Ethiopia. Initially, Rural Water Supply and Environmental Programme (RWSEP)– the predecessor of CMPs was a conventional approach applying the government's financial mechanism. RWSEP was able to reshape itself through experiences to support the poor communities genuinely. Currently, the CMP approach is dependent on both technical and financial support.

In CMPs, a series of capacity building activities are performed at different levels of government to enhance smooth implementation and financing of rural water supply and sanitation. The project trains CMP technical staff out of regional and district government employees. The regional CMP technical staff members provide support in the form of capacity building, technical assistance, monitoring and supervision of district level staff members. The process of the capacity building is then cascaded down to the community level.

Functionality and effective implementation

In the study area, schemes are considered

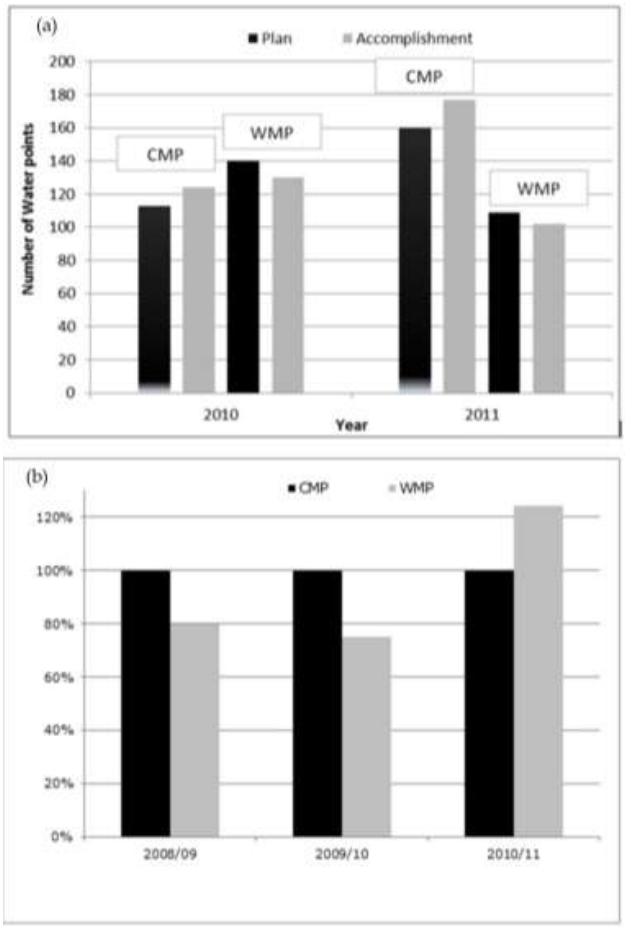


Figure 7. (a) Accomplishment versus plan, (b) annual fund utilization rates of CMPs and WMPs (Source: Tesfaye, 2012).

functional if they possess water regardless of its amount. However, the national targets of per capita demand and distance to water systems are seldom taken into account. Thus, the functionality of water schemes cannot guarantee that they provide adequate services. According to other studies made by different researchers in the same research project, the functionality rate ranges from 94 to 98% for schemes implemented using the CMP approach and from 84 to 92% for those implemented using a non-CMP approach (Mebrahtu, 2012; Sharma, 2012; Tesfaye, 2012). The results show that the CMP approach provided better protection and management than the non-CMP approach. However, these functionality rates the actual services communities obtain. In both cases, approximately 25% of users under functioning water systems is satisfied with the national standard (15 lpcd).

Figure 7a shows that the CMP approach produced, at least, the number of planned water points while the WMP approach performed worse than planned. Moreover, in the case of the CMP approach, the implementation rate beyond the planned schemes indicates the efficient use of funds. In the two explored years, more water points were constructed with the allocated budget than planned. The efficiency of the CMP approach is also manifested by the fund utilization rate as indicated in Figure 7b. It was

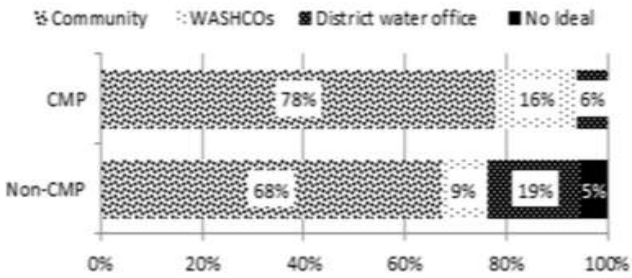


Figure 8. Perception of responsibility for scheme management in the CMP and non-CMP approaches.

almost 100% each year, while in WMP, it varied from 75to 80%. The 124% rate for District Managed Projects (WMP), which was realized in the third year, indicates that schemes started in the previous years were finalized in the third year, which increased the fund utilization rate of the year of completion. Thus, CMP is more effective and efficient than other approaches in utilizing funds and implementing plans.

Tariff collection

Water fee collection was observed to be quite different in CMP and non-CMP approaches. About 74% of the CMP respondents pay for their water (in addition to the operation and maintenance deposit made during project application) versus 43% of the non-CMP respondents. From this, it can be deduced that the communities in CMP approach are devoted to keeping their system operative. The national policy is to collect water tariffs to cover the O&M costs. The average tariff is 3.2 ETB (the standard deviation of 1.8 ETB), which is close to 0.13 euros per household per month. Since the number of households using a water point is 50 on average, the money collected through tariffs (160 ETB) is not enough to cover the O&M costs including the salary of the guards. CMP has proposed a minimum of 1,000 ETB as required for operation and maintenance of a system per year, excluding the salary of a guard; an average cost of a maintenance is 245 ETB according to Guangua district data (n=458). For non-CMP, the average tariff is 1.5 ETB (1.1 ETB), which is about half of that collected by CMPs.

The users in CMP approach seem to show the purpose of the collected tariff. Nearly 72% of CMP and 24% of non-CMP users responded that the money collected was used to cover maintenance costs and the salaries of the guards. However, 28% of the CMP users think they are paying a water tariff only to cover the guard's salary. In CMP, relatively modest awareness training about the purpose of the proper O&M could improve their performance better than in the other approaches. Nevertheless, although the CMP approach is better in collecting tariff, the amount collected is not satisfactory to deposit for further component replacement of water supply systems.

The survey included the question "Who is responsible for protecting the water scheme?" to assess the perceptions of management by respondents and the result shown is in Figure 8. Service recipients of both CMPs and Non-CMPs assigned the first priority to the community that takes care of the water system (78 and 68%, respectively); second priority was assigned to WASHCOs in the case of CMPs and the District Water Office in the case of Non-CMPs (16 and 19%, respectively).

Conclusions and policy implications

The sustainability of water supply systems requires a series of actions for long-lasting services that can be ensured through proper maintenance and replacement of parts and systems. This means that after implementation, continuous investment is needed to keep the system operational and to repair any damages. In this regard, the communities that own the systems are responsible. Therefore, user groups should realize the importance of water points, and they should be trained to work with determination to keep the system functioning for as long as possible by replacing parts and systems when necessary.

To get the users genuinely involved, the services provided or produced should convince users that they are benefiting from the water system. For example, the distance to source and the quantity and quality of water should be within acceptable limits. Otherwise, community management will not work and cannot lead to the desired outcome. All implementation approaches used in Ethiopia have succeeded at least in attaining the target of reducing the travel distance to fetch water. However, the

country is a long way from providing an adequate quantity and quality of water. Therefore, much remain to be done in the sector.

As explained above, system management is assumed to be the responsibility of the community in all approaches. Yet, the success of community management depends particularly on the level of users' involvement in the project, and the way communities organize their activities and create a sense of ownership. Different approaches cause different behaviours as concerns community participation. Non-CMP is administering investment funds in the same manner. The project management responsibility is on the staff of the organizations, and the procurement process is also governed by the regulations of organizations– a process which takes weeks and even months to execute. Work is also contracted out to external contractors. These approaches are characterized mostly by delays in construction and a distant relationship with the user community. However, CMPs have recently delegated almost all their responsibilities to the communities. The project managers and procurement and contract officers of CMPs are community representatives. Moreover, the contractors are also artisans trained out of community members themselves. Therefore, execution of plans and the use of funds are more effective in CMPs than other projects due to the smooth financial flows and procurement process.

The difference between the senses of ownership felt by the users is clear in relation to the two categories of approaches (CMP and non-CMP). In the case of non-CMP approaches, the communities blamed the implementers for service breakdowns and the locations of water points. Moreover, the user committees are ineffectual or even non-existent. Water points implemented by CMPs are another issue. Although, all users do not pay a monthly fee, they usually contribute large sums when there is a system breakdown, and are also keen to protect their water system. However, the expectation that CMPs would collect a monthly water charge and deposit it in the local Micro Finance Institution is rarely realized. Therefore, this aspect needs to be given due attention in the future.

Conflict of Interests

The authors have not declared any conflict of interests.

ACKNOWLEDGEMENTS

Scholarships from Maa-ja vesitekniikan tuki ry and CIMO in Finland, logistical support from the COWASH project in Ethiopia for fieldwork and the support from the Academy of Finland (no. 288153) are gratefully acknowledged.

REFERENCES

Arnstein SR (1969). A ladder of citizen participation. J. Am. Institute Plan. 35(4):216-224.

Behailu BM, Suominen A, Katko TS (2015). Evolution of Community Managed Water Supply Projects (CMP) from 1994 to the 2010s in Ethiopia. Public Works Management and Policy 20(4):379-400.

Brunson LR, Busenitz LW, Sabatini DA, Spicer P (2013). In pursuit of sustainable water solutions in emerging regions: a Review paper. J. Water, Sanit. Hyg. Dev. 3(4):489-499.

Bryman A (2006). Integrating quantitative and qualitative research: how is it done? Qual. Res. 1:97-113.

Caircross S, Valdmanis V (2006). Water supply, sanitation, and hygiene promotion. In Jamison D. T. Breman TG, Measham A R, Alleyne G, Claeson M, Evans DB, Jeha P, Mills A, Musgrove P, 2nd eds, *Disease Control Priorities in Developing Countries*, World Bank, Washington DC. pp. 771-792.

Creswell JW (2013). Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications.

CSA (2010). *Population and housing census report*, Ethiopian Centeral Statistics Agency, Addis Ababa, Ethiopia, accessed at: www.csa.gov.et/newcsaweb/images/documents/surveys/Population%20and%20Housing%20census/ETH-pop-2007/survey0/outputInformation/reports.html (12 April 2016).

Deaton A (1997). The analysis of household survey: A Microeconometric Approach to Development Policy. Published for the World Bank, The Johns Hopkins University Press, Baltimore and London.

Doe SR, Khan MS (2004). The boundaries and limits of community management: Lessons from the water sector in Ghana. Community Development Journal. 39(4): 360-371.

GTP (2015). Growthe and transformation Plan (GTP-2) for water sector, Ministry of Finance and Economic Development, Addis Ababa, Ethiopia.

Harvey PA (2007). Cost determination and sustainable financing for rural water services in sub-Saharan Africa. Water Policy 9(4):373-391.

Harvey PA (2008). Poverty Reduction Strategies: opportunities and threats for sustainable rural water services in sub-Saharan Africa. Progress Dev. Stud. 8(1):115-128.

Howard G, Charles K, Pond K, Brookshaw A, Hossain R, Bartram J (2010). Securing 2020 vision for 2030: climate change and ensuring resilience in water and sanitation services. J. Water Clim. Chang. 1(1):2-16.

Jones S (2011). Participation as citizenship or payment? A case study of rural drinking water governance in Mali, Water Altern. 4(1):54-71.

Mebrahtu M (2012). Assessment of the CMP approach in developing rural water supply schemes, Benishangul-Gumuz Region, Master's thesis, Addis Ababa Uniersity. Accessed at: www.cmpethiopia.org/page/454 (20 November 2015).

Mellor JE, Watkins, DW, Mihelcic, JR (2012). Rural water usage in East Africa: Does collection effort really impact basic access? Waterlines 31(3):215-225.

North DC (1990). Institutions, institutional change and economic performance. Cambridge University Press.

OWNP (2014). One WaSH National Program: Program Operation Manual (POM) for the Consolidated WaSh account, Ethiopian Ministry of Water and Eneryg, Addis Ababa, Ethiopia, accessed at: www.cmpethiopia.org/content/download/1285/5790/file/CMP (10 March 2016).

Rautanen S, van Koppen B, Wagle N (2014). Community-driven multiple use water services: Lessons learned by the Rural Village Water Resources Management Project in Nepal]. Water Altern. 7(1):160-177.

Sharma N (2012). CMP in implementing rural Water supply in Amhara region, Master's thesis, Tampere University of Technology, Tampere, Finland, accessed at: www.cmpethiopia.org/page/454 (20 November 2015).

Taylor B (2009). Addressing the Sustainability Crisis – Lessons from research on managing rural water project, Dar es Salaam, Tanzania.

Teddlie C, Yu F (2007). Mixed methods sampling a typology with examples. J. Mixed Methods Res. 1(1):77-100.
Tesfaye Y (2012). A comparative study on woreda managed and CMP rural water supply projects, Master's thesis, Indira Gandhi Open University, Addis Ababa, Ethiopia, Accessed at: www.cmpethiopia.org/page/454 (20 November 2015).
UAP (2008). The Ignition of mass mobilization on universal access plan for water and sanitation program, Ethiopian Ministry of Water and Eneryg, Addis Ababa, Ethiopia, accessed at: ww.cmpethiopia.org/media/universal_access_plan_mass_mobilization_strategy (15 July 2015).
UAP (2011). Revised rural water supply – UAP, Ethiopian Ministry of Water and Eneryg, Addis Ababa, Ethiopia, accessed at: www.cmpethiopia.org/media/rural_water_supply_universal_access_plan_uap_i (13 September 2015).
UN (2000). Charting the progress of populations, United Nations Population Devision, New York, United Nations, accessed at: www.un.org/esa/population/pubsarchive/chart/2.pdf (16 October 2015).
UN (2003). Indicators for Monitoring the Millennium Development Goals, United Nations Development Group, New York, United Nations, accessed at: http://mdgs.un.org/unsd/mdg/Resources/Attach/Indicators/Handbook English.pdf (12 April 2016).
WHO and UNICEF (2000). Global Water Supply and Sanitation Assessment 2000 Report, World Health Organisation and UNICEF, Geneva/New York, Switzerland/USA.
WHO and UNICEF (2014). Progress on drinking-water and sanitation – 2014 Update, World Health Organisation and UNICEF, Geneva, Switzerland.
WIF (2013). Federal democratic republic of Ethiopia the WaSH Implementation Framework, Addis Ababa, Ethiopia accessed at: http://www.cmpethiopia.org/media/signed_wash_implementation_framework_scanned (January, 2016)
World Population Review (2016). Ethiopia population 2016, accessed at: http://worldpopulationreview.com/countries/ethiopia-population/ (12 April 2016).

PUBLICATION III

Behailu B.M., Hukka J., Katko T.S. "Service Failures of Rural Water Supply Systems in Ethiopia and Their Policy Implications", *Public Works Management and Policy. doi:10.1177/1087724X16656190*, OnlineFirst July 1, 2016.

Public Works Management & Policy
1–18

DOI: 10.1177/1087724X16656190
pwm.sagepub.com
SAGE

Service Failures of Rural Water Supply Systems in Ethiopia and Their Policy Implications

Beshah M. Behailu[1], Jarmo J. Hukka[1], and Tapio S. Katko[1]

Abstract

As the world is striving to improve water supply coverage, a significant number of rural communities are forced to turn back to unprotected sources due to service breakdowns of their water supply systems. Yet, these communities do not seem to receive the same attention as those building new systems. The purpose of this article is to reveal and diagnose the determinant factors of service failures and to propose mitigation measures to the rural water supply in Ethiopia. The study is conducted through a literature review and field discussions with experts (n = 48) and artisans (n = 35), who have been involved in the implementation, operation, and maintenance of the systems. Moreover, failed schemes (n = 20) were visited, and discussions were held with village elders of each water point. The findings indicate that lack of uniformity of implementation approaches, and institutional and organizational incapability of the local government aggravate the service failures. The further capacity building, institutionalization, and improving remuneration of employees are likely to reduce the problems substantially.

Keywords

service breakdowns, rural water supply, cost recovery, sustainability elements, Ethiopia

Introduction

Drinking water supply in the context of rural communities of developing countries is quite unsatisfactory. First, the need to develop water supply systems that serve all the

[1]Tampere University of Technology, Finland

Corresponding Author:
Beshah M. Behailu, Department of Civil Engineering, Tampere University of Technology, P.O. Box 600, 33101 Tampere, Finland.
Email: beshah.behailu@tut.fi

citizens has not yet been addressed adequately. Second, built systems are not operating at full capacity (Carter, Tyrrel, & Howsam, 1999). To make matters worse, the annual financial capacities of the countries are below the level required to cover both the new development and operation of existing systems (Seppälä & Katko, 2003). These factors, together with extensive service failures, challenged the realization of the Millennium Development Goals (MDGs) and now the Sustainable Development Goals (SDGs), particularly in sub-Saharan Africa (SSA). The majority of the countries in the region were unable to achieve the targets by 2015 (United Nations [UN], 2014; WHO & The United Nations Children's Emergency Fund [UNICEF], 2015). In particular, the situation is harsh in the rural setting of the region; eight out of 10 people are living without improved water services (WHO & UNICEF, 2015).

Dispersed rural settlements and the absence of infrastructure currently make it impossible to launch effective action to solve the water supply problems in rural Ethiopia. These areas still need multidimensional development to eradicate poverty and improve living standards. In addition to water supply, the rural communities need development in many other areas: farming technology, energy supply, housing quality, and access to basic services such as schools, markets, and health centers. The rural communities are suffering from various problems due to the absence of such infrastructure in their vicinity. These communities are busy all day long. Especially women are involved in laborious activities all year round. Yet, all these problems are interrelated. Thus, any plan to solve an individual problem in these communities is unlikely to succeed, because the problems are inseparable. Community management that has been promoted since the middle of the 1980s is meant to achieve sustainable solutions to water supply services, particularly during the post-construction period. Thus, to achieve sustainability objectives, external agents need to understand the situation in a community in advance of their intervention because experiences and expectations vary across communities.

In fact, sustainability has various definitions depending on the context it is used in. Brundtland's (1987, p. 16) definition of sustainability as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" has a longer time frame than development projects normally have. However, in water supply and sanitation, it is limited to a fixed time frame due to the service lives of components and other external factors. Abrams, Palmer, and Hart (1998) defined sustainability of water services as ". . . water continues to be available for the period for which it was designed in the same quantity and of the same quality as was designed" (p. 4). This definition is close to the context of the term used in this article.

In general, the factors determining sustainability are social, economic, environmental, and technical by their nature. These factors have been defined by various scholars (Bendahmane, 1993; Carter et al., 1999; Eneas da Silva, Heikkila, de Souza Filho, & Costa da Silva, 2013; Giné & Pérez-Foguet, 2008; Katko, 1991; Montgomery, Bartram, & Elimelech, 2009; Spaling, Brouwer, & Njoka, 2014; UN, 2007). Although the above references from the last three decades spell out the requirements for sustainable water supply systems, the problem still persists, as manifested by the large proportion of nonfunctional systems. For example, 25% of the water supply systems in SSA countries fail

before the second year after their inauguration (Taylor, 2009). According to Brikké and Bredero (2003), the corresponding non-functionality rate runs from 30% to 60%.

In Ethiopia, the non-functionality of water supply systems is also very serious (Chaka, Yirgu, Abebe, & Butterworth, 2011). It is very important for future development to determine the problems and the causes of service breakdowns of rural water supply. Therefore, this article aims at diagnosing the key reasons for service failures based on the literature review and a field study carried out by the first author in Ethiopia in 2012-2014 as an extension of a research, evolution of community managed water supply projects from 1994 to the 2010s in Ethiopia, done by Behailu, Suominen, & Katko (2015). The objective of the literature review is to map the changes that have occurred over the past decades in the thinking related to sustainability and to relate the contribution of the work to the concept of sustainable services.

In this article, improved water service refers to the definition given by the WHO and UNICEF (2010), which stated that "an improved drinking-water source is defined as one that, by nature of its construction or through active intervention, is protected from outside contamination, in particular from contamination with faecal matter." Moreover, the functionality of water supply services implies the availability of water in the desired amount, quality, and price that is affordable to users and sufficient to cover operation and maintenance costs (including water fees, time, and energy; Sara & Katz, 2004; Sector Efficiency and Improvement Unit [SEIU], 2010).

Method

This study includes a literature review covering a variety of developing economies and a field survey on the rural water supply situation in Ethiopia. Articles published in scientific journals from the 1990s to 2014 were reviewed, especially as concerns factors related to sustainability of rural water supply. The fieldwork included interviews of 48 water office staff members from seven districts and 39 artisans involved in the construction and maintenance of the water supply schemes in two districts of Amhara region in Ethiopia: Fogera and Dega Damot.

Forty-eight water office experts were also asked to rank the causes of service breakdowns. The 35 artisans of Fogera district filled a questionnaire that contained different subjects related to the implementation of water supply schemes and their possible implications for the non-functional schemes. In addition, four artisans in the Dega Damot district were interviewed. Moreover, the first author attended an artisans' evaluation meeting in Fogera district and visited 20 non-functional water schemes in November 2012, December 2013, and June 2014.

Results and Discussion

Literature Reviews and the Local Context

In administration, future research, and business strategies, the PESTEL (Political, Economic, Social, Technological, Environmental, and Legal aspects) framework is

Table 1. Sustainability Elements of Water Supply Systems.

No	Sustainability elements	Reference
1	Operative *technology*, appropriate *institutions*, adequate cost recovery	Katko (1991)
2	*Social*, environmental, *technical*, financial	Bendahmane (1993)
3	*Motivation*, maintenance, cost recovery, continuing support	Carter, Tyrrel, and Howsam, (1999)
4	*Social*, *technical*, economic, environmental	UN (2007)
5	*Institutional*, managerial, *social*, environmental, financial, *technical*	Giné and Pérez-Foguet (2008)
6	Community demand, local financing and cost recovery, dynamic *operation and maintenance*	Montgomery, Bartram, and Elimelech (2009)
7	*Social, technical, administrative* and financial issues, environmental, reliability	Eneas da Silva, Heikkila, de Souza Filho, and Costa da Silva (2013)
8	*Supply sustainability, sector sustainability*, management sustainability	Spaling, Brouwer, and Njoka (2014)

Note. Similar elements are underlined in the same style.

often used for analyzing the internal and external environment. The detail of this framework encompasses various elements: political, economic, social, technological, environmental, and legal aspects. The aim is to assess the feasibility of a certain activity within a wide framework, not just from technical and economic perspectives. Water as a public good requires continuity in supply and acceptability to consumers in quality and quantity. Therefore, the water supply service is unavoidably governed by these factors. Literature, which was reviewed from the 1990s to 2014, shows that the PESTEL framework has been used as a sustainability tool to keep services operational. Although these elements are explained in various forms in different studies, their focus is, however, ultimately on various governance factors. This study has presented some of the key sustainability elements that are commonly pronounced in the sector as shown in Table 1.

As elaborated in Table 1, the literature reviewed addresses many similar issues or wider themes. However, the sustainability of water supply and sanitation systems has not significantly improved. For example, the UN development agenda for the next 15 years remains focused on sustainability. This strongly suggests that past efforts in this regard were not as successful as expected. The following section summarizes how the literature describes the sustainability elements of water supply systems and the similarities that exist between them.

The factors of sustainability are interconnected, and no single element exists on its own. Thus, treating them separately is quite difficult. Yet, for the purpose of this article, the key sustainability elements are summarized under five major categories and are explained below (for clarification, the terms used by different studies are listed in the parenthesis). These elements are social aspects (motivation, community demand), economic aspects (cost recovery, financial, economy, adequate cost recovery), continuing

support, environmental aspects (supply sustainability, reliability), and institutional aspects (support continuity, management sustainability, appropriate institutions, operation, and maintenance). These categories will be discussed below.

Social Aspects

Helping someone who understands a problem is much easier than helping those who have no idea of it. Similarly, it is worthwhile investing in communities that really understand the problems of unprotected water sources. In rural areas, many people think that water cannot cause any harm because they grew up seeing people drinking water from unprotected sources and the community has never linked water-related problems with the quality of the water used. Therefore, communities and citizens have to be taught to raise awareness and to create demand for improved services. A community and its members have to become motivated about water services (to be eager to receive them); otherwise, community participation and further management may not be as effective as it should be.

Table 1 presents the sustainability elements of different researchers in various ways. To a large extent, they are concerned about similar issues. For example, motivation (Carter et al., 1999), community demand (Montgomery et al., 2009), and social aspects (Eneas da Silva et al., 2013) approach the same subject but from different perspectives. Motivation, which is underlined by Carter, is assumed to boost the demand for water and improve the understanding of the need for improved water in the community. Therefore, the user community should be motivated and taught giving due attention to social bonds and norms (social capital) as explained by Eneas da Silva et al. (2013) and Pretty (2003). In general, communities should be motivated and supported by incentives through education (Carter et al., 1999) and provided with continuous training (Harvey & Reed, 2007). It is also very important to know about the available social capital in the target community (Eneas da Silva et al., 2013) to be able to create meaningful community participation through genuine demand (Montgomery et al., 2009).

The concern of community management, participation, involvement, and other related subjects in the water supply is to bring sustainable services. Social aspects are vital for creating solid community involvement, the sense of ownership, and committed management. The main question is how to assure long-term service delivery and how to keep rural communities served even beyond the economic life of the water supply systems. From the social point of view, the end user needs to be involved in the problem identification, planning, implementation, and management of their water supply systems, and the process should be designed to exploit the available social capital and give due respect to traditional institutions.

Economic Aspects

Economic aspects in this part refer to the ability of governments and communities to build capable water supply structures, and to support their operation and maintenance.

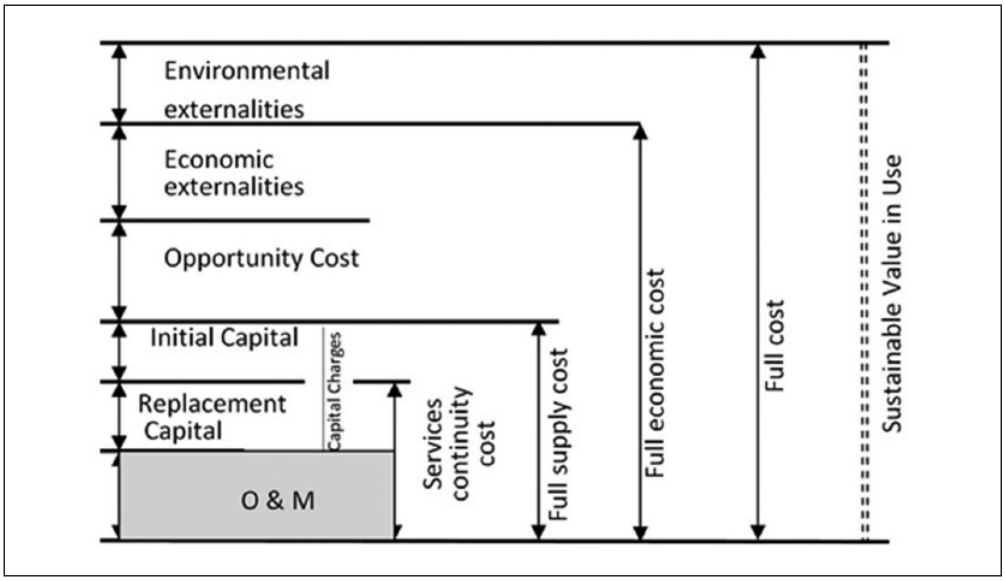


Figure 1. Water supply costs and shares that need to be recovered (modified from Seppälä and Katko, 2003; Rogers et al., 1998).

However, the challenge in rural water supply is that people are often unable to cover the operation and maintenance costs. Hence, many projects and programs include cost recovery as a requirement of service sustainability. However, the definitions of full cost recovery in water supply and sanitation are very ambiguous. Some projects focus on the collection of money through tariffs for the operation and maintenance (O&M) of the systems but ignore the need to cover system replacement. Others deem it important that at least a part of the investment cost is recovered just to assure the renovation of old systems and their replacement when they have reached the end of their service life. However, in practice, communities in rural areas of developing economies often disregard this aspect because of lack of education, ability to pay, and appropriate institutions.

Most studies have considered cost recovery as one of the key sustainability elements. If communities are able to cover at least the O&M and system replacement costs, governments and NGOs that support water supply system development would be able to help those communities that are beyond the services. A very important question is to what extent a community can recover the costs of their system. A sustainable value of water supply systems includes operation and maintenance costs, capital costs, opportunity costs, economic, and even environmental externalities as indicated in Figure 1.

According to Seppälä and Katko (2003) and Rogers, Bhatia, and Huber (1998), the full costs of services are the aggregate of full supply costs (full financial costs), opportunity costs, and costs of social and environmental externalities. The last three components are often caused by environmental impacts and non-monetary costs. The problem

is to know exactly the sorts of costs that can be recovered. Moreover, the possibility of recovering the full cost in the developing countries is unrealistic. In fact, ideally, it can be helpful if at least full financial costs are recovered, but the actual living conditions and level of understanding in the communities—including, for example, the need for cost recovery—make that largely impossible. Therefore, developing economies are far from equating environmental and economic externalities, and opportunity costs with actual costs.

Full cost recovery is a challenge, even to European Union (EU) member states (Hukka & Katko, 2015), let alone developing economies, because rural areas in the developing countries are very poor and their settlements are often too scattered to act jointly. In addition, based on earlier experiences, people tend to expect receiving water supply services (both new development and O&M) from the government or external supporters (Katko, 1990). Thus, recovering of costs, in practice, involves paying a tariff that often covers only the salaries of guards and replacement of simple spare parts. Deciding on the water charge is left to users who do not have the capacity to forecast future costs and know very little about cost recovery. As a result, they set a very low flat rate that is hardly ever collected regularly.

In Ethiopia, water charges are very rarely collected and are, on average, based on the findings of this study, on an average 3.2 ETB (Ethiopian Birr) (0.13 euro) per household per month (n = 179)—n is a number of water supply schemes. That is not enough to cover O&M costs, let alone full supply costs. However, as the spare part costs are increasing, the water fees collected from users are not rising correspondingly. That indicates that the rate of cost recovery in rural Ethiopia is far too low. The reason for such low rates is that tariffs are determined by the community without a full appreciation of the cost factors involved and a shortage of hard currency. Rural communities are challenged in setting adequate rates because the costs of spare parts are often unpredictable and paying of bills in cash every month is difficult for agricultural communities that are dependent on seasonal crop yields. Therefore, some improved rules and assistance are needed to provide services to the communities, and obviously, we have to start pursuing a policy that makes it possible to recover at least the service continuity costs.

Continuing Support

The third element, continuing support, refers to the support that needs to be extended beyond the project span to enable the users to manage their system properly. The ability to bring about substantial and sustainable change in a rural community is hampered by the project-based nature of improvements, which are often constrained by time and limited resources. For example, most donor- and NGO-based implementation of water supply and sanitation systems are restricted to a limited time where they are focused on construction, rather than sustainable operation of the systems. Once construction is complete, the external agents normally will hand over the system to the users and move on to the next project. However, the community who received the service is often ill-equipped to operate and manage it efficiently and needs ongoing support to

ensure that their management and operational skills are adequate. This continuing support can be financial, technical, administrative, or whatever else is needed by the community. Not providing such support will be an impediment to successful and sustainable systems.

According to Carter et al. (1999) and Harvey and Reed (2007), this support refers to the role of back stoppers in the community during the post-construction phase. This concern is often given less weight in the realm of community management. The reason for the need of continuing support is the inability of rural communities to manage and operate water supply systems. First, they are not educated to operate such systems and, second, the heterogeneity of communities in religion, culture, and norms contributes significantly to lower coherence between community members in managing their common system. As Harvey and Reed (2007) remind, the effectiveness of ownership feeling in attaining sustainability is more challenged by individual behavior than the community.

Rural communities in developing economies need both technical and financial support, whereby donors and partner organizations have been lending a hand in many ways. However, as pointed out by Harvey and Reed (2007), external support should not undermine local efforts. In other words, external agents should not replace local actors but recognize their efforts and help to improve them. Therefore, support for the implementation of systems should be extended beyond the completion of a project so that it enables the users to handle their systems gradually. In this manner, the role of external supporters to create a capable local community will be realized (Harvey & Reed, 2007) as illustrated in Figure 2.

Members of water user communities who are appointed to look after the water supply systems are known as caretakers. In Ethiopia, most implementers train water caretakers to repair and maintain the systems. However, the training methods do not include the full participation of trainee caretakers in practicing fitting and unfitting parts of systems. Thus, these caretakers in rural Ethiopia are not working as efficiently as they could. Besides, training is given in groups (caretakers from various water systems) for cost optimization reasons. Therefore, training demonstrates each component of the water supply systems to the trainees in groups and allows them to familiarize themselves with the components. Yet, the trainees do not get a chance to practice enough to master the job due to the high number of trainees. However, water supply schemes' early stage failures are not common. Therefore, the caretakers do not get a chance to test their maintenance skills sufficiently. Consequently, when a system fails, they do not remember how to perform their tasks properly. Moreover, the performance of water supply, sanitation, and hygiene committee (WASHCO) and caretakers in water fee collection and utilization, and other management matters should be continuously supervised and strengthened until the intended result is achieved to comply with the view of Ayibotele (1988).

Environmental Aspects

As indicated in Table 1, supply sustainability (Spaling et al., 2014), environmental aspects mentioned by Eneas da Silva et al. (2013), and reliability (Masduqi, Endah,

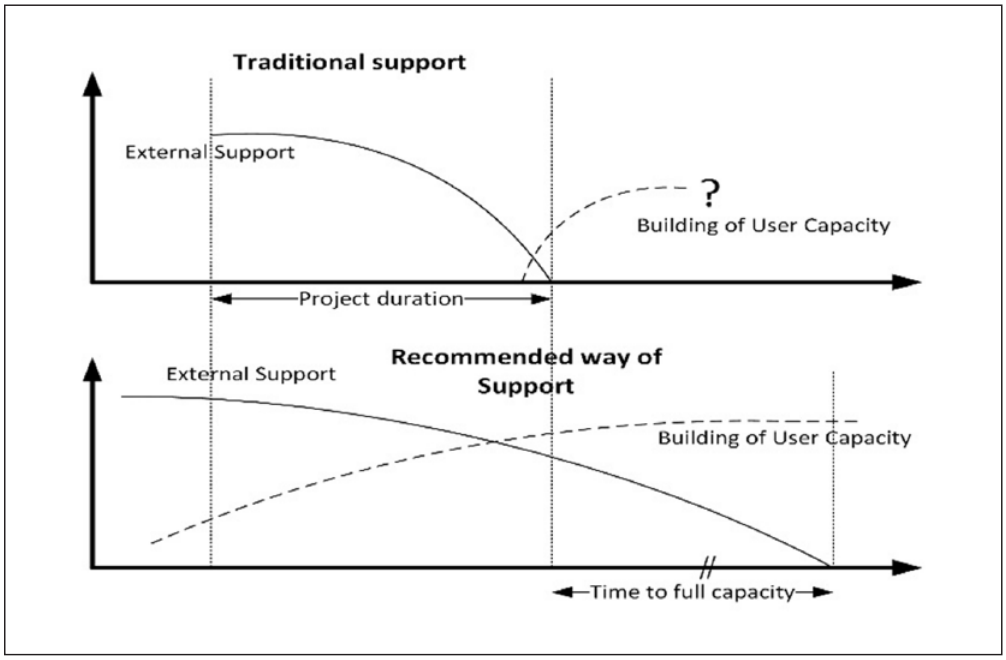


Figure 2. Traditional and recommended ways for external support in building community capacity.

Soedjono, & Hadi, 2010) are referring to the same element, environmental sustainability in particular. According to Spaling et al. (2014), supply sustainability refers to the availability of water sources along with other supplies. The main concern in the rural water supply is the reliability of water sources, which can be expressed in terms of quantity, quality, and accessibility. Therefore, sources considered for water supply purposes should be protected from contamination and yield reduction. At the same time, improved water supply schemes should not have a negative impact on the environment (Eneas da Silva et al., 2013). In rural areas, the biggest concern is assuring the availability of water. Otherwise, the environmental impact of water supply schemes is minimal because of their size and less complex treatment technology.

Appropriate institutions (Katko, 1991), sector sustainability (Spaling et al., 2014), and the technical, administration, and financial capacity described by Eneas da Silva et al. (2013) are meant to create an enabling environment and sustainable services in rural water supply and sanitation (Lockwood, 2004). Thus, the planning of water supply schemes needs to be governed by rules that enable protecting the environment from harm and the resulting drying up of water sources. In this respect, the situation in Ethiopia is very promising if the efforts produce proper results. Watershed management has been practiced nationwide in the form of soil and water conservation works since 2010. That is good news for water supply as it replenishes groundwater and increases the yield of available surface water sources.

Appropriate Institutions

According to North (1990), institutions are the humanly devised constraints that structure political, economic, and social interaction. They consist of both informal constraints (sanctions, taboos, customs, traditions, and self-imposed codes of conduct) and formal rules (constitutions, laws, property rights). These national or local well-structured and appropriate institutions are vital for promoting sustainability. Such institutions should determine the ways in which communities are approached, issues discussed, the environment compromised, and technical matters managed. There should be a system of checks and balances vis-à-vis the activities and incentives for the stakeholders. In North's (1990) sport team analogy, the institution is simply represented by the rules of the game whereas organizations are denoted by the players. Institutions are usually there to govern the way organizations act in a certain business. Moreover, organizations initiate institutional changes. Thus, both are important for development as one drives the other and keeps systems flexible with the dynamic world. That is the main reason to include institutions and organizations as the basis of governance along with policies (Kemerink, Mbuvi, & Schwartz, 2012).

Some examples, from Table 1, have described the importance of appropriate institutions to make rural water supply services sustainable. Quin, Balfors, and Kjellén (2011) argue that 'Nobody is willing to walk and talk with the people . . .,' although the organizational framework implies that actors undertake certain rules and responsibilities, they are not always undertaken properly. Thus, the above mentioned argument emphasized on the importance of enforcement of rules to push civil servants work with the people. This is directly related to the weakness of the institutions in Uganda to implement rules. The same is true in Ethiopia. Staff members of the district water office are responsible for the technical follow-up of the construction of rural water supply schemes, but they are not doing all they are supposed to do. The enforcement and the incentives to carry out these activities are non-existing. Apparently, the lack of adequate organizational and financial capacity of the districts has resulted in understaffed organizations and unsatisfactory implementation institutions. Therefore, strong institutions with appropriate enforcement and incentives should be placed at the district level to promote functional systems.

Chains of Causes and Effects on the Service Failures of Schemes in the Study Area

The Ethiopian government and partner organizations have been struggling to increase the coverage of rural water supply services with the aim to provide 15 liters per capita per day (lpcd) within 1.5 km. Therefore, these figures are simple indicators of evaluating the success of development in the sector although they alone do not constitute a sufficient base for such evaluation. This study shows that the travel distance is in the range of the national target in the surveyed households while water consumption level is much below the national standard (15 lpcd; Figure 3 reveals that more than three quarters of the population is fetching less than 15 liters of water per day. Moreover, approximately

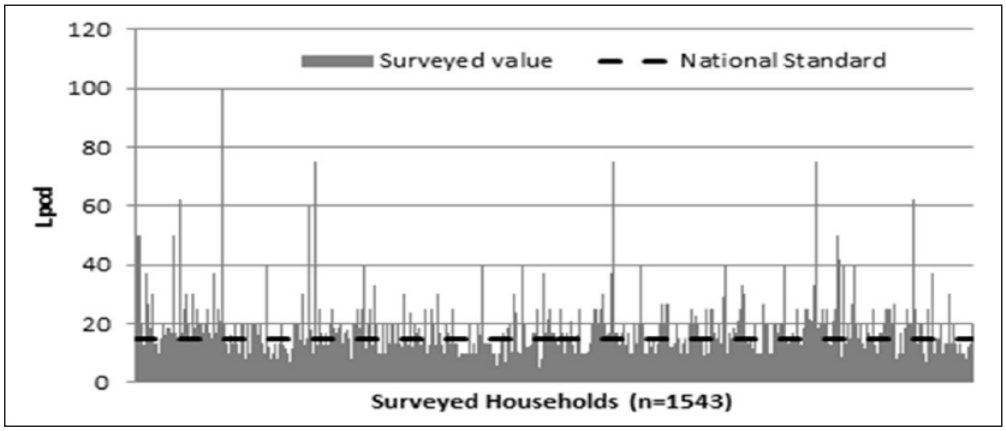


Figure 3. The level of per capita per day consumption.

50% of the studied water points [$n = 25$] fail at least twice a year, and 83% of 66 water schemes encountered water yield reduction for about 2 months in a year).

As discussed earlier, rural water supply systems generally fail to serve or inadequately serve their communities due to social, economic, environmental, and technical factors. Based on the interviews, questionnaires, and field observations, the factors are greatly exacerbated by the lack of institutional capacity in Ethiopia. The institutional capacity in this article refers to a system that is established to facilitate development activities, follow-up and monitoring mechanisms, and the presence of controlling mechanism in the district water office. As shown in Figure 4, the lack of institutional capacity has a substantial influence on other factors. This figure is developed based on the interviews of 48 experts in the districts.

Service breakdowns are defined here as occurrences of service interruptions, failures to provide an adequate quantity of water, or abandoning the water system by the users. Based on interviews and questionnaires, frequent service breakdowns of rural water supply systems are due to low yields of water sources, poor post-construction management, water quality problems or a combination of these. Low yield implies that water sources dry up or built structures do not supply enough water for the design population. Moreover, poor post-construction management means that failed parts of a system are rarely replaced in time; people do not contribute to the maintenance and proper use by the community.

As Figure 4 shows, the low yield is the result of environmental factors or man-made causes. Most water supply schemes in rural areas under consideration are hand-dug wells for a group of households. Because these wells are shallow, groundwater level variation has a significant effect on the availability of water in them. The reliability of water supply also depends on the quality of construction and proper site selection.

In practice, quality construction means wells deep enough to allow extracting an adequate quantity of water in the driest season, leakage-free structures, durable components (that need nominal maintenance), and technology that can be operated by local

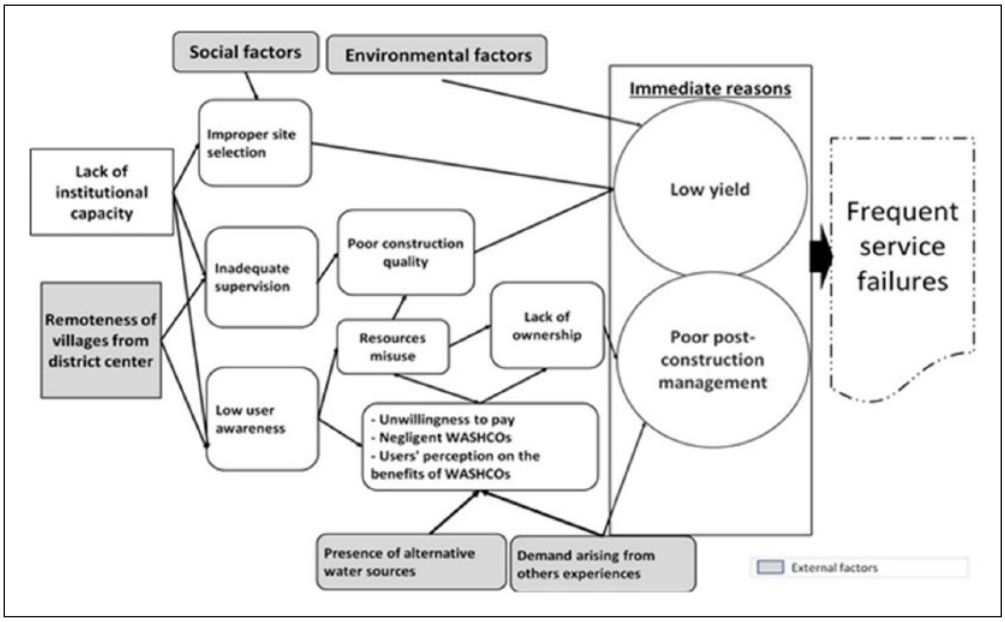


Figure 4. Factors contributing to service breakdowns in rural water supply in Ethiopia based on the findings from the field.
Note. WASHCOs = water supply, sanitation, and hygiene committees.

knowledge. In the rural areas of Ethiopia, the most important construction quality factors are durability, site selection, and reaching the right depth where enough water can be found. Wrong timing of the construction of a hand-dug well, in particular, may lead to an erroneous estimate of the well's yield. The construction has to take place during the dry season to ensure the availability of as much water as possible. However, in the study area, this issue was not found to be a major problem in projects that follow the Ethiopian financial year, which starts in July. The projects of implementers who follow a financial year starting in January usually overlap with the rainy season in June to September. Construction of wells during these months exaggerates the yields of the sources and eventually leads to a shortage of water in the dry season.

A very striking issue is material misuse and fraudulent reporting on the depth of wells. Although it is not a problem in all districts, the situation must be clarified to enable those concerned to take required action. Misuse of resources is covered up by the artisans and WASHCOs' members (22 of 35 the artisans contacted agreed on the presence of resource misuse). As the committees are responsible for controlling the construction of the water supply schemes, it is easier for them to negotiate with the artisans. The artisans and WASHCOs sometimes report exaggerated well depths to the district water office to claim extra payments and construction materials. Based on the discussions, this problem is quite common in remote villages where supervision is weak. A couple of districts that faced this problem solved it by setting up a new control mechanism and intensifying supervision.

Table 2. District Populations (Rural) Based on the 2007 Census and Number of Water Office Staff.

District	Rural population	District water office staff	Staff to population ratio
Fogera	203,259	9	1:22,584
Farta	225,398	12	1:18,783
East Estie	196,924	10	1:19,692
Guangua	191,577	10	1:19,158
Dega Damot	152,343	13	1:11,719
Yilmana Densa	195,683	7	1:27,955
Dibate	59,255	12[a]	1:4,938
Mandura	33,228	18[a]	1:1,846
Pawi	35,484	21[a]	1:1,690

Source. Central Statistical Agency of Ethiopia (CSA; 2010a, 2010b) and district offices.
[a]Districts of Benishangul-Gumuz assign water technician at villages (kebeles) level, in addition to the Water office staff.

Inadequate supervision and improper site selection are the most important factors contributing to the yield reductions because they lead to lower construction quality. The problem is also aggravated by the lack of institutional capacity. Moreover, social behavior has influenced the site-selection process, because everyone wants to have a water point near one's house. Therefore, the members need to have a debate on the site of water points and they generally agree to have them at a convenient distance for all users regardless of the hydro-geological conditions. This, in turn, is a problem with regard to the availability of water. In addition to the social factors, the institutional set-up and organizational competency have an impact on the quality of site selection. Most staff members have a low-level education, and their turnover rate is high. In most districts, skilled manpower with a bachelor's degree will not work for more than a year because of higher salaries paid by other equivalent organizations or facilities in other districts. It is also difficult to make heads of district offices serve for a longer period. Based on the observations of the first author, four of the seven district heads were substituted within 18 months, and the new leaders did not have a background in any water-related field. The high staff turnover rate and the unstable situation of heads of water offices have serious effects on the progress of developments in the districts and, consequently, construction quality. The worst-affected villages are far from the administrative centers of the districts.

In Ethiopia, rural communities have less exposure to education, and only 49% of the total population is literate (The World Factbook, 2015), and thus, the rural communities have low levels of knowledge to interact with new systems management styles. Therefore, adequate training and awareness are very important for proper utilization and management of systems. The remoteness of the villages from the administrative center of their district also had an impact in addition to the lack of staff. The staff available in districts typically consists of seven to 21 people for a population range from about

33,000 to 225,000 as indicated in Table 2. They cannot address the demand effectively in their district. Moreover, technical staff members need to travel long distances to reach the rural communities and the remotest villages are often inaccessible by road. Hence, the personnel sent to educate a remote community and supervise construction may have to travel on foot, and the incentives offered are not very attractive either. Also, the incentives are not based on real efforts, and staff members usually hate to be assigned to remote villages because they would rather work nearby. Thus, supervision is very weak due to the workload and lack of incentives. Moreover, the artisans pointed out the absence of proper supervision (eight out of 35) as a second serious problem next to the lack of discussion (nine of 35) to resolve issues in the process of implementation.

In discussions, various factors were suggested, but it is difficult to identify a single reason being more responsible for the failures than others. For example, negligent committee members lose the interest of users (15 of 35 artisans who filled the questioner reflected that the committee members are negligent, and 17 of 35 feel the WASHCO members are self-benefit oriented). However, the negligence of WASHCOs is the result of the assumption of the community concerning benefits the WASHCOs members receive from the projects. That, again, raises suspicions about the committee being involved in the misuse of construction materials. All these causes and effects finally form a vicious circle. Generally, the reasons for a weak feeling of ownership include an unwillingness to pay, negligent WASHCOs, user perception of the benefits accruing to WASHCOs, and misuse of resources, in addition to the absence of well-established management systems. A well-established management system is characterized by a strong bond between the district water office and the user committee, where there is joint accountability for the management and implementation of proper tariff collection and the presence of a skilled workforce for operations and maintenance. Moreover, the committee should be legitimized by the local community and have procedures in place to replace a member when required. A secure supply of spare parts should also be available to the local community to reduce their dependence on the external government or NGOs.

The abovementioned factors are believed to emanate from low user awareness, the presence of alternative water sources, and demands triggered by competition with other communities. Hence, institutions established by districts can be blamed for not having appropriate community training, special remuneration systems, and control mechanisms in remote villages.

Conclusion and Recommendations

Conclusion

Based on the study, the following conclusions are made.

- The concern of sustainability has not been changed in the last three decades. Various researchers have frequently pointed out the crucial components of sustainability, yet services failures have not substantially reduced in the past three decades despite an increased focus on community management.

- The reasons for service breakdowns in rural water supply in Ethiopia include yield reduction or drying up of water sources, lack of timely maintenance, failure of rehabilitation, lack of spare part supplies, and lack of adequate cost recovery.
- The absence of dynamic institutions that change with time and incorporate the social, environmental, and economic aspects of sector development has contributed for most factors of failures.
- The existing policies are not supported by adequately trained human resources, adequate finance, and a proper institution at the district level. The district water offices' human resource structure is not properly planned and organized. However, the human resource needs of districts have not ever been met, and what is even worse, the turnover rate of the existing staff is too high.
- Perception of users on water services and water committee determines the overall water system management.

Recommendations

The following policy recommendations have been developed based on the rural Ethiopian situation, but many of the recommendations would also apply to other countries with similar characteristics.

- The efforts of different sector agents should be harmonized and regulations made uniform. In this regard, the remuneration paid by all organizations working in the same country should be about the same to ensure expert services to all. Because most rural areas lack proper infrastructure, the staff and skilled labor who work in remote areas should receive special remuneration.
- Both national governments and NGOs should focus on human resource development and find ways of maintaining the existing staff and reducing staff turnover in districts. That will promote the post-implementation support and create an enabling community.
- District water offices should have a system of monitoring the level of education given to the rural community in terms of understanding their problem and management of their systems. The utmost effort should be exerted to train the community and create real demand for protected water schemes rather than competition among communities. That would make a substantial contribution toward reducing misunderstanding between users and WASHCOs and resources management.
- The national or regional governments should help local governments and the community to understand the importance of cost recovery and market fluctuations in setting a water tariff that is sufficient to cover security and operations and maintenance costs.
- Efforts to upscale the community through pre- and post-implementation should be supported to enable communities to manage themselves rather than expecting help from external agents when problems arise.
- Material misuse during construction should be avoided by establishing strict supervision. Final checks should be made by the district technical staff to ensure

the quality of construction and that the well is deep enough to provide the intended supply to beneficiaries.
- Caretakers should be trained well during commissioning, and refresher training should be provided later for groups to accumulate sustainable and transferable knowledge in the community. Otherwise, the performance of operation and maintenance tasks will become impossible in the long run.
- Water offices should supervise the performance of the water systems, WASHCOs, and their financial management because the users and their representatives often lose confidence.
- Educating the community regarding the benefits and management of the service before implementing a project is vital for creating a sustainable system.

Acknowledgments

Scholarships from Maa-ja vesitekniikan tuki ry and Centre for International Mobility (CIMO) in Finland, logistical support from the Community-Led Accelerated WASH (COWASH) project in Ethiopia for fieldwork, and the support from the Academy of Finland (no. 288153) are gratefully acknowledged. Moreover, we acknowledge the three anonymous reviewers who were involved in the process, and the editor for their constructive comments.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: Scholarships for this study were received from Maa-ja vesitekniikan tuki ry, CIMO in Finland and the Academy of Finland (no. 288153).

References

Abrams, L., Palmer, I., & Hart, T. (1998). *Sustainability management guidelines*. Pretoria, South Africa: Department of Water Affairs and Forestry.

Ayibotele, N. B. (1988). Institutional aspects of water supply and sanitation in Africa. *Natural Resources Forum*, *12*, 353-367.

Behailu, B. M., Suominen, A., & Katko, T. S. (2015). Evolution of community-managed water supply projects from 1994 to the 2010s in Ethiopia. *Public Works Management & Policy*, *20*, 379-400. doi:1087724X15593955

Bendahmane, D. B. (1993). *Lessons learned in water, sanitation and health: Thirteen years of experience in developing countries*. Washington, DC: Water and Sanitation for Health Project and U.S. Agency for International Development. Retrieved from http://www.ehproject.org/PDF/ehkm/wash-lessons_learned1993.pdf

Brikké, F., & Bredero, A. M. (2003). *Linking technology choice with operation and maintenance in the context of community water supply and sanitation: A reference document for planners and project staff*. Retrieved from www.who.int/water_sanitation_health/hygiene/om/wsh9241562153.pdf

Brundtland, G., Khalid, M., Agnelli, S., Al-Athel, S., Chidzero, B., Fadika, L., . . . Singh, M. (1987). *Report of the World Commission on Environment and Development: Our Common*

Future ('Brundtland report'). The United Nations Oslo. Retrived from http://www.un-documents.net/our-common-future.pdf

Carter, R. C., Tyrrel, S. F., & Howsam, P. (1999). The impact and sustainability of community water supply and sanitation programmes in developing countries. *Water and Environment Journal*, *13*, 292-296.

Central Statistical Agency of Ethiopia. (2010a). *Part I: Population size and characteristics*. Author. Retrieved from www.csa.gov.et/index.php/2013-02-20-14-51-51/2013-04-01-11-53-00/census-2007

Central Statistical Agency of Ethiopia. (2010b). *Population and housing census report - Benishangul-Gumuz region—2007*. Author. Retrieved from www.csa.gov.et/index.php/2013-02-20-14-51-51/2013-04-01-11-53-00/census-2007

Chaka, T., Yirgu, L., Abebe, Z., & Butterworth, J. (2011). *Ethiopia: Lessons for rural water supply; assessing progress towards sustainable service delivery*. The Hague, The Netherlands: IRC International Water and Sanitation Centre.

Eneas da Silva, F. O., Heikkila, T., de Souza Filho, F. d. A., & Costa da Silva, D. (2013). Developing sustainable and replicable water supply systems in rural communities in Brazil. *International Journal of Water Resources Development*, *29*, 622-635.

Giné, R., & Pérez-Foguet, A. (2008). Sustainability assessment of national rural water supply program in Tanzania. *Natural Resources Forum*, *32*, 327-342.

Harvey, P. A., & Reed, R. A. (2007). Community-managed water supplies in Africa: Sustainable or dispensable? *Community Development Journal*, *42*, 365-378.

Hukka, J. J., & Katko, T. S. (2015). Appropriate pricing policy needed worldwide for improved water services infrastructure. *Journal: American Water Works Association*, *107*(1), E37-E46.

Katko, T. S. (1990). Cost recovery in water supply in developing countries. *International Journal of Water Resources Development*, *6*, 86-94.

Katko, T. S. (1991). *Paying for water in developing countries* (Doctoral thesis). Tampere University of Technology, Finland. (Publication No. 74)

Kemerink, J., Mbuvi, D., & Schwartz, K. (2012). Governance shifts in the water services sector: A case study of the Zambia water services sector. In T. S. Katko, P. S. Juuti, & K. Schwartz (Eds.), *Water services management and governance: Lessons for a sustainable future* (pp. 3-12). London, England: International Water Association.

Lockwood, H. (2004). *Scaling up community management of rural water supply*. The Hague, The Netherlands: IRC International Water and Sanitation Centre.

Masduqi, A., Endah, N., Soedjono, E., & Hadi, W. (2010). Structural equation modeling for assessing of the sustainability of rural water supply systems. *Water Science and Technology: Water Supply*, *10*, 815-823.

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*, 1017-1023.

North, D. C. (1990). *Institutions, institutional change and economic performance*. New York, USA: Cambridge University Press.

Pretty, J. (2003). Social capital and the collective management of resources. *Science*, *302*, 1912-1914.

Quin, A., Balfors, B., & Kjellén, M. (2011). How to "walk the talk": The perspectives of sector staff on implementation of the rural water supply programme in Uganda. *Natural Resources Forum*, *35*, 269-282.

Rogers, P., Bhatia, R., & Huber, A. (1998). *Water as a social and economic good: How to put the principle into practice*. Stockholm: Global Water Partnership/Swedish International Development Cooperation Agency.

Sara, J., & Katz, T. (2004). *Making rural water supply sustainable* (Water and Sanitation Program). Washington, DC: World Bank.

Sector Efficiency and Improvement Unit. (2010). *Functionality of water supply services* (Functionality/Sustainability Thematic Working Group, Position paper). Retrieved from https://improveinternational.files.wordpress.com/2012/10/position_paper_functionality_of_water_supply_services.pdf

Seppälä, O., & Katko, T. (2003). Appropriate pricing and cost recovery in water services. *Journal of Water Supply: Research and Technology–Aqua*, *52*, 225-236.

Spaling, H., Brouwer, G., & Njoka, J. (2014). Factors affecting the sustainability of a community water supply project in Kenya. *Development in Practice*, *24*, 797-811.

Taylor, B. (2009). *Addressing the sustainability crisis: Lessons from research on managing rural water projects*, Tanzania. Retrieved from www.wateraid.org/documents/plugin_documents/sustainability_crisis.pdf

United Nations. (2007). *Indicators of sustainable development: Guidelines and methodologies*. Department of Economic Development, United Nations, New York. Retrieved from http://www.un.org/esa/sustdev/natlinfo/indicators/guidelines.pdf

United Nations. (2014). *The Millennium Development Goals Report*. Retrieved from http://www.un.org/millenniumgoals/2014%20MDG%20report/MDG%202014%20English%20web.pdf

The World Factbook. (2015). *Literacy*. Retrieved from https://www.cia.gov/library/publications/the-world-factbook/fields/2103.html

World Health Organization & UNICEF. (2010). *Definition and methods*. Geneva, Switzerland: World Health Organization/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. Retrieved from http://www.wssinfo.org/definitions-methods/

World Health Organization & UNICEF. (2015). *Progress on sanitation and drinking-water: 2015 Update and MDG assessment*. Retrieved from http://www.unicef.org/publications/files/Progress_on_Sanitation_and_Drinking_Water_2015_Update_.pdf

Author Biographies

Beshah M. Behailu received an MSc in Water supply and Environmental Engineering from Arba Minch University (Ethiopia) in 2010. Over the past 10 years, he has served as a practitioner engineer and academician in the area of water supply and sanitation. Presenlty, he is a doctoral student at Tampere University of Technology with research focus on sustainable services for rural water supply and sanitation.

Jarmo J. Hukka, PhD, has 40 years of professional experience in the water sector. He has carried out research on water services sector policy, governance, reforms, and privatization of services. He has authored 175 publications and holds an adjunct professorship in futures research in water sector at Tampere University of Technology. He has also worked for 12 years in water and sanitation projects in Cayman Islands, Sri Lanka, Kenya, and Kosovo; and as a Principal Water and Sanitation Engineer at the African Development Bank in Tunis.

Tapio S. Katko (Civ. Eng, PhD) holds the UNESCO Chair in Sustainable Water Services at Tampere University of Technology. In his career of 35 years, he has spent 4 years abroad and has authored (and co-authored) 36 monographs and many publications on water services evolution, management, institutions, policy, and governance.

PUBLICATION IV

Behailu B. M., Pekka Peitila., Katko T. S. "Indigenous Practices of Water System Management for Sustainable Services: *Case of Borana and Konso, Ethiopia*", *SAGEopen, Accepted.*

SAGE Open

Indigenous practices of water management for sustainable services: Case of Borana and Konso, Ethiopia

Journal:	*SAGE Open*
Manuscript ID	SO-15-1540.R1
Manuscript Type:	Special Issue - Traditional Wisdom
Keywords:	Indigenous knowledge, wells, water harvesting, sustainability, water system management, Borana, Konso
Main Discipline or Subject Area:	Other

Abstract:	This paper explores the possibility of incorporating traditional water management experiences into modern water management. After the literature review, two case studies are presented from Borana and Konso communities in southern Ethiopia. The study was conducted through interviews, discussions, and observations. The two cases were selected due to their long existence. Both communities have their own water source types, depending on local hydrogeological conditions. Borana is known for the so-called Ella (wells) and Konso for Harta (ponds), which have been managed for more than five centuries. All government and development partners strive to achieve sustainable services in water supply and sanitation. Therefore, they design various management packages in order to engage the communities and keep the systems sustainable. However, the management components are often designed with little attention to local customs and traditions. The cases in the two communities show that traditional knowledge is largely ignored when replaced by modern one. However, the concepts of cost recovery, ownership experience, equity, enforcement, integrity, and unity, which are highly pronounced in modern systems, can also be found in the traditional water managements of Borana and Konso. Naturally, one shoe never fits all. Borana and Konso experiences are working for their own community. This research implies that when we plan a project or a programme for a particular community, the starting point should be the indigenous practices and thoughts on life.

Introduction

Water has a strong tie to the physical and spiritual wellbeing of humankind. Regardless of the differences in religion, culture, and social norms, every person depends on water. Paganism, Christianism, Buddhism, Islam, and many other religions all have strong connections with water as a spiritual component or a means of cleanliness before their Gods (Abrams, 2000; Groenfedt, 2006; Schelwald-van der Kley, 2009; Chatel, 2010; Chuvieco, 2012). Teachings of religions and traditional institutions have a direct or indirect influence on ways of water management. Most religions have been exercising the concept of the dominion of man over natural resources. Even though religious or social institutions are all for protecting natural resources and sharing them reasonably, the efforts have not been fruitful in that resources are overexploited and polluted, and the future generations thus left without much consideration (Schelwald-van der Kley, 2009; Chuvieco, 2012).

These traditional and religious institutions have the potential to shape the ways of achieving sustainable environment through their informal rules and constraints. The informal constraints can often govern the success of formal constraints which are established by scientific merit (North, 1990). Informal constraints are the day-to-day activities of the societies, whereas governments or external agents introduce formal rules. Therefore, the end users in the case of development might think differently about the practices that they are familiar with and an introduced one. Thus, it is challenging to alter the societal thinking to a new paradigm overnight only by advocating new practices (Cleaver, 2012). No matter how useful they are, new ideologies usually face resistance as indigenous peoples are loyal to their traditional way of life. Therefore, for successful development and systems management, a gradual change and systematic approaches are required for balancing the loyalty to traditional customs.

The management approaches used by the national governments and partner organizations are considered in this paper as modern or imported management (Schelwald-van der Kley, 2009). These modern systems are deemed to replace the traditional ones in search of sustainable services. In fact, the dynamism of management – which is influenced by various factors, including technology, climate change, population growth, and education level of the people in charge – requires flexible systems that are adaptable to different situations. However, striving to achieve sustainability by introducing new technologies and ignoring the existing local knowledge is of no use to the people who dominantly depend on traditional practices.

The communities which have long-served traditional management systems are not easily willing to work with the imported (modern) techniques if they have not been involved in the development of those systems, or if their social components are interpreted wrongly or even ignored. In such cases, traditional people prefer to remain observers rather than become involved as real participators. In consequence, modern water systems are used while the services are operational, but the communities return to unimproved sources after the services break down.

Development of advanced technologies and new approaches to sustain systems is worthwhile to accept; yet, blending them with traditional knowledge that exists in target areas can make them more attractive and valuable for the intended purpose. Thus, successful management practices of societies should be investigated before introducing new technologies and management styles, since endeavors that ignore the local conditions are unlikely to succeed. The International Council for Science has enforced this idea, describing traditional knowledge as follows:

> *"Traditional knowledge is a cumulative body of knowledge, know-how, practices and representations maintained and developed by peoples with extended histories of interaction with the natural environment. These sophisticated sets of understandings, interpretations and meanings are part and parcel of a cultural complex that encompasses language, naming and classification systems, resource use practices, spirituality and world-view." (ICSU, 2002)*

The focus in the sector of water supply and sanitation is to improve development in a sustainable manner. Since the 1980s, the sustainability of water supply and sanitation has become a special concern of the developing countries and international donors. Since the decade of International Drinking Water and Sanitation (1980–1990), several approaches have been employed in the sector to bring in sustainable services. Shifting from top-down to a bottom-up approach, the introduction of participatory approaches, vowing to community participation, provoking community management, and advertising community financing are ways to increase the sustainability of the systems. Yet, the problems of water and sanitation still persist due to the complexity of the structure of communities and variation of traditional practices from place to place.

According to Arsano (2007), customary laws that have been practiced in isolated communities have proved to maintain equitable use of water and long-lasting services. Arsano has pointed out that the customary law of Borana's deep wells has unique features of ownership, custodianship, user access, and management. Moreover, Konso is well known for its soil and water conservation practices, and recently became one of the communities recorded as a UNESCO Heritage Site for their landscape management (UNESCO, 2010). The Konso people are well known for their traditional engineering and collective actions. They work together to build attractive terracing landscapes and complex village compounds in addition to construction and protection of water systems. To strengthen their togetherness, they frequently use proverb "Living together means sharing resources" (Garra, 2006). This social cohesion is the basic underlying factor in achieving sustainability even in modern management (Harvey & Reed, 2007).

The fundamental issues that motivate this study are (i) the need for service sustainability of water supply and sanitation, (ii) lack of integration of modern management approaches with the local situation, and (iii) the disparity of sustainability of the modern and the traditional systems. The case study deals with the traditional water management of Borana and Konso, Ethiopia. They have well-structured traditional institutions that have enabled their water systems to be sustained for centuries (UNESCO, 2010; Arsano, 2007; Coppock, 1994) and the introduced technologies fail to operate for long (Bulee, 2014 & Garra, 2014).

Various reasons can be mentioned for the failure of modern schemes in the study areas, including financial, environmental, technical, and social aspects. However, the social aspects (norms, cultures, religions, and traditional administrations) make a significant contribution for Borana and Konso water system management (Bulee, 2014; Garra, 2014; Yoyo, 2014). Therefore, this study focuses on the traditional water system management to take lessons for the modern implementation approaches from financing, user participation, and managing aspects of domestic water supply and irrigation systems. Thus, this paper is to investigate the binding force of the communities for their solidarity in resources management and seek lessons for more sustainable practices.

Objective and Method

The research is based on case study. Even though, in comparison with other research approaches, a case study is assumed to be weak by many researchers, there are areas where it is crucial (Flyvbjerg, 2006 & Gable, 1994). According to Gable, a case study has a high rate of discoverability. Moreover, a case study is an emerging approach to building theories (Eisenhardt, 2007). All research approaches, such as the survey, case study, and experiment have their merits and demerits (Gable, 1994). The extent of research generalizability, replicability, and representability of a study depends on the approach employed. However, it does not mean that the approaches with low replicability or generalizability, like a case study, are useless in research (Flyvbjerg, 2006); they are vital for social work and community planning (Yin, 2003).

The objective of this paper is to explore the good lessons of traditional water management in the two communities. Therefore, utilizing case study is indispensable to investigate the experiences and challenges of the targeted management practices. Borana and Konso were selected as case areas due to their long history of water system management practices and disparity in sustainability in the modern and traditional water supply systems. Moreover, this research is conducted to supplement the study conducted on Community Managed Project approach in Ethiopia in order to see possible lessons to share.

The materials for this case study were collected from 2nd to 18th of April 2014. The methods employed were interviews, discussions, and observations. In both areas, community elders (n=8) were interviewed on the historical background of their water systems; their water system administration rules; informal constraints; resources contribution for the initial investment, operation, and maintenance; and on their views towards modern development of water systems. The interviews were made at water source – at wells and ponds of Borana and Konso, respectively.

Elders selected for the interview are well-known history tellers in their community. They are mentioned in the references by Yoyo, 2014; Bule, 2014; Suyo, 2014 and Garra, 2014. Moreover, the traditional custom of knowledge transfer in both communities is tale oriented. Families transfer wisdom to their children through language. Therefore, it was an opportunity for the study to find uniform information in a wide area related to the historical and contemporary nature of the traditional water systems development and management.

Traditional Water Management

Different traditional water technologies and management practices have been employed in various parts of the world since time immemorial. The practices are actually dependant on the local situations. Some are linked with surface water and others with groundwater extraction and management. A typical example, which has been used for long and widely, is called *Qanat*. It is a traditional water extracting and transporting technique that is commonly employed in Morocco, Spain, Syria, Iran, and Central and Eastern Asia. Qanat has different names in different countries: *Khettara* in Morocco, *Qanat* or *Kārīz (Kāhrez)* in Central and Eastern Asia including China, and *galerias* in Spain (Canavas, 2014 & Mohsen, 2013). This system has been operating for centuries to extend the life of deserts (Hartl, et al., 1989 & Canavas, 2014).

The primary driver of traditional water management is water shortage and need for survival. Arid regions where rainfall is low have adopted *Qanat* as an only means of acquiring water for domestic and irrigation use (Mohsen, 2013) whereas dry-wet and semi-arid regions, which have average rainfall in

erratic pattern, are stuck to rainwater harvesting practices, either by constructing ponds, allowing the runoff percolate to sand reservoirs, or other techniques as mentioned by Ferrand & Cecunjanin (2014). These communities have been practised such techniques for centuries to secure their well-being.

In the countries where *Qanat* has been practised, the temperature is extremely high, thus making surface water to evaporate, and the groundwater table is deep up to 300 meters (Canavas, 2014). *Qanat* is a technique of developing an underground network, and has been developed for the transportation of water from hillside deep mother-wells to plain areas for domestic and irrigation purposes. The underground network can substantially reduce evaporation. To engineer the natural resources exploitation, one should either learn in a formal school or from life experiances. Both ways have their own merits, but the latter holds a strong link with societal customs and traditions. The theory of institutional change elaborates how informal rules are governing in changing the performance of formal rules (North, 1990). Striving to improve the existing systems is acceptable; however, meeting the goal of addressing the target community and getting their acceptance is a bottle-neck. The level of acceptance is determined by the extent the process accommodates experiences and values of the indigenous communities. Otherwise, a stable institution to operate and manage systems cannot be achieved.

The traditional water systems are related to water sources which are accessible easily, including springs, rainwater, shallow wells, and exceptionally deep wells in Borana and Qanat systems. These sources of water supply exist in developing countries with often insignificant improvement while developed countries are served by sophisticated modern water supply systems, making the traditional water systems history (Knutsson, 2014).

Many countries, including Finland and Sweden, had traditional beliefs related to water (Knutsson, 2014 & Katko, 1997). Before the modern water supply in such countries, the sources of water were public wells and natural springs, and the management was also motivated by the local customs. However, through time it evolved into the modern management of today. Moreover, in the emerging economies, such as India and China, water harvesting technologies have been employed for 4,000 years to satisfy their water demand (Oweis, *et al.,* 2004). Nevertheless, developing economies, particularly in sub-Saharan Africa, have not been able to either secure improved water supply to all population or utilize successfully traditional practices to boost efforts.

Background of the study area

The study was conducted in the case areas of Borana and Konso. As indicated in Figure 1, the study areas are located on the southern of Ethiopia, bordered by Kenya. The two communities have a close relation from their historical background in addition to being neighbours. Their traditional administration and line of development include similarities in their language (their languages are related to one another), and they share many attributes. The characteristic that makes them special for this study is the solidarity of the communities to respect their traditional law and practices to maintain their communal systems with traditional management practices for an extremely long period. Moreover, the two communities are still practising their traditional administration systems which they believe to be effective to maintain a level of communal resources.

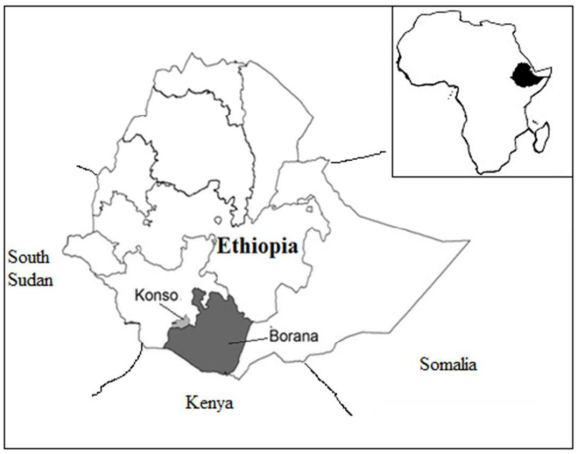


Figure 1. Map of the study areas.

Water Management Practices in Borana

The traditional administration system in Borana is known as *Gedaa.* It has also contributed to the water system management in Borana. The *Gedaa* system has a general assembly that meets every eight years. In the assembly, every rule that was enacted in the previous years is evaluated from the angle of its challenges on the Borana community, and if there are weak features, modifications are made. Water has an important place on the agenda. Water management is considered in the assembly to evaluate the enactment of rules on water management in the community in general and the integration of wells management in particular. *Abba Gedaa* (the manager in chief of the *Gedaa* system) is responsible for the wellbeing of the Borana community, although water sources might belong to different communities.

In Borana, a well is owned by a distinct clan (tribe) and managed by the father of the water *(Konfi)*. However, this does not mean that other clan is excluded from a particular water source (Helland, 1980). Any household or clan in Borana has a right to get water from the nearest source after making a formal request to the father of the water beforehand; since people move from place to place in search of grazing land, they should inform the receiving well council in advance to make proper arrangements. This process is a formality, as requests are not rejected unless someone has a problem with the rules of his original well (Helland, 1980). Participating in the operation and maintenance of the water systems is the responsibility of all users. There are three categories of well maintenance: (i) daily maintenance of removing dung, (ii) seasonal maintenance to clean a sediment deposit after flood season, and (iii) major well rehabilitation – extension of the depth of well following the depletion of a groundwater table (Coppock, 1994).

All members of Borana are loyal to the customary laws that are administered by the *Gedaa* system. The customary laws are participatory and impose responsibility based on individual's capacity. In

terms of well excavation and maintenance, all capable members of the community have a responsibility to contribute labour ans cattle for festive (Legesse, 1973). In case one refuses to participate, he will get a strong warning from the well council (an assembly of the water users). If the deeds of disobedience persist, he will be totally banned from using wells and other communal water sources in Borana. Since the administration of different wells is interconnected as shown in Figure 2, they have a fast information sharing mechanism. Thus, during migration, only those who obey the rules of their own system have a right to request services from other sources for any reason. The rules are strict, and the Borana people are very loyal and do not break them.

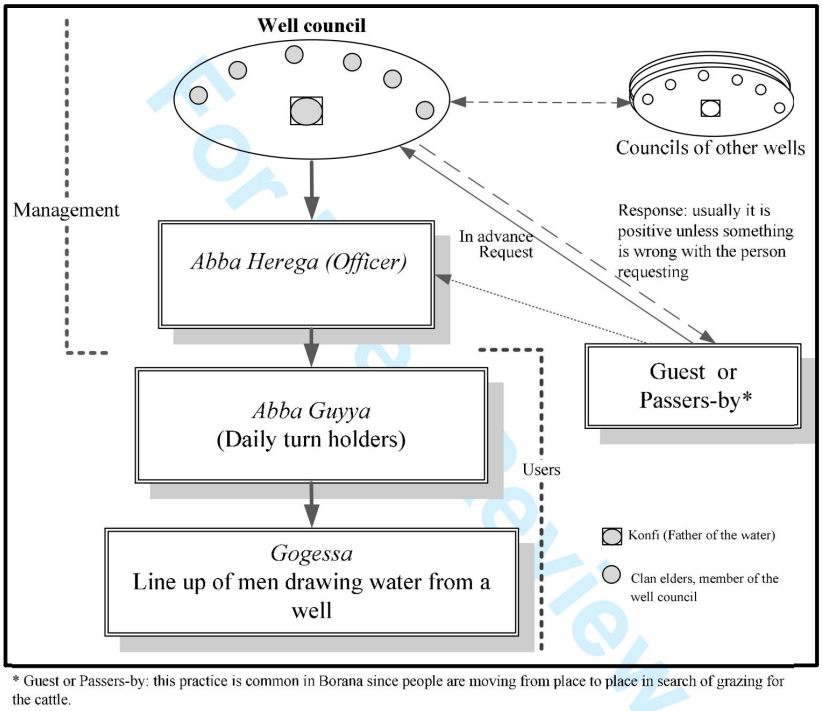


Figure 2. Water administration structure of Borana.

In Borana, the management of water system is organized into a group of five (Yoyo, 2014 & Pälsson, 1990). Every five neighbouring wells are organized together to carry out well maintenance that is beyond the capacity of the owner communities. If the problems are still difficult, they will go to the central *Geda* level for a solution to be found.

The deep wells (*Tula*) in Borana are found in nine well fields – containing a number of wells in the same location. A clan representative or a person who leads the excavation of a well at the beginning owns the leadership of a well - the excavation is started with a blessing and slaughtering oxen to feed the workmanship in the course of well-digging. This head of the clan is called Father of the Water (*Konfi*). This power is inherited to children, grandchildren and so on. The body that manages the system is organized by elders of the clans with the lead of the *Konfi* to form a well council (*Chora ella*)

(Helland, 1980 & Coppock, 1994). According to Helland, the well council is responsible for making an arrangement of the daily watering order and nomination of the *Abba Herega*. He is an officer who follows up on the daily watering order and maintenance. He is elected on the merit of managing capacity, respectfulness, and honesty. As shown in the Figure 2., *Abba Guyaa* and *Gogessa* are also part of the cascade of the management structure. In Borana, nobody is excluded from using water.

The management practice of Borana water wells has no formal committee that constitutes a chairperson, treasurer, and so on, which are commonly known in WASH and water users associations in irrigation systems. The management in Borana is unique in its nature. The governing rule is the Gedaa system (Gedaa Institutional Arrangement). The management of the wells is male-dominant – women are involved only in lifting water, but the arrangement in the chain is that they are placed at the bottom, just to manage the process in their own capacity. *Konfi, Abba Herega*, *Abba Guyyaa* and *Gogessa* are responsible for managing the well of their own jurisdiction, so to speak.

Konfi: *Konfi* is the father of a water source. He is the guardian of the water and the power is inherited in the family. According to the interviewes (Yoyo, 2014;Bulee, 2014; Suyo, 2014), a *Konfi* does not need to be physically capable or influential in the society, he simply had possessed power at the time of well construction as a leader of the group of construction and this authority remains with him and is passed to his elder son and grandson sequentially. Generally, his responsibility is to nominate *Abba Herega* and to give permission for water for guests and passers-by (Figure 2).

Well council: This is an assembly of the water users that is led by the *Konfi*. Its role in the management is arbitration, mediation, enforcement, and water allocation (Homann, 2005 & Helland, 1980). The well council has six to seven members (elders) as shown in Figure 2.

Abba Herrega: *Abbaa Herega* is an officer of the management of the system and he is responsible for arranging and following up the day-to-day activities of a water source. The well council assigns *Abba Heregga* either from the members of the same clan or from other users. Unlike *Konfi*, his nomination is based on the ability to perform the duty, honesty, and impartiality in providing services. Moreover, *Abbaa Herega* is subjected to replacement when he fails to manage efficiently or shows partiality among the communities.

Abba Guyyaas are members of the community who are assigned to water the cattle on a specific day. In Borana, members have access to water in three-day cycles. This means that each day is assigned to a different group of households, based on their contribution to the operation and maintenance activities. For instance, the *Konfi* waters his cattle on the first day, and the rest of the days are arranged based on their favours to the water system protection. The number of *Abbaa Guyyaas* depends on the size of the cattle and the amount of water in the well. They are assisted by *Gogessa*, men who line up to lift water from the well to a cattle trough. The number of the *Gogessa* depends on the depth of the water in the well. During the dry season when the water level is lower, more men or women are required in the chain to lift water.

Tariff and contribution

In Borana, there is no direct cash contribution for the construction, maintenance, and operation of the water wells. The contribution is in providing labour and cattle. During the excavation of new wells or maintenance of existing systems, they usually contribute cattle. Well council estimates the requirement of labour and resources for the activity, and relative allocation is made for members based on their

capacity and cattle owned, and supervised by *Abba Herega.* Likewise, the members of the well users act accordingly. People in Borana have never hesitated to discharge the responsibility that they are supposed to do. If a household were to refuse to take part in the maintenance or to slaughter the requested number of cattle, thus breaking the rule, they would be cast out of the community and never get water from other wells; just water from a river.

User involvement through contribution and participation during the implementation and management of water systems is key to attain sustainable services. Operation and maintenance of systems are also identified as a factor of keeping systems functional. However, recently developed systems failed to achieve functionality in the case areas. In Borana community, genuine involvement and true ownership have in fact been practised already for 71 *Gedaa* of eight-year span each, which is approximately five centuries (Arsano, 2007; Coppock, 1994; Yoyo, 2014) & Bulee, 2014).

The systems are maintained in three important occasions based on Coppock (1994) and the informants. First, the water sources are cleaned daily after collecting water and giving it to animals. Secondly, after each flooding season sediments deposited in the water sources are removed. Thirdly, maintenance is practised when needed, depending on the groundwater table and its level drawdown. This activity is performed typically once in a decade and sometimes more often depending on the groundwater table.

According to Homann (2005), the traditional administration has been interfered with by the modern governmental administration, and its management is deteriorating without significant attitude changes towards the modern management. Bule (2014), one of the interviewees wished for the modern governmental administration let them room to employ the traditional management for sustainability of services in various aspects, including water management and conflict resolution.

On the whole, in Borana water management, the three major features can be identified as follows:

- Some literature says the sources of solidarity in Borana are originated from water. Borana society itself believes that they are.
- The problem of water in the area is chronic and thus not to abide by the common rule is not an option.
- Customary rules (*Addaa*) and Boran's traditional law are well distinguished in Borana and the system of Gedaa enables them to maintain common interests.

Water sources Management in Konso

Konso, like Borana, has a traditional administration system that is governed by a generation. According to Konso's community, one generation is 18 years (Garra, 2014). The term of traditional administration is nine years and a generation is allowed to govern two terms. This administration system is called *Abbaa Dibe* - *Abbaa* means father and *Dibe* mean drum. A *dibe* (drum) is kept with a person assigned to be the leader of the generation and the active generation will be responsible for maintaining the resources and security of the community. Accordingly, they work hard to manage their water systems, as it is scarce in the area.

Water sources in Konso are not uniformly distributed. To make the matter worse, they are gradually depleting, and some of them had to be abandoned. However, their settlement structure is depending on the availability of water sources and farming land. Where there is no natural spring, traditional ponds

are provided to collect floodwater to secure water need in the dry season. Therefore, the people of Konso have adapted to deal with environmental changes.

In the settlement of villages, all households do not have equal access (in terms of distance) to the water sources. Some of them are living close to the water sources, while others travel from great distances. Users who live nearest to a water source are able to monitor what is happening with it. The Konso people take this into account and vest the ownership to the households who are closest to the water sources. The ownership in the Konso context means a responsibility to safeguard the water source from abuse. Moreover, they have a belief that each water source has a spirit, which usually communicates with the landowner while he is asleep (Garra, 2006). According to the interview with Garra (2014), the author of a book called *Konso water and Gods*, the water spirits have likes and dislikes, and they talk to custodians of the water sources. In turn, the custodians report to the elders and the community what they heard from the spirits. In this regard, they immediately solve the water usage problem. Of course, the dislikes of the water spirits are related to sanitation.

Water spirits are the hidden forces that secure the water sources from misuse and pollution. In Konso, rules are very simple and respected by every member of the community as they are related to water spirits. For example, swimming in ponds is allowed only when there is plenty of water. In the dry season, a notice will be displayed to restrict swimming. Yet, nobody is assigned for control at water sources and rules are respected in Konso even in the absence of caretakers. Even a single kid cannot swim in a pond when it is against the rule of the land. Therefore, this exercise is something we can deal with to promote modern management rules; through the elders of the community.

What if people fail to be governed by the rule of the land? Unlike Borana, in Konso such people are not restricted from using water, although they might not abide by the rule of the land. Rather, they are excluded from the social involvement. They will not able to buy *Cheka* (local beer); if someone from the family is sick, nobody helps to carry him/her to a clinic; other social sanctions will also be imposed. Practically, they say "water is God's gift, so we cannot prevent others, even hyena, from drinking".

Spirit of Water: the hidden power in Konso water management

As mentioned above, water spirit is the means to protect water sources from contamination and abuse. Moreover, they usually install a stick as a symbol of generation, known as *Olahita.* As shown in Figure 3, *Olahita* is a stick erected in the middle of the pond. It is believed to be a taboo to take any piece of the stick and an embarrassment for the generation to see the stick taken off. The local people could not tell everything openly concerning the real meaning of *Olahita*, but my informant told me that besides the stick having a spiritual meaning it is believed to protect the pond from evil.

The other, technical reason why they erect the stick in the middle of the pond is that the stick is placed at the bottom of the pond. In the next maintenance of the pond, the people need to reach the bottom of the stick to indicate the deepest point of the pond.

Figure 3. 'Olahita', the symbol of a generation, spirit of water and benchmark of maintenance.

Management of water sources in Konso is very easy if it is related with water spirits. Almost all springs have their own spirits with certain kinds of likes and dislikes (Garra, 2014). Most dislikes are related to sanitary aspects. According to Garra (2006 & 2014), menstruation and newly delivered women, plastic materials, and individuals who had sex a night before are some of the dislikes of the water spirits.

Natural engineering skill of Konso

The people of Konso are experts in activities that are related to resources conservation. Their landscape and forests are under their own control. They built kilometres of terracing to preserve soil and planted drought-resistant, multi-function trees. A drop of water that falls in Konso belongs to Konso, since they conserve it. They never allow runoff to flow out of their catchments. Their bench terraces, in the steep slope terrain of Konso, have been designed to infiltrate water. Moreover, the excess flood can be collected into ponds that have been constructed in an appropriate locations for maximum harvest.

Selecting a site according to soil property and its potential to collect water is an expertise of the Konso people. Moreover, the engineering they practice to trap debris is amazing. Silt trap structuring in modern engineering could learn from Konso, and how to make such structuring from local materials. Through practice, they recognized that high velocity of water brings silt that could potentially threaten the life of ponds, and accordingly they provided structures to slow down the speed of the water well in advance before reaching ponds. Figure 4 shows how they protect their water system from human and animal interaction, and from silt.

Figure 4. (A) Wooden mesh to filter debris coming to the pond, (B) Fenced pond, (C) Outside terracing to protect silt from the sides of the pond, and (D) Stilling basin that settles silt coming in with flood before entering the pond. (photo by Behailu April, 2014)

Water harvesting in Ethiopia

From 2003 to 2005, the Ethiopian government had a water-harvesting campaign. That was to improve the agricultural productivity that was affected by erratic rainfall distribution. The technology employed was household ponds to harvest water during the rainy season and to provide supplementary irrigation. The mass-mobilization aimed at having the systems to every household over a period of a couple of years. Yet, the approach used was not convincing to bring sustainable services. The government was mainly targeting on the achievement of figures – the number of ponds constructed. The first year of the programme was not completely successful since the majority of the ponds were not holding water after the main rainy season due to excessive seepage and limited watersheds to collect water adequately.

In combating this problem, during the second year of the programme a new technique was introduced to protect seepage by providing polyethylene sheet as shown in Figure 5. However, this option also failed to retain water in the pond due to rodents and imperfection of installation of the plastic in the ponds. Although the same strategy was employed in the following year, the user-community refused to accept it and the programme was finally halted. Moreover, the rural people used the plastic for other purposes, such as roof covering, floor sheet, and hive cover. Thus, the goal of water harvesting strategy collapsed and the government stopped working on that after the period of years 2003–2005.

Figure 5. Non-productive water harvesting pond and its plastic cover in Konso (Photo April, 2014).

Dispite the traditional knowledge of the Konso people in site selection and maintenance of ponds, the water harvesting campaign failed. According to the Agricultural office report, one third of the household ponds were functional at the time of the field work in the Konso district. Garra (2014), the then head of Agricultural and Rural Development Office in the district and an informant of this study, explained that the campaign was not user-inclusive. The communitiy was not given a chance to express their objections and recommendations on how to implement the technologies.

On the whole, in Konso water management, the major features can be identified as follows:

- The traditional administration of Konso, already dominated by the governmental administration culture, has almost vanished.
- Water spirits are a means to scare people to obey the rules.
- Responsibility and high responsibility imposed onto a generation is a means to keep competent working force to safeguard the wellbeing of Konso.
- The geographic and climatic situations of the area makes the people work hard to adapt to environmental changes.
- Introduced technologies were not user-inclusive.

Discussion

Developing countries like Ethiopia are extremely heterogeneous in terms of their culture, religion, and educational level. These countries are the unserved parts of the world in terms of water supply and sanitation. Despite their heterogeneity and high population, external agents that assist in development are few compared with the number of service seekers. Moreover, the national governments, in the sub-Saharan Africa, are in shortage of funds to address water and sanitation issue and put suitable institutions in place to manage the implemented systems; the reason is due to the low and uncollectable tariff of such services (Foster & Briceño-Garmendia, 2010 cited by Hukka & Katko, 2015).

On the other hand, communities have their own traditional administration where members respect and protect their communal resources. Typically, people are patriotic when it comes to their own customary laws, and therefore, they hardly have any trust on introduced systems. Due to this fact, bringing a community from their traditional way of thinking is costly and difficult (Cleaver, 2012), as it takes finance and time to educate and upgrade the consciousness of the beneficiaries. This cannot be a solution for the chronic water supply problems that need urgent action. Therefore, utilizing local practices and traditional management systems will boost the coverage of services in the rural areas of the developing countries.

Resources management both in Borana and Konso are dominantly governed by the traditional administrations that they have lived with for centuries. These people have to sustain their resources for long periods, although there are certain problems that the communities have not realized; such as, deteriorated water quality and resources optimization problems. Their traditional administrations that are concerned with the well-being of the entire people have a quality that retains their rules as respected across their territories. However, the modern management that differs from the traditional water management style reaped low respect in the areas. This is due to lack of contextualization of the imported managements with the local situation, as well as to poor consultation of the users. In Konso, 67% of the household ponds, constructed by the Ethiopian government in 2003–2004, have failed to serve for a decade, while the traditional water sources are giving service. Moreover, modern water schemes are not operated and maintained timely as has been done for the traditional water wells in Borana. Based on the interviewees, the failure and success of schemes can be pinned on the issue of ownership.

The sustainability of the traditional water management has been achieved in Borana and Konso due to the traditional administrations called *Abba Gedaa* and *Tibe*, respectively. On the whole, institutions are vital for long-lasting services. Similarly, both Borona and Konso have a traditional institutions in which every member of the communities trusts and abides by. The astonishing dimension of the traditional institution, especially in Borana, is that the components of the institution are usually subject to modification every eight years. Moreover, the base of the amendments of rules is the evaluation of the performance of the institution during the previous eight years *(Gedaa).* In the general Assembly of Borana's *Gedaa,* the performances of the past eight years of enactments are passed from different sectors presented. They have "elites" with the position of ministerial equivalent who are responsible for different sectors and present to the general assembly every eight years.

This paper highly recommends those policy makers and actors in the sector who desire to put workable management directions and practices into place to understand the existing practices before imposing a modern one. This is true both in the global and local context. For example, Ethiopia has approximately 80 ethnic groups, which have different social values, norms, religion, and culture. Moreover, they have their ways of managing resources as described by Chuvieco (2012). These experiences can be an asset for the external agents, although the practice of exploiting the existing knoledge is weak in many cases, as can also be seen in the case of Borana and Konso.

Sense of ownership feeling and selecting proper systems are challenges of water services management. Often the users are not integrated to protect and run their own water supply system. Cost recovery (contribution to operation and maintenance) is not satisfactory; community representatives are usually not uniformly motivated to their work, and user communities feel that water services production and maintenance, including spare-parts supplies, bear on external agents. Therefore, the non-functionality and further abandoning of water supply systems before their service period is common in the rural

areas of the developing countries. However, the key elements to sustain systems were observed to be practised in different ways in the communities. Nevertheless, when it comes to the modern management, it can become incompatible with the local situation, and the communities remain observers, not actors in the system development and management.

Traditional water resources management has the capacity to create an astonishing feeling of ownership, equitable distribution, solid management practices, and consistent operation and maintenance. From the point of view of cost recovery, it is quite agreeable with the scientific demand. The communities are already involved in the implementation and maintenance of their systems by contributing labour, providing cattle, and other possible options in the area. Therefore, all users feel responsible based on their proportion of water consumption.

Conclusions

Every community has its own identity, lifestyle, and customs to value. These elements could be helpful as well as distractive. Whichever, we need to be careful in exploiting them. The harmful traditions that impose on some part of the community for the sake of the advantageous group require systematic approaches to educate and eradicate. On the other hand, a value that is respected by the community and has less likely any negative impacts should be up scaled and incorporated in the introduced project managements so as to catch the attention of the users.

The cases in Borana and Konso show that the traditional knowledge is largely ignored by the modern approaches. Here, we are not arguing that traditions should prevail, but we are saying that scientific knowledge should emanate from the local experience, especially in terms of resources management. The modern thinking should be wise enough to be accepted by the community for which it is designed. In addition, it would be beneficial to take into account the success stories of the old systems because they have sustained over time. Evidence shows that Borana and Konso have managed their water sources for more than five centuries. Besides, the two communities are very keen on operation and maintenance. Their traditional systems render ownership to all users. They contribute to operation and maintenance reasonably and have enforcement actions for members who refuse responsibilities.

The Borana and Konso communities are very talented in exploiting their resources and able to identify suitable well and pond sites. Besides, they have their own management structure within a system and across the systems. Although they are not meeting their water supply needs because of various factors (water quality, water scarcity, knowledge gaps, etc.), their management systems have characteristics others may learn from. Indeed, the concepts of cost recovery, ownership experience, equity, enforcement, integrity, and unity, which are highly pronounced in modern systems, can be found in the traditional water managements of Borana and Konso.

Naturally, one shoe never fits all. Experiences of Borana and Konso are working for their own communities. However, what we can learn from this research is that when we plan a project or a programme for a particular community, the starting point should be their own experience and thoughts on life. That way, we can easily reach acceptance of the community and create a feeling of ownership to generate responsibility and successful management of systems during and after the project implementation.

References

Abrams, P. (2000). *The water page: Water in religion.* Retrieved from The African water water page: http://www.africanwater.org/religion.htm

Arsano, Y. (2007). *Ethiopia and the Nile: dilemas of National and Regional hydropolitices (PhD dissertation).* Univ. Zürich, 2004.

Bensaid, H. B. (2013). Protection and performance of the ancestral water supply system 'Khettara'as a sustainable alternative for arid regions. *Water Science & Technology: Water Supply, 13*(6), 1452–1462.

Canavas, C. (2014). Public awareness and safeguarding traditional knowledge: challenges and conflicts in preserving and representing kārīz/kǎnérjǐng in Xinjiang, PR China. *Water Science & Technology: Water Supply, 14*(5), 758–765.

Chatel, F. d. (2010). Bathing in Divine Waters: Water and Purity in Judaism and Islam. In T. T. Oestigaard, *A History of Water Series II, Volume 1: Ideas of Water from Ancient Societies to the Modern World* (pp. 273–297).

Chuvieco, E. (2012). Religious approaches to water management and environmental conservation. *Water Policy, 14*, 9–20.

Cleaver, F. (2012). *Development Through Bricolage: Rethinking Institutions for Natural Resource Management.* London and New York: Routledge, Taylor & Francis Group.

Coppock, D. L. (1994). *The Borana plateau of southern Ethiopia: synthesis of pastoral research, development, and change, 1980–91.* (Vol. 5). ILRI (aka ILCA and ILRAD).

Eisenhardt, K. M. (2007). Theory building from cases: opportunities and challenges. *Academy of management journal, 50*(1), 25–32.

Ferrand, E.A. & Cecunjanin, F. (2014). Potential of rainwater harvesting in a thirsty world: a survey of ancient and traditional rainwater harvesting applications. *Geography Compass, 8*(6), 395–413.

Flyvbjerg, B. (2006). Five misunderstandings about case-study research. Qualitative inquiry, 12(2), 219-245.

Gable, G. G. (1994). Integrating case study and survey research methods: an example in information systems. *European Journal of Information Systems, 3*(2), 112–126.

Garra, K. (2006). *Konso Water and Gods.* Perugia: Museo Tamburo Palante.

Groenfedt, D. (2006). Water Development and Spiritual values in western and Indigenous societies. In UNESCO, & M. C. R. Boelens (Ed.), *Water and indigenous peoples* (Vol. Knowledges of Nature 2, p. 177). Paris: UNESCO.

Hartl, M., Beaumont, P., Bonine, M., & McLachlan, K. (1989). Qanats in the Najafabad valley. Qanat, kariz and khattara: traditional water systems in the Middle East and North Africa., 119-135.

Harvey, P. A., & Reed, R. A. (2007). Community-managed water supplies in Africa: sustainable or dispensable? Community Development Journal, 42(3), 365-378.

Helland, J. (1980). *Social Organization and Water Control Among the Borana of Southern Ethiopia.* Nairobi, Kenya: International Livestock center for Africa.

Homann, S. (2005). *Indigenous knowledge of Borana pastoralists in natural resource management: a case study from southern Ethiopia.* Cuvillier Verlag.

Hukka, J. J., & Katko, T. S. (2015). Appropriate Pricing Policy Needed Worldwide for Improving Water Services Infrastructure (PDF). Journal-American Water Works Association, 107(1), E37-E46.

ICSU(The International Council for Science). (2002). *Science and traditional knowledge.* Retrieved February 10, 2015, from www.icsu.org/publications/reports-and-reviews/science-traditional-knowledge

Katko, T. S. (1997). *Water!: evolution of water supply and sanitation in Finland from the mid-1800s to 2000.* Finnish Water and Waste Water Works Association.

Knutsson, G. (2014). The Role of Springs in The History of Sweden. *Vatten- Journal of water management and research, 70*, 79 – 86.

Koppen, B. C. (Ed.). (2007). *Community-based water law and water resource management reform in developing countries.* (Vol. 5). CABI.

Legesse, A. (1973). *GADA: Three Aproaches to the Study of Africa Society.* New York: The Free Press.

Mohsen, T.-J. H. (2013). Review of ancient wisdom of Qanat, and suggestions for future water management. *Environmental Engineering Research, 18*(2), 57– 63.

North, D. C. (1990). *Institutions, institutional change and economic performance.* Cambridge university press.

Oweis, T., Hachum, A., & Bruggeman, A. (2004). Indigenous water-harvesting systems in West Asia and North Africa. Indigenous water-harvesting systems in West Asia and North Africa. ICARDA

Pälsson, G. (Ed.). (1990). *From water to world-making: African models and arid lands.* Uppsala: Nordic Africa Institute.

Robinson, L. W. (2010). Traditional pastoralist decision-making processes: lessons for reforms to water resources management in Kenya. *Journal of Environmental Planning and Management, 53*(7), 847–862.

Schelwald-van der Kley, L. a. (2009). *Water: a way of life: sustainable water management in a cultural context.* CRC Press.

UN. (NA). *United Nations.* Retrieved February 12, 2015, from www.un.org: http://www.un.org/esa/socdev/unpfii/documents/5session_factsheet1.pdf

UNESCO. (2010). *Cultural Properties - Konso Cultural Landscape (Ethiopia)*, 34 COM. Retrieved February 26, 2015, from UNESCO: http://whc.unesco.org/archive/2010/whc10-34com-20e.pdf

Virtanen, P. P. (2011). Global climate policies, local institutions and food security in a pastoral society in Ethiopia. *The Journal of Sustainable Development, 5*(1), 96 –118.

Yin, R. K. (2013). Case study research: Design and methods. Sage publications.

Interviewee

Bulee, B. (2014, April 10). Ela and its management. (B. M. Behailu, Interviewer).

Garra, K. (2014, April 12). Konso administration, cuture and traditional water manangemnt. (B. M. Behailu, Interviewer).

Suyo, R. (2014, April 04). Traditional water manangement. (B. M. Behailu, Interviewer).

PUBLICATION V

Beshah M. Behailu; Harri Mattila. "Need of Services and Understanding of Service Providers in Water and Sanitation: A Case of Ethiopia", *Proceedings of the CIB World Building Congress 2016 : Volume IV - Understanding Impacts and Functioning of Different Solutions. 431-440*, 2016.

WBCIB
CIB World Building Congress 2016

Proceedings of the CIB World Building Congress 2016

Volume IV

Understanding impacts and functioning of different solutions

Edited by
Suvi Nenonen
Juha-Matti Junnonen

TAMPERE UNIVERSITY OF TECHNOLOGY
ril
CIB

Need of Services and Understanding of Service Providers in Water and Sanitation: A Case of Ethiopia

Beshah M. Behailu
Tampere University of Technology, Department of Civil Engineering,
(email: beshah.behailu@student.tut.fi)
Harri Mattila
HAMK University of Applied Sciences, Bioeconomy Unit, Cleantech Research Group, Sustainable development
(email: harri.mattila@hamk.fi)

Abstract

Water and sanitation services are basic requirements for the development of a nation. The provision of these services should necessarily be arranged by the national government through policies, and long-term and short-term plans. Moreover, follow-up of the implementation of principle in policies and plans will determine the service level on the ground. This paper is intended to explore gaps in the policy-making and implementation in the areas of water supply in Ethiopia. Review of Ethiopian water sector policy, universal access plans, growth and transformation plans and other literature are employed to achieve the objective of this paper. Moreover, the experiences of the first author that he acquired during data collection for his doctoral study are taken into account to draw conclusions. Hence, the study shows that standards set at the federal level fail to consider the actual situation on the ground and the experts at implementation level are to interpret some aspects of the policy ambiguously. Therefore, this paper recommends the policy-makers and higher officials to consult the people in charge of putting policies in effect to have contextualized and work for uniform desired-output. Service providers need to understand the notion of the receiving community in order to provide the services that satisfy the users.

Keywords: Services, policy, service provider and service producer, water supply, sanitation

1. Introduction

Well-articulated and in-depth organized policies alone cannot guarantee the achievement of the intended goals of a country. Rather, they need to be followed by systematic regulations and directives to put them into practice (Matland, 1995). Moreover, it is not only the policy-makers who require an understanding of the real problem to be solved and the mechanisms of alleviation but also every concerned member at various levels of the government, partner organisations and the receiving communities need to know to have a successful implementation. This aspect determines the thought of policy-making if it is top-down or bottom-up as explained by Matland (1995). It should also have a favourable platform to accommodate both internal and external actors.

Platforms that are provided by national policies and strategies could guide the way of actions of governmental and non-governmental organisations, and donors in a particular country. Either from the legal or logical point of view, external imposition cannot achieve a substantiated impact in terms of contributing to the developmental strategies of countries. Support in this context means helping countries to achieve their own goals, policies and strategies (MoWR, 2001b); otherwise, the effect will be retardation.

On the other hand, the detail of a national policy on a specific agenda is very critical to accommodate both local and external partners who work in a certain sector. If it lacks clarity and depth, the implementation will still be ambiguously challenging. Moreover, in the presence of excellent policies and directives, achievements might be trivial due to the way they are understood by the members of the implementing bodies both in the governmental and non-governmental organizations. Therefore, before going into a deep analysis of the situation in the country, let us see the points boldly mentioned in the Ethiopian water sector policy.

This paper is not to make a thorough critique of the entire water policies of Ethiopia, but to make a review where improvements are suggested on how to fill the gaps observed in the area of water supply and sanitation. The main question here is how accurately the policy flows down to the community though the intermediary government levels – in other words how the policy-makers control the effectiveness of the policies? Moreover, we will try to discuss the process of policy-making based on the facts in the national programmes and make conclusions accordingly.

The rationale for selecting this subject is the remarkable national effort to the development of water supply and the visible gaps in the sector. Moreover, the merit of the expertise of the authors in the field has agitated this paper. The first author has done his research on the rural water supply of Ethiopia since 2012 and the second author was involved in a project which works for the rural water supply of Ethiopia with the collaboration of the Finnish government.

The focus of this paper is to create awareness among the Ethiopian policy-makers in the way they can think of the future and how to monitor the effective policy-making and

implementation. Moreover, the study is on Water, Sanitation and Hygiene (WASH) services in general with more focus to rural water supply.

2. Ethiopian water sector policy and development programmes

Based on the history of water resources development in Ethiopia, clear changes in the area of water supply and sanitation have been observed very recently (Behailu, et al., 2015). Moreover, the department, which was responsible for the water supply and sanitation, was not clearly placed appropriately until the active policy came into force in 2001. Earlier, the department was placed in different sectors where it had less attention, especially at the district level. During the years 2003-2004, when the administration of the country was decentralized, for the first time, a water desk under the natural resources department of the Agricultural development office was established at the district level (Calow, et al., 2012). In fact, currently, it is being transformed into an autonomous water office.

In institutionalizing the water supply and sanitation sector, the new millennium has a historical record. After the current active policy of the water sector enacted in 2001, several programmes and plans have been launched and are in operation to improve the life of citizens. These plans and programmes are water resources development strategy (MoWR, 2001b), Universal Access Plans (UAP, 2008; UAP-II, 2011 & UAP-III, 2011), WASH Implementation Framework (WIF, 2013), One WASH National Programme (OWNP, 2014) and Growth and Transformation Plans (I & II) (GTP, 2010 & 2015). These plans and frameworks have water supply and sanitation as a key component. Therefore, this paper will review them from the angle of water supply.

2.1 Ethiopian water sector policy and strategy

The Ethiopian water sector policy and strategy have comprehensively addressed irrigation, hydropower, drainage, water supply and sanitation. Water resources protection, management and optimization are well articulated in the policy, and in the case of limitation, water supply has been given priority (MoWR, 2001 a&b). The documents intensively describe the importance of clean water and sanitation as they are directly linked to the health problems of the country and base for the economic and social development (70% of the diseases in the country are waterborne (MoWR, 2001b).

As the focus of this paper is on water services, this section will review the policy and strategy from the angle of explaining water supply and sanitation. Moreover, water supply for urban and rural areas will be viewed differently since they have a different perspective in the documents. The role of administrating the urban water supply in Ethiopia is vested in the autonomous body consists of users or board. The board of the user council is responsible for rising investment capital and money for operations and, with a limited assistance from regional and federal governments, to seek loans in the case of large projects. In the case of urban water supply, the users are expected to cover the full cost – the initial cost and cost of Operation and Maintenance (O&M) (MOWR, 2001a).

In the case of rural[1] water supply, the source of initial investment is the government or external agents whereas O&M is the responsibility of the communities (Calow, et al., 2012; MOWR, 2001a&b). As a result, the policy stressed the need for user consultation to the development of such systems in order to create ownership feeling for active O&M. Thus, the success of rural water supply mainly depends on the availability of the government's capital budget and funds from donors and the O&M on the approach followed during implementations. This, in turn, significantly affects how the implementers understand the policy in the context of consultation and participation of the user community.

According to the Universal Access Plan, UAP (2008), the user community contribution should cover at least 10% of the capital cost of the projects, in order to motivate and create adequate ownership feeling. Moreover, users are deemed to cover the cost of operation and maintenance of their water system – cost recovery in the rural context is partial (MoWR, 2001a), only for operation and maintenance unlike to the urban water supply. The policy document has clearly pointed out water is not for sale since it is a public good. Therefore, service charges are to cover operations and maintenance costs, not for using the water resources. The cost recovery context here has been considered in different ways. Therefore, the tariff setting is left for the community and the rate is observed to be very small compared to the requirement for operation and maintenance (Behailu, et al., under review). According to national directives on policy and strategy, the role of tariff setting is left to the user community. Yet, the amount they agree to pay is not sufficient to cover increasing prices of spare parts.

To smooth the implementation of the policy, detail procedures and directions are provided in the water sector strategy. The strategy contains the ways the policy of water supply and sanitation from technical, financial, institutional, capacity building, social and environmental aspects. In general, it is more concerned to provide sustainable, effective, efficient, reliable and affordable services. Maybe due to the high proportion of the rural population, it recommends hand pumps as the best means to expand sustainable service. In practice, however, hand pumps are limited to the areas where there is shallow groundwater table and not universal in terms of availability. Moreover, it is susceptible to climate change as shallow groundwater is easily affected by the amount of direct recharge. Therefore, the strategy did not provide alternative solutions for the areas, which do not have plenty of surface and groundwater resources. Hand pump water systems that are installed in shallow wells will not guarantee sustainable services in communities with rapid population growth, areas that are affected by climate variability now and then, and water resources are in a declining trend.

In terms of finance, the implementation of water supply in rural areas is advised and supported by the local financial institutions like micro-financial institutions, local saving institutions and banks to access loans to implementation, operation and maintenance of water supply and sanitation systems. This is, actually, to supplement the external supports and government

[1] Rural in Ethiopia accounts for 84% of the approximately 100 million populations.

subsidies for water supply development. The strategy emphasises to maintain social equity by providing a subsidy for those who are not able to cover the cost of their services (MoWR, 2001b). However, the majority of rural communities are not able to finance water supply projects. Thus, this situation is making the work in water supply difficult to finance and address all in a short period.

Ensuring transparency, fairness, responsibility, and accountability in utilizing and managing of the WASH funds are the priorities of the strategy of the water sector. According to Calow, et al. (2012), the country has managed to maintain corruption on a low to medium level in rural water supply. However, the efficiency of systems requires improvement to operate at their full capacity.

In terms of training in the capacity building, the national water resources development strategy has attractive capacity building scheme (MoWR, 2001b), but it lacks the proper way to handle the existing trained staff not to migrate out. The shift of personnel from one organisation to the other does not matter to the overall performance of the sector, but there are areas that suffer heavily – rural areas where technical staffs do not like to work due to the lack of facilities and incentives.

2.2 Water supply in the Universal Access Plan I & II

The first Universal Access Plan (UAP) was for the period 2006-2012 and its target was to achieve the water supply coverage of 98% as a country including both urban and rural areas. The core of the first UAP was community mobilisation. Creating awareness among the community is crutial to handle the system sustainably. However, the plan was revised in 2011, to harmonize with the GTP.

In the revised version of the UAP, the rural and urban water supply were separated and designed to achieve 100% of coverage by 2015. However, the levels of services remained the same as in the previous plans such as 15 litres for rural and 20 litres for urban per capita per day in the radiuses of 1.5 km and 0.5 km, respectively.

In terms of the technical details, UAP-II has comprehensive plans that hold technical, financial, institutional and social aspects. Moreover, it has plans for operation and maintenance, rehabilitation and expansion. Otherwise, all documents of UAP have detailed the explanations of implementations of water supply systems both in rural and urban areas.

At the end of 2015, the objectives of any of the three plans have not been achieved. On top of that, the second Growth and Transformation Plan has already started with new standards, 25 litres for rural and 40 – 100 litres for urban water supplies. This implies that the new UAP will be expected very soon.

2.3 WASH Implementation Framework (WIF)

WASH Implementation Framework (WIF) is a framework formulated by four Ministries in Ethiopia, all directly involved in water supply and sanitation implementation. The goal of the framework is to bring fragmented efforts together to improve their impact. The Ministries involved in the framework are Health; Water, Irrigation and Energy; Education and Finance. In one way or the other, these Ministries have been taking part in the development of water supply and sanitation, thus, they sat down together to harmonize their efforts for greater impact.

The key elements in WIF are integration, harmonization, alignment and partnership (WIF, 2013). These elements are also the starting point in implementing One WASH National Program (OWNP, 2014). It means that WIF has paved a way for OWNP by creating a common understanding of the four ministries, which are involved in water supply and sanitation implementation.

The point that needs to be encouraged is the action taken to harmonize the activities of WASH in the country that was fragmented. The effort of integration in the country will, at least, reduce the cost of information, and duplication efforts in the same areas. On the contrary, actors in the sector did not give attention to local situations. It seams that they are still think that one principle will work uniformly everywhere in the country. For instance, a uniform system intended for all areas will not funcion ideally in both agrarian and pastoralist areas. In the national policy, “water supply” includes the domestic consumption and water for cattle. Therefore, water supply services in the context of pastoralist have a wider perspective than water supply for the area where their livelihood is typically agriculture. However, the framework is sticking to 15 litres per head per day as a target to achieve.

However, the commitment of the ministries to lay the foundation of harmonization and paving the way to One WASH National Program is appreciable. This is due to the fact that the experiences of many other countries still lack the concept of resource harmonization and avoiding working independently without coordination.

2.4 One WASH National Programme

The principle of one budget, one program, and one report is the motto of One WASH National Programme (OWNP). Its objective is to harmonize actors in the sector. This actosrs are including donors, partner organisation (NGOs), and governmental organisation and the private sector. In the conventional way of implementation, these actors operate separately based on their preference and hence their outputs achieved can not be measured. Moreover, different actors would have worked in the same area and caused duplication of efforts. Following the WIF, the coordination of the four ministries mentioned above created a fertile ground to establish one WASH. The national government together with regional counterparts and partner organisations should lead the development direction as outlined in the OWNP.

OWNP is launched in 2013 and is now in the implementation phase. The programme is expected to bring harmonized campaigns in the sector to address the marginalized rural, especially who are situated in the most remote areas without accessible roads.

2.5 Water in the Growth and Transformation Plan I&II

An amazing plan that has created big questions among the citizens of Ethiopians is known as Growth and Transformation Plan (GTP). It was launched in 2010 with ambitious goals that seem unachievable throughout the development sectors in the country. The plan was designed for five years and the second GPT has already started as of July 2015. Grand Renaissance Dam, Addis Ababa light train, Djibuti – Addis Ababa and Awash – Waldia – Mekkel express train projects are a few that are observed changing the image of the country. Water supply, as one of the development sectors in the country, has similar attention in the growth and transformation plan. Although the initiation of the government on the development is very appreciable, there are doubts among the citizen on the effectiveness of the plans in the short periods of the plan horizons. As indicated in Figure 1, the horizontal axis shows water supply coverage under different service levels. According to the national government, each service level has denoted by each GTP and each GTP is assumed to promote the country from one economic level to the other. In 2010, the country has designed a plan to grow from the least developed status of the lower middle income and then to the upper middle income level, before promoting to the status of the developed economy in three consecutive five-year-plans. However, it is hard to judge how many GTPs can transform a country from one economic level to the other.

Urban and rural water supply targets of the previous GTP were 20 litres per capita per day for urban and 15 litres for rural areas. Having these figures in mind the country could not achieve full coverage with this level. Nonetheless, the country again displayed a new standard of quantity supplied – 25 l/c/day for rural and 40-100 litres for urban – based on GTP 2. In fact, the service level increases through change of GTP and economic.

The point that we want to discuss at this juncture is that how the water supply systems, which were constructed for the previous standards could better fit in the new standards. Moreover, natures of the water supply schemes in the country are not in a capacity to render the GTPs proposed service level.

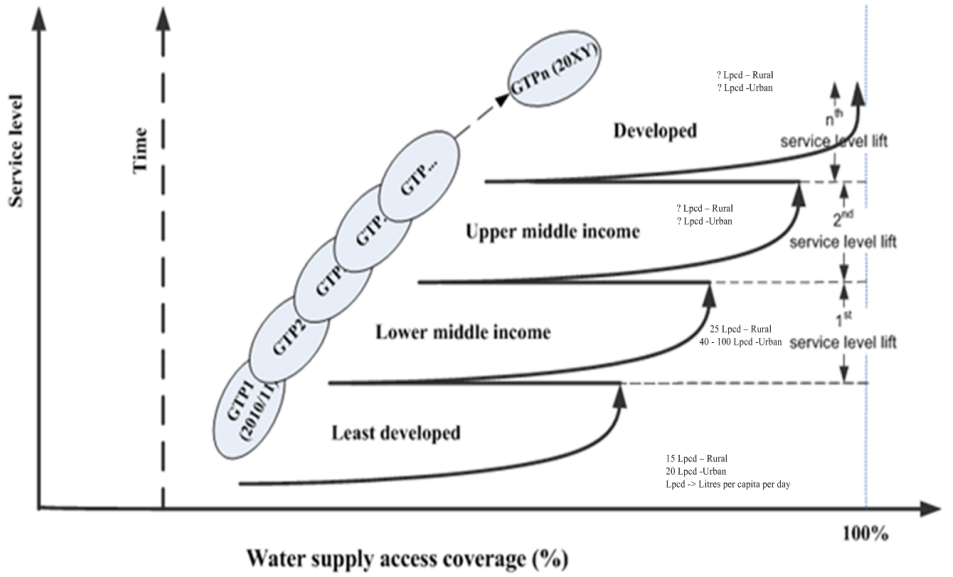


Figure 1: Tracking the Spiral Uphill Journey Path to Water Supply Universal Access to the Highest Service Level (modified from Mekonen, 2015)

3. The existing situation of services

Matland (1995) explained the top-down approach of policy-making manifested by three important drawbacks, such as lack of addressing the public objectives, excluding users and lack of a boundary between administration and policy. From these aspects, the Ethiopian water sector policy could fall under the top-down approach due to the following reasons: (1) the implementations at grassroots level are lacking pure knowledge about the policies, (2) interests of the community are not well addressed – they are driven by the consent of implementors and (3) the administration of the country is led by the political environment.

Ethiopia was celebrated for the achievement of Millennium Development Goal target 7 C in March 2015. The water supply coverage was improved by 57 % for the last couple of decades. The achievement was evaluated based on the national standard for rural and urban. The rural people are assumed to get 15 liters per capita per day and the urban 20 liters per capita per day and within the distances of 1.5 and 0.5 km, respectively (UAP, 2011). However, the study conducted in two regions of the country showed that the water supply coverage is highly subjected to insufficient service, particularly from quantity point of view. At least 40% of the populations are still without any water service. Therefore, the central point of this paper is to answer a question "How much service providers are concerned about sustainable services of the system they are in charge of?"

The served populations of the country are still uncomfortable about the service they are getting. In rural area at least 75% of the served population gets water less than 15 litres per day, which is

below the national standard. Furthermore, almost all cities in the country have frequently experienced service breakdowns and a shortage of supply. For instance, Addis Ababa (the capital city); Adama, Dire Dewa, Bahirdar, Harar, Hawassa and Mekele (Regional Capitals) and other small cities usually report for residents' complaints about water scarcity. The causes of the problems might be various, but the dominant ones are poor standards of provision and production, the instability of technical personnel, and lack of commitment to feel the pain of the end user.

Ethiopia is a country that has various climatic conditions and standards of living. Some cities have a temperature low enough to freeze water in the pipelines and some have an average temperature of over 40 degree Celsius. However, the national standards do not consider these disparities. This can be good evidence of the gaps that exist between service providers and producers. The technical personnel are more concerned in discharging their responsibility than the provision of adequate services.

According to the Ethiopian governmental structure, the district level is the most important governmental entity in facilitating services to the rural communities. However, the facilities and salaries at that level cannot attract skilled manpower. Regional, federal or non-governmental organizations attract skilled manpower. As a result, staff turnover is a common and known practice in the country. One of the threats in the growth and transformation plan (GTP) is also marked as staff turnover – 60% of skilled manpower from the total required expected to be available during the plan period. The implication of this is that the service providers are not ready to understand the rural community and not significantly concerned about the sustainable services.

4. Conclusions

The last two decades have been extraordinary for the water supply and sanitation in Ethiopia. In terms of providing policy, regulations, strategies and plans many have been done since 2001. Moreover, physical implementations of services are not insignificant, although diversified plans have been introduced to improve the coverage of the services. However, from the criteria of top-down and bottom-up approaches, the policy dominantly looks fitting the top-down approach. For example, 15 litres per capita per head is a national standard of the rural community in the country with diverse climatological regions. If the policy was bottom-up, the policy-maker would understand that this amount is not enough.

From the view of creating ownership feeling, the national government has a regulation to keep the public participation to make at least 10% contribution. The basic objective of contribution is not primarily to seek money, but to retain the involvement of the users to feel ownership and make them able to manage the systems after the implementation. However, in practice, the people at the implementation level can feel it as a burden that they must provide participation level to the government to prove the involvement of the communities. In this regard, the way of participating is not achieving its target in many cases.

Therefore, the national policy needs to be extended to every stakeholder and confirmed if policies are implemented in the sense of its original objective. Moreover, service providers or producers must shoulder the responsibility of providing intended services. To materialize these, actually, there must be a forum to create understanding among users about the future of the systems.

References

Behailu, B.M., Suominen, A., Katko, T.S., Mattila, H., Yayehyirad, G. "Community Managed Projects (CMP) and other Implementation Approaches in Rural Water Supply of Ethiopia." Waterlines, under review.

Behailu, Beshah M., Arto Suominen, and Tapio S. Katko. "Evolution of Community-Managed Water Supply Projects From 1994 to the 2010s in Ethiopia." *Public Works Management & Policy* (SAGE) 20, no. 4 (2015): 379-400.

Calow, Roger, Alan MacDonald, and Piers Cross. *Rural water supply corruption in Ethiopia.* 2012.

GTP. *Growth and transormation plan 2010/11 - 2014/15 (GTP-I).* Addis Ababa, Ethiopia: Ministry of Finance and Economic Development, 2010.

GTP. "Growthe and transformation (GTP-2) for water sector." Addis Ababa, Ethiopia, 2015.

Matland, Richard E. "Synthesizing the implementation literature: The ambiguity-conflict model of policy implementation." *Journal of public administration research and theory* 5, no. 2 (1995): 145-174.

MOWR. *Ethiopian Water Sector Policy.* Addis Ababa, Ethiopia : Ministry of Water Resources, 2001a.

MoWR. *Ethiopian Water Sector Strategy.* Addis Ababa, Ethiopia: Ministry of Water and Energy, 2001b.

OWNP. "One WaSH National Program: Program Operation Manual (POM) for the Consolidated WaSh account." Addis Ababa, Ethiopia, 2014.

UAP. *Universal Access Plan: An Implementation manual for Integration of Mass Mobilization for Universal Access Plan of Water supply and Sanitation Program.* Addis Ababa, Ethiopia: Ministry of Water and Energy, 2008.

UAP-II. *Revised Rural Water Wupply Universal Access Plan (UAP II).* Addis Ababa, Ethiopia: Ministry of Water and Energy , 2011.

UAP-III. *Urban Water Wupply Universal Access Plan (UWSUAP).* Addis Ababa, Ethiopia: Ministry of Water and Energy, 2011.

WIF. *The National WaSH Implementation Framework (WIF).* Addis Ababa, Ethiopia: The ministry of Water and Energy, The ministry of Health, The ministry of Education and The ministry of Finance and Economic Development, 2013.

Tampereen teknillinen yliopisto
PL 527
33101 Tampere

Tampere University of Technology
P.O.B. 527
FI-33101 Tampere, Finland

ISBN 978-952-15-3854-4
ISSN 1459-2045