

Pro gradu – Master’s Thesis

Towards Sustainable Water Management in Rural Nepal
-
**A Case Study of the Finnish Supported Water Supply
Schemes in Nawalparasi District**

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ABSTRACT

The study analyses the elements which may hinder or contribute to the long-term sustainability of community-managed rural water supply systems in Nepal. The sample of the study consists of eight gravity flow water supply schemes located in the district of Nawalparasi in Western Nepal. The schemes were constructed during the Rural Water Supply and Sanitation Project (RWSSP), jointly funded and implemented by the governments of Finland and Nepal in 1990-2005.

The data collection during two field visits to Nepal in May 2014 and in April 2015 was conducted through interviews with users committee members, water users and other stakeholders closely linked with rural water supply sector. Reports of RWSSP were reviewed to analyze approaches taken by the project on issues linked with long-term sustainability.

The findings of the study reveal that at some point of their lifetime, all rural water supply systems experience challenges, which affect their operation and functionality. In addition to natural hazards, such as floods and landslides, various social issues such as population growth, conflicts and disputes in the community can have a significant negative effect on the operation and maintenance of the systems. Yet, it is the community's approach and response to these challenges which eventually determines whether the systems will be sustainable or not in the long run. Communities with social capital had more prerequisites to respond and prepare to the challenges and reach for external support. To ensure the sustainability of community-managed water supply systems, adequate post-construction support for management capacity and conflict mediation especially for poorer performing users committees would be required, in addition to technical and financial support.

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TIIVISTELMÄ

Haasteet maaseudun vesihankkeiden kestävydessä on tiedostettu maailmanlaajuisesti jo useiden vuosikymmenten ajan. Paikallisten käyttäjien osallistuminen hankkeiden toteutukseen ja hallinnointiin on nähty yhtenä ratkaisuna ongelmaan. Tutkimuksessa analysoitiin tekijöitä, jotka tukevat tai haittaavat käyttäjien hallinnoimien maaseudun talousvesihankkeiden pitkän aikavälin kestävyyttä.

Tutkimus tehtiin laadullisena tapaustutkimuksena, jossa tutkimusaineiston muodostivat kahdeksan Suomen ja Nepalin vuosina 1990–2005 yhteistyössä toteuttaman Rural Water Supply and Sanitation Project (RWSSP) -hankkeen aikana rakennettua painovoimaista talousvesijärjestelmää Nawalparasin läänissä. Tutkimusaineisto koostui toukokuussa 2014 ja huhtikuussa 2015 Nepalissa toteutettujen kenttäjaksojen aikana vesikäyttäjäkomiteoiden, käyttäjien ja vesihallinnon asiantuntijoiden kanssa tehdyistä haastatteluista. Lisäksi tutkittiin RWSSP hankkeen tuottamia dokumentteja ja raportteja, joiden avulla analysoitiin lähestymistapoja kestävyyskysymyksiin hankkeen toteutuksen aikana.

Tutkimus osoittaa, että maaseudun talousvesihankkeet altistuvat elinkaarensa aikana tekijöille, jotka haittaavat järjestelmien käyttöä ja ylläpitoa. Ympäristöriskit, kuten tulvat ja maanvyörymät, aiheuttavat toistuvia ongelmia talousvesijärjestelmien toimivuuteen etenkin vuoris-
toisilla alueilla. Ajan kuluessa sosiaaliset tekijät, kuten väestönkasvusta seuraava veden tarpeen lisääntyminen, eriarvoisuutta lisäävä vesijärjestelmien väärinkäyttö (mm. epäviralliset vesiliitännät julkisista vesipisteistä kotitalouksiin) sekä vedenkäyttöön liittyvät konfliktit, vaikuttavat osaltaan järjestelmien hallintaan ja ylläpitoon. Yhteisöjen ja käyttäjäkomiteoiden sosiaalinen pääoma ja kyky vastata koettuihin haasteisiin määrittävät osaltaan järjestelmien pitkän aikavälin kestävyyttä. Tutkimuksessa havaittiin, että sosiaalista pääomaa kasvattivat merkittävästi yhteisön aktiiviset jäsenet, jotka hyödynsivät sosiaalisia verkostojaan yhteisen edun hyväksi. Muita vaikuttavia tekijöitä olivat mm. kyläläisten arvostus vapaaehtoistyötä kohtaan sekä naisten aktivoituminen päätöksenteossa naisryhmien (Mother’s groups) perustamisen seurauksena. Yhteisöissä, joissa käyttäjäkomiteoilla on kykyä päätöksentekoon, osal-

listuvat yhteisön jäsenet aktiivisemmin vesijärjestelmien ylläpitoon. Kyseisissä yhteisöissä edellytykset vastata haasteisiin ovat paremmat kuin yhteisöissä, joissa esiintyi epäluottamusta, konflikteja ja käyttäjäkomiteoiden kyvyttömyyttä valvoa yhteisesti sovittuja toimintatapoja.

Rakentamisen jälkeinen yhteisön ulkopuolinen tuki (post-construction support) on osaltaan edellytys hankkeiden kestävyydelle. Yhteisöissä, joissa käyttäjäkomiteat toimivat heikosti, tulisi panostaa ulkopuolelta tulevaan tukeen esimerkiksi konfliktien ratkaisussa ja hallintomenetelmien kehittämisessä, mikäli yhteisöjen omat toimintavalmiudet ratkaista ongelmia sisäisesti eivät ole riittävät. Sosiaalisen pääoman tiedostaminen ja kasvattaminen tukee toimintavalmiuksien parantumista. Vaikka yhteisöillä olisi kykyä kattaa hankkeiden korjauskustannukset, teknistä osaamista esimerkiksi vesijärjestelmien kunnostamiseen, peruskorjaukseen tai laajentamiseen käyttäjämäärän lisääntyessä ei useinkaan ole tarpeeksi. Teknistä osaamista tulisikin valtion tasolla lisätä osaksi kylätason hallintorakenteita, jotta teknistä osaamista vesijärjestelmien ylläpitoon ja huoltoon olisi saatavilla jatkuvasti lähellä käyttäjiä.

RWSSP -hanke toteutettiin yhteistyössä Nepalín lääni- ja kylätasojen paikallishallinnon kanssa tavoitteena tukea keskusjohtoisen hallinnon hajauttamista. Hankkeen aikana painotettiin kyläläisten roolia vesi- ja sanitaatiojärjestelmien rakentamisessa ja ylläpidossa. Vesijärjestelmien kestävyttä pyrittiin turvaamaan mm. lisäämällä naisten osallistumismahdollisuuksia, kouluttamalla paikallisia tekniikkoja ja perustamalla käyttäjäkomiteoita sekä käyttö- ja ylläpitorahastoja (O&M fund). Edellä mainittujen lisäksi myös paikallishallinnon virkamiesten hallinnollisen kapasiteetin kehittäminen nähtiin keinona tukea hankkeiden kestävyttä. Hanke toimi haastavassa ympäristössä, sillä Nepalín sisällissota vuosina 1996–2006 rampautti jo valmiiksi osittain heikosti kehittyneitä paikallishallinnon rakenteita, joiden perustalle hanke luotiin. Haasteista huolimatta hanke toimi tärkeänä kokeilualustana käyttäjien hallinnoimien vesijärjestelmien ja paikallishallinnon instituutioiden rakentamiselle Nepalissa.

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List of acronyms

ADB	Asian Development Bank
CATN	Centre for Appropriate Technology
CBO	Community Based Organization
CBS	Central Bureau of Statistics
DDC	District Development Committee
DDP	District Development Plan
DoLIDAR	Department of Local Infrastructure Development and Agricultural Roads
DSCO	District Soil Conservation Office
DTO	District Technical Office
DWASHCC	District Water Supply Sanitation and Hygiene Coordination Committee
DWSO	District Water Supply Office
DWSS	Department of Water Supply and Sewerage
FCG	Finnish Consulting Group
FEDWASUN	Federation of Drinking Water and Sanitation Users Nepal
HMGN	His Majesty's Government of Nepal
INGO	International non-governmental organization
LGCDP	Local Governance Community Development Programme
LDO	Local Development Officer
MFA	Ministry for Foreign Affairs of Finland
MLD	Ministry of Local Development
MoFALD	Ministry of Federal Affairs and Local Development
MPLD	Ministry of Panchayat and Local Development
MHPP	Ministry of Housing and Physical Planning
MPPW	Ministry of Physical Planning and Works
MUD	Ministry of Urban Development
NAPA WASH	Nawalparasi and Palpa Districts Sustainable Water Supply and Sanitation Project
NEWAH	Nepal Water for Health
NGO	Non-governmental organization
NMIP	National Management Information Project
NPR	Nepalese Rupee
O&M	Operation and maintenance
ODF	Open defecation free
RWSSP	Rural Water Supply and Sanitation Project
SEIU	Sector Efficiency Improvement Unit
UNICEF	United Nations Children's Fund
UMN	United Mission to Nepal
VDC	Village Development Committee
VWASHCC	Village Water Supply Sanitation and Hygiene Coordination Committee
WASH	Water Supply Sanitation and Hygiene
WHO	World Health Organization
WSP	Water safety planning
WSSDO	Water Supply and Sanitation Division Office

1. INTRODUCTION

1.1 Motivation and need for the study

Universal access to safe and sustainable water supply is still a challenge which has not been solved despite many decades of infrastructure projects implemented by developing country governments and donor organizations. In 2015 an estimated 663 million people still lacked improved drinking water sources, many of them living in rural areas (WHO/UNICEF 2015:4). However, mere construction of improved systems is not enough if they are not maintained as, unfortunately, there are still many examples of water supply projects which have failed to provide services sometimes even only shortly after completion of the construction due to various reasons. Sustainability of water supply and sanitation interventions has been a hot topic in the development discourse since many decades already. The first world-wide attempt to provide water supply and sanitation for all the people in developing countries took place during International Water Supply and Sanitation Decade 1980-1990. The ambitious goal of the decade was not met but the lessons learned increased the interest towards community management in rural water supply, which has been an approach widely applied ever since (Behailu et al. 2015).

In 2015, the United Nations' General Assembly adopted the Sustainable Development Agenda 2030 which includes a specific goal to provide universal and equitable access to safe and affordable drinking water for all by 2030. Thus, although sustainability of water supply has been discussed for many decades already, it seems to be more important issue now than ever and a lot of work remains to be done to meet the goal set for 2030. It is acknowledged that without sustainability there is unlikely to be long-lasting results in the communities. In case of rural water supply, community participation in project planning and implementation as well as in the management of rural water supply systems has been considered one of the critical aspects of sustainability (e.g. Barnes et al. 2011, Behailu et al. 2015, Schouten & Moriarty 2003, Dube 2012, Gebrehiwot 2006, Spaling et al. 2014).

Finland has been supporting the rural water supply sector in Nepal since the late 1980s. The first intervention, Rural Water Supply and Sanitation Project (RWSSP), was implemented in the

Lumbini Zone in Western Nepal between 1990 and 2005. The project was characterized by its approach to support the national decentralization process, emphasize local ownership and community management of rural water supply schemes and to involve beneficiaries from the beginning of project implementation. Many aid programmes are conducted in a limited time frame with limited funding which has often led to a situation where long-term evaluation or revisiting water schemes years after the programme or project has ended seldom takes place (Barnes et al 2011). After the RWSSP phased out, it has been included in few country evaluations and assessments (Koponen, J. et al 2012, Sharma, S. 2012, Caldecott J. et al 2012) mainly based on the review of project documents and discussions with project implementers. Actual field studies on the post-construction situation at the project schemes in Nepal have not been carried out.

To answer the need, Finnish non-governmental organization WaterFinns initiated a development cooperation project in Nepal in 2014. Nawalparasi and Palpa Districts Sustainable Water Supply and Sanitation Project (NAPA WASH) 2014-2016 is located in two districts in Western Nepal, Nawalparasi and Palpa, where RWSSP was implemented. The main components of the NAPA WASH project are field assessment and capacity building at the village level. Through field assessment including a survey and qualitative studies conducted by Finnish and Nepali student researchers, the project aims to increase understanding on the factors of long-term sustainability of rural water supply systems and identify successful community practices and strategies to ensure scheme functionality (WaterFinns 2014). This research is one of the qualitative studies aiming to shed light on the factors of long-term sustainability.

The Government of Nepal, the country where this study has its focus, has set a national target for providing a basic level of water services and access to improved sanitation for all by the end of 2017. Nationwide data on coverage and functionality of rural and urban water supply and sanitation schemes has been collected through National Management Information Project (NMIP) implemented by the Department of Water Supply and Sanitation (DWSS). Based on the latest report published in 2014, the estimated country-wide water supply coverage is 83.6%. According to the NMIP report 2011 some 17.9% of the population with a water supply are served by well-functioning projects, 38.9% by projects that need minor repair, 11.8% by projects that need ma-

for repair, 21.0% by projects that need rehabilitation, 9.1% by projects that need reconstruction, and 1.6% by projects that are non-repairable (i.e. non-refunctionable). However, it has been acknowledged that official figures of water supply coverage do not reflect the actual situation in the field as systematic monitoring and collection of the data on the scheme performance, water quality and service level issues are lacking. (MPPW 2011, MUD 2014)

Although there have been many studies on functionality in Nepal (see for instance WaterAid Nepal 2010, Kanta & Bhattarai 2010, DWSS 2011, HELVETAS 2013, FCG International 2013), the reports have remained on a rather general level as their emphasis has been to cover a wide number of projects and water schemes to obtain a larger picture of the situation in Nepal. Not many studies have focused comprehensively on the elements of long-term sustainability at the grass-roots level especially from the viewpoint of the challenges and opportunities present in the communities and approaches taken by the water users committees which are responsible for the everyday operation and maintenance (O&M) of the rural water supply schemes in Nepal. As a Finnish citizen, I also have an interest on Finnish funded interventions and their sustainability. Thus, the idea to study water schemes which were implemented during the 1990-2005 in partnership with Nepalese government agencies and local communities seemed interesting. Although challenges with functionality issues have been reported, I had also heard about positive experiences concerning the development within the water and sanitation sector. As negative experiences and failure of development interventions often get more visibility than success stories, it is important to learn also from the positive experiences which could be shared with others as well. As the schemes studied were established with the support of a project partly funded by the Finnish government, this study will also contribute to knowledge on sustainability and impact of Finland's bilateral water-sector projects in Nepal.

1.2 Research Objective

As the importance of community participation and management to the sustainability of rural water supply and sanitation projects has been widely acknowledged (e.g. Barnes 2011, Abrams et al. n.d, Schouten & Moriarty 2003, Dube 2012, Gebrehiwot 2006, Spaling et al. 2014, Behailu et al. 2015) my assumption is that a well-functioning grass-root level management is one of the prerequisites for sustainable water system. Many authors have also noticed that availability of

external support structures for local communities in the form of post-construction support, has also determined in many cases the success or failure of the long-term sustainability of the projects (e.g. Rautanen S.-L. 2016, Lockwood & Smits 2011, Schouten & Moriarty 2003, Harvey & Reed 2003).

The purpose of this study is to increase the understanding of the elements which may hinder or contribute to the long-term sustainability of community-managed rural water supply systems at the grass-roots level. The focus is on water users committees responsible for the everyday operation and maintenance (O&M) of rural water supply schemes. Water scheme refers to a water supply system which consists of the water source, transmission and distribution networks and water distribution points and is serving households located in a specified geographical area. Water users committees are community groups which operate in relation to other community groups and external institutions such as local and regional level governance structures, non-governmental organizations (NGOs) and donor organizations.

Research questions

The research questions of this study are:

1. What opportunities and challenges are there for community-managed rural water supply systems in Nepal?
2. What differences can be identified in the approaches taken by better performing and poorer performing water users committees?
3. What types of external support for the water users committees can be identified to be the most crucial for the management of water supply schemes?

The structure of the thesis is as follows: In the introductory chapter, the main idea behind the study needs and objectives are presented together with the research questions. The theoretical framework is presented in the second chapter. The context of the case study is presented in chapter three followed by the methodology described in chapter four. In chapter five results are presented and discussed in the light of the theory and finally conclusions are drawn in chapter six.

2. CONCEPTUAL FRAMEWORK

The underlying structure and frame of the study can be well articulated by a theoretical framework for clarity of work and ease of result analysis. The theoretical framework has been defined by Maxwell (2005:33 in Merriam 2014:66) as “the system of concepts, assumptions, expectations, beliefs, and theories that support and informs your research.” In this research the theoretical framework is drawn from three separate, but interrelated, literature: sustainability of community-managed water supply, water governance and capacity development.

2.1 Sustainability of community-managed rural water supply

The concept of sustainable development has been discussed from many different aspects since it first time emerged in the famous report ‘Our Common Future’ published by the World Commission on Environment and Development (Brundtland Commission) in 1987 (WCED 1987). The report defined sustainable development as “*development which meets the needs of current generations without compromising the ability of future generations to meet their own needs*”. The concept as it developed underlines the importance to acknowledge three dimensions of development: environmental, social and economic.

Regarding the sustainability of rural water supply, a broad range of definitions have been used over the years. Some earlier definitions viewed sustainability mainly in economic terms from the viewpoint of self-sufficiency and cost-recovery. While others emphasize environmental dimensions such as the sustainability of water resources others incorporate institutional factors, such as external support provided by external agencies after the completion of the project, within the concept. Different organizations and groups of people from local water users to national governments and donors may view sustainability differently based on the perceptions and values they attach to different aspects of the concept. (Gebrehiwot 2006)

Barnes et al. (2011:169) define sustainability of water supply as “*the ability of services to continue to provide recipients with the intended human-health and lifestyle benefits without a significant adverse effect on other people, the environment, or other services, existing or potential.*” Another definition by Harvey and Reed (2003:115) considers rural water supply to be sus-

tainable when *“the water sources are not over-exploited but naturally replenished, facilities are maintained in a condition which ensures a reliable and adequate water supply, the benefits of the supply continue to be realized by all users over a prolonged period of time, and the service delivery process demonstrates a cost-effective use of resources that can be replicated”*

The definition by Barnes et al. (2011) points out the importance of considering the impacts of the water supply system to its surroundings and assessing its effect to other water supply schemes, people and environment while Harvey and Reed (2003) also point out to the importance of cost-efficiency in using the resources sustainably.

2.1.1 Development of the community-management approach

In September 2015, the United Nations' General Assembly adopted the 2030 Agenda for Sustainable Development with total seventeen Sustainable Development Goals (SDGs). The goal number six "Ensure availability and sustainable management of water and sanitation for all" includes a sub-goal stating that universal and equitable access to safe and affordable drinking water for all should be achieved by 2030 (United Nations 2015). Although 2.6 billion people have gained access to an improved drinking water source since 1990, an estimated 663 million people still lacked improved drinking water sources in 2015, many of them living in rural areas. Thus sustainability of rural water supply is a burning issue. (WHO/UNICEF 2015:4).

Yet, 2030 Agenda for Sustainable Development is not the first attempt to bring full access to improved water supply and sanitation for all residents world-wide. The first attempt was over three decades ago in the form of International Drinking Water Supply and Sanitation Decade 1980-1990 where the emphasis was on the physical construction of water supply systems while social aspects were often left at the background with less emphasis. Even the ambitious goal of the decade was not met, the experiences gained had a strong impact on the evolution of community management in rural water supply. Although community participation had been accepted as the model by some NGO-led projects since the early 1980s, the community-management concept started to be applied more widely in the sector in 1990s and has ever since been mainstreamed into the development strategies of national governments, donors and NGOs (Behailu et al. 2015:380-383)

Among the lessons learned from the water supply and sanitation decade was the need to increase emphasis on sustainability issues and strong link between hardware and software. Community participation and passive involvement of women in the management of water supply had been identified as some of the bottlenecks for sustainability in general (Christmas and de Rooy 1991 and Cairncross 1992 cited in Behailu et al. 2015:382) while issues that had been hampering the sustainability of small-scale community-managed projects implemented during the decade included lack of trained personnel, absence of cost-recovery and unaddressed issues of operation and maintenance (Cornwall 2002 cited in Behailu et al. 2015:382). In the past, prior to the community-management concept, it was often considered as the responsibility of governments to implement, operate and maintain water supply systems and users expected to have the water service for free (Rouse 2013 and Moriarty 2003 cited in Behailu et al. 2015:380). Thus, it has proved challenging to change this mind-set that still exists in some parts of rural areas in developing countries.

2.1.2 Pre-project and post-project factors of sustainability

Analysis on the factors of sustainability of community-managed rural water supply projects can be divided in pre-project and post-project phases. Pre-project refers to the time before the construction of the water supply system has been completed while post-project refers to the time after the construction has been completed and responsibility for the management is given to the community (Gebrehiwot 2006, Bakalian & Wakeman Eds. 2009 and Rautanen S.-L. 2016) Significant pre-project factors affecting the sustainability of the water supply schemes are presented in Table 1.

Table 1. Pre-project and post-project factors of sustainability (Bakalian & Wakeman, Eds. 2009, Gebrehiwot 2006, Rautanen S.-L. 2016)

Pre-project factors	Post-project factors
<ul style="list-style-type: none"> • Demand responsive approach • Serving-the-unserved • Community participation, emphasis on women • Use of the baseline survey • Technical design and quality of construction • Institutional capacity and support • Empowerment and capacity strengthening • Training of water users and local management bodies 	<ul style="list-style-type: none"> • Technical factors (incl. design, performance and maintenance issues) • Community and social factors (incl. willingness to support projects) • Institutional factors (incl. policy and external follow-up support) • Environmental factors (incl. the sustainability of the water source) • Financial factors (incl. cost recovery) • Health factors (incl. the need to continue provision of hygiene education to affect long-term behaviour changes)

In the post-construction phase factors which can affect the sustainability of water supply schemes can further be divided to those “within community”, at least partly within the sphere of the community to influence and factors “outside community”, those which the community itself cannot influence as described by Gebrehiwot (2006). A synthesis of the factors withdrawn from the literature is presented in Table 2.

While community participation in project planning has generally been acknowledged as a significant aspect in igniting community responsibility for operation and maintenance of the water supply systems (e.g. Barnes et al. 2011, Abrams et al. n.d, Schouten & Moriarty 2003, Dube 2012), it also enhances equity, accountability and sustainability of benefits (Gow et al. 1994 cited in Gebrehiwot 2006:25). However, Barnes et al. (2011:179) points out that although issues of community ownership and local decision making are important, participatory approaches do not always automatically produce sustainable solutions. That is because decisions made by a community are influenced by the community’s level of understanding of the issues and in some cases external assistance may be needed to guide the community decision making. For instance, when community members assume that the water source is adequate to provide water for the system but are unaware of possible aquifer drawdown or the effect of catchment deforestation on stream recharge problems with water availability may emerge (Spaling et al. 2014:798).

Table 2. “Within community” and “outside community” factors affecting the sustainability of rural water supply systems in the post-construction phase. (Bakalian & Wakeman, Eds. 2009, Gebrehiwot 2006, Rautanen S.-L. 2016)

“Within-community” factors	“Outside community” factors
<ul style="list-style-type: none"> • Tariff collection and cost recovery to cover routine operation and maintenance of water supply infrastructure • Preventative maintenance of water supply infrastructures • Adequate capacity (technical, financial, administrative etc.) of water users committee and its individual members as well as capacity within the community necessary to manage a system or to engage with an external party to operate and manage the system on its behalf • Presence of skilled village maintenance workers • The continued involvement of community, both women and men, in all aspects of system management and maintenance • Continued learning-by-doing • Adequate levels of social cohesion, or social capital, required to achieve system management and the motivation, or willingness, to contribute resources, time and money. 	<ul style="list-style-type: none"> • Access to or availability of spare parts, tools and equipment for the community to carry out repairs • The availability of long-term external follow-up support (for users committee and water users, also to promote hygiene and behaviour change) • The presence of private companies, entrepreneurs and NGOs providing goods and services and skilled technicians to carry out complex repairs • Linkages to government and private sector service providers • The existence of a supportive policy environment, legal frameworks underpinning the legitimacy of water committees, and clearly defined roles for operation and maintenance • A water source that continues to produce water of sufficient quantity and quality to satisfy users • Peer-networks (e.g. among village maintenance workers, new water users committee members)

Harvey and Reed (2003:116) criticize an expectation of self-sustaining community-managed water supply system which assumes that communities would be capable of sustaining water supplies all by themselves without external support. They note that as many urban water supplies are heavily subsidized by governments it is unreasonable to expect rural water supply systems to become subsidy-free immediately. In addition, they point out how during the planning and construction phase communities rarely acquire full understanding of what it requires sustaining long-term water supply services. Tariff collection to cover recurrent costs and long-term post-construction support for rural community-managed water supply systems by government agencies or other institutions have been recognized by many authors as two of the critical factors for sustainability (Bakalian & Wakeman, Eds. 2009; Schouten & Moriarty 2003, Harvey & Reed 2003, Rautanen S.-L. 2016).

2.1.3 Functionality, operation and maintenance

Functionality is a concept closely linked with sustainability of community-managed rural water supply. Some even consider an actual functionality of water supply services as a key indicator of sustainability of water supply services. Different definitions for functionality can be used, but in the research the Nepalese government definitions on functionality are applied. Functionality is defined as *“The degree to which a product or a service is meeting the aspirations, needs or demands of users or customers, within the range of available options, standards and norms.”* The functionality of water supply services is further defined as the degree to which:

- water supply schemes function up to their design capacity for their design period and serve all water users with quantity, quality, accessibility and continuity,
- water supply services are sustained and continued beyond the design period,
- stakeholders adhere to defined roles, responsibilities, norms and standards,
- stakeholders meet performance standards,
- norms, standards and regulations are available, communicated, adhered to and enforced,
- operation, minor repairs and ongoing maintenance take place at scheme level,
- post-construction support is institutionalized, available, accessible and practiced

(SEIU 2010)

Based on the aforementioned definition, gravity flow water supply schemes in Nepal are categorized into five categories as defined by the National Management Information Project/ Department of Water Supply and Sewerage (DWSS 2011)

- **‘well-functioning’** - projects that are functioning and need no repairs
- **‘need minor repair’** - projects that are functioning and need repairs that are within the capacity of users (with no external inputs required)
- **‘need major repair’** - projects that are functioning but need major repairs (with external inputs for construction components and technical supports required)
- **‘need rehabilitation’** - Projects that are functioning at their design level but are incapable of meeting present demand in quantity and/or quality

- **‘need reconstruction’** - projects that are defunct and need major technical and financial inputs from external sources as well as sizeable contributions from users before they can function again

Carter and Ross (2016) point out how using functionality as a key indicator for sustainability can be problematic, as it is based on a snapshot view of a present situation. Functionality or non-functionality of a water supply system says nothing about yesterday or tomorrow. A non-functional water system of today may be fixed tomorrow while a functional system today may become non-functional tomorrow. Thus the authors emphasize also the importance of the experiences described by the users about the history of breakdowns and struggles and the approaches taken. The distinction between ‘functional’ or ‘non-functional’ is not always very straightforward but is open to interpretation, which also depends on the one who is observing the system. There may be a situation where the water yield at the source has decreased or there is a leakage in a pipe, but water is still available in the tap, it just may come with lower pressure. If water is still available, users may consider the system to be functional although it was not functioning the way it was designed for. Thus a notion of ‘partial functionality’ has been added to describe situations which may vary from low discharge, inadequate sanitary status to poor or variable water quality (Carter & Ross 2016:96). Authors also note that some water points may be non-functioning or partially functioning not because of a technical failure but due to seasonally low yields of water for instance during the dry season. While functionality describes the present situation, sustainability is about services over time, stretching to the future, as it concerns the likelihood of services will continue to function over time. Lockwood and Smits (2011) also point out that as functionality looks at the ‘output’ and not the underlying factors which can make the service sustainable or not, using it as an indicator for sustainability can be limiting. While Carter and Ross (2016:99) note that functionality may act as a simple indicator for sustainability, they emphasize the need to use more informative indicators, both quantitative and qualitative, of the way how services are implemented and managed.

Operation and maintenance are crucial aspects in the sustainability of water supply. In rural water supply systems, operation refers to the everyday running and handling of water supply includ-

ing activities such as operations to convey safe drinking water to users (e.g. control of valves) and correct handling of facilities by users (e.g. the use of water taps). Maintenance refers to activities which are required to sustain the water supply in a proper working condition. Davis and Brikke (1995:5) define maintenance in three levels: 1) Preventive maintenance - regular inspection and servicing to preserve assets and minimize breakdowns, 2) Corrective maintenance - minor repair and replacement of broken and worn out parts to sustain reliable facilities and 3) Crisis maintenance - unplanned responses to emergency breakdowns and user complaints to restore a failed supply. In case repairs and maintenance are no longer economically viable or technically feasible to keep the water supply system in good condition rehabilitation is necessary. Rehabilitation refers to the replacement of equipment and correction of major defects to enable the water facility to function in a way as originally intended.

2.2 Governance of water resources

Governance is a broad concept which has been defined by many authors and used in many different fields of studies. UNESCAP (2003 cited in Juutinen et al. 2007) defines governance as *“the process of decision-making and the process by which decisions are implemented (or not implemented)”*. According to Bevir (2013) governance refers to *“all processes of governing, whether undertaken by a government, market or network; whether over family, tribe, formal or informal organization or territory; and whether by laws, norms, power, or language”*. The author sees governance as a set of diverse practices inherited by actors which are constantly created and recreated by the very actors through their activity.

As a broad term, governance can be used in different contexts such as local governance, national governance or corporate governance. Relevant to this study is the concept of local governance which should not be mixed with the concept of local government. Whereas local government refers to specific institutions created by national or state constitutions or other relevant legislation to deliver a range of specified services to a relatively small geographical area, local governance is *“the formulation and execution of collective action at the local level”* (Shah 2006:1 cited in Juuti et al. 2007). In addition to formal legally acknowledged local government institutions, various organizations such as non-governmental and community based organizations (NGOs and CBOs), local user groups and traditional practices of decision making and codes of behaviour

(informal institutions), play their role in governance (Juuti et al. 2007:44). Members of the local groups with their local interests represent local governance and democracy at the grass-roots level.

The concept of water governance refers to the exercise in political, economic, administrative and social authority, which influences the development and management of water resources and related service delivery (UNESCO 2003 cited in Juuti et al. 2007:8). It contains various mechanisms, processes and institutions, through which citizens and groups articulate their interest, exercise their legal rights and meet their obligations in relation to water resources. Like governance, water governance also takes place at different levels of society. It is also widely acknowledged that most of the problems linked with prevalent water challenges and crisis around the world are linked with poor water governance, not merely lack of water services. Good governance, in turn, is considered as participatory, consensus-oriented, transparent, accountable, responsive, effective and efficient, inclusive, equitable and follows the rule of law (Juuti et al. 2007). Rautanen (2016) further defines good governance being about processes and institutions to produce results that meet the needs of the society while making the best use of the resources in their disposal.

In case of community managed water supply systems water users committees are formed to take the responsibility to manage everyday operations of water supply system in order to provide a service of water supply to the community. Committees have an organizational structure with key positions of chairperson, secretary and treasurer along with other members. Members are elected or appointed by the community served by the water supply system. In addition there are various rules and regulations governing the actions of the committees. Water users committees operate in interaction with other community groups, organizations and government bodies especially at the local levels thus playing a significant role in local water governance.

One of the approaches often taken during the development interventions linked with rural water supply is the objective to develop the capacity of water users committees, usually through trainings and awareness creation. These activities aimed at developing the capacity of water users

committees are usually linked with the wider aim to develop local good governance practices and to improve the sustainability of water service delivery. Some aspects of theory related to the concept of capacity development in literature are discussed in the following chapter.

2.3 Capacity development

Capacity is a concept which has been emerging in the international development literature and practice for some time already. However, as acknowledged by many authors (see for instance Hilderbrand 2002, Wrigley 2007, Baser & Morgan 2008, Kühl 2009, Mugisha 2015) the complexity of defining the concept still remains as there is not a single definition or model of elements constituting capacity which would be fully acceptable to all practitioners. Many authors discuss the concept of capacity in relation to capacity building or capacity development.

In his article on capacity development as the model for development aid organizations Kühl (2009) discusses the history and evolution of organizational concepts used in the development discourses which are linked with the strengthening of institutions and local forces in countries where development activities have taken place since the 1950s. Concepts such as institutional building, institutional strengthening, human resource development and new institutionalism were used before the concept of capacity building and later capacity development or capacity strengthening started emerging in the discourses in the early 1990s. At the same time he argues that although the terms capacity building and capacity development are interchangeable, and the use of different term does not seem to have an impact of the practice in the field, capacity building refers to new build-up of capabilities while in capacity development a special emphasis is on the development of already existing capabilities (Kühl 2009:567-568). Nair (2003:1) argues that emergence of the term capacity building came from the vast experiences of traditional technical assistance failing to give expected results so there was need of more comprehensive approaches to development including social and institutional issues along with the macroeconomic and structural reforms as well as recognition of the importance of functional institutions to the growth and development of countries.

The United Nations Development Program (UNDP) has defined capacity as “*the ability of individuals, institutions and societies to perform functions, solve problems and set and achieve ob-*

jectives in a sustainable manner” (cited in Baser & Morgan 2008:22). When using the term ‘capacity’ Kühl (2009:552) refers to all capabilities required to assume responsibility for the development of one’s own environment, from concrete skills (technical know-how, skills to operate equipment) to key competencies (problem-solving, networking, adapting to changing situations).

Kühl (2009:574) links capacity development strongly with development assistance when he argues that Western development assistance organizations are and have been faced with certain expectations in the industrial countries, such as being accountable to the taxpayers for using tax money effectively. According to him the concept of capacity development should primarily be seen in the light of the legitimacy requirements to which the development assistance organizations are subject to. Baser and Morgan (2008:18) do not limit the concept of capacity development solely in the field of development assistance but have a more holistic approach by including the potential in developing the capacity within each human system, be it individual, group or network or even a country. According to them the capacity development is the process of unlocking this capacity and the process means always some level of change in people’s access to resources, opportunities and authority. Authors emphasize that while some individuals and groups are privileged, others are not, and those with power need to accept or support the changes which take place when the development of capacity occurs. Nair (2003:2) reminds that if real changes in capacity are expected to take place nationwide, it is necessary to involve all levels of society; individual, organizational and systems, as they are all inter-related in society.

Mundia (2009) discusses the capacity building from the view of Southern NGOs (non-governmental organization) and CBOs (community-based organizations) getting support for capacity building from Northern NGOs and other donors. He defines organizational capacity as a function of many factors (e.g. physical assets, cultural norms and individual capabilities) existing within an organization. To him, capacity is “*the ability of the organization to effectively manage its programmes to achieve the stated goals and objectives with minimum external assistance*” (Mundia 2009:5). Ker (2003 in Wachira n.d.) defines organizational capacity as organizations’ “*ability to successfully apply its skills and resources to accomplish its goal and satisfy its stakeholders’ expectations*”. Skills and resources include staffing, technology, financial resources,

infrastructure, strategic leadership, process management as well as networks and linkages with other organizations and groups. Mundia suggests that instead of being a set of discrete activities, capacity building should be a continuous process designed to influence complex human and organizational systems. That is because all outside interventions have an impact on the capacity of an organization. He also continues to note that instead of having the sole focus on people's skills and knowledge, other aspects such as processes and culture of the organization need to be focused as well. It is also important to keep in mind, that capacity building is a voluntary activity where the responsibility to decide on, implement or participate in capacity building activities lies on the client organization. Those providing capacity building activities cannot force the adoption of any of the systems or strategies.

Like Mundia (2009), also Baser and Morgan (2008) approach capacity development from the viewpoint of systems thinking. The system perspective shows that no single element or factor (such as trained staff, financial support or organizational structure) can by itself explain the development of capacity. Instead, system 'properties' such as capacity, which have characteristics not found in any of the elements, emerge out of the interactions of the elements. They continue to argue that interventions such as trainings are not likely to make significant changes to the performance in case they do not ignite or create an opportunity for change in the actor's behavior. (Baser and Morgan 2008:14). Current capacity building practices of many Northern NGOs, including short-term support, simplistic training approaches and mass trainings with limited budgets are criticized by Mundia (2009:21) Based on his findings, in a situation where only one representative from an organization is invited to the training, the lack of support from other members of the organization (who did not participate in the training) may hinder the implementation of the learned skills in practice. As he continues to discuss, this is because often the transfer and sharing of knowledge to other members of the organizations, not participating the training, does not take place or is not very effective. However, based on his experience, mentoring my relatively similar organization can be an effective method in strengthening the capacity of an organization. (Mundia 2009:21)

To represent a more holistic approach to capacity and capacity development, Baser and Morgan (2008) present capability framework which consists of five core capabilities of organizations. Baser and Morgan define capability as “*the collective skill or aptitude of an organization or system to carry out a particular function or process either inside or outside the system. Capabilities enable an organization to do things and to sustain itself.*” The five core capabilities and their definitions presented by Baser and Morgan were summarized by Brinkerhoff and Morgan (2010) as follows:

The capability to commit and engage: Actors are able to: mobilize resources (financial, human, organizational); create space and autonomy for independent action; motivate unwilling or unresponsive partners; plan, decide, and engage collectively in exercising their other capabilities.

The capability to carry out technical, service delivery, and logistical tasks: Actors are able to: produce acceptable levels of performance; generate substantive outputs and outcomes (e.g., health or education services, employment opportunities, justice, and the rule of law); sustain production over time; and add value for their clients, beneficiaries, citizens, etc.

The capability to relate and attract support: Actors can: establish and manage linkages, alliances, and/or partnerships with others to leverage resources and actions; build legitimacy in the eyes of key stakeholders; deal effectively with competition, politics, and power differentials.

The capability to adapt and self-renew: Actors are able to: adapt and modify plans and operations based on monitoring of progress and outcomes; proactively anticipate change and new challenges; learn by doing; cope with changing contexts and develop resiliency.

The capability to balance diversity and coherence: Actors can: develop shared short- and long-term strategies and visions; balance control, flexibility, and consistency; integrate and harmonize plans and actions in complex, multi-actor settings; and cope with cycles of stability and change.

Among the findings of Baser and Morgan was that many of the interviewed practitioners saw capacity mainly as an issue linked to human resources and development of operational and technical skills and competencies of people. However, as presented in the capability framework, the capability to carry out technical, service delivery and logistical tasks is only one of the five core capabilities constituting capacity but according to Baser and Morgan all five are necessary to ensure overall capacity (2008:26). The capability to commit and engage in development activities was emphasized by Baser and Morgan as being vital for energizing the organization and other capabilities:

Participant commitment and motivation are the driving forces behind the process of capacity development. In particular, both leadership and 'followership' are key elements of and contributors to commitment and motivation. Human systems in the form of organisations or institutions evolve through cycles, configurations and phases that shape the nature of their capacity. External intervenors need to be aware of these types of evolutionary patterns. (Baser & Morgan 2008:19)

One of the challenges with capacity development processes, as noted by Baser and Morgan (2008) is that although many interventions on capacity development focus on the formal and visible there are many hidden and informal factors such as relationships and patterns of authority which are significant in the development of capacity. Baser and Morgan make a notion how most of the capacity development has traditionally focused on weaknesses, gaps and deficits, not on strengths. Some reasons for this have been traditional 'engineering' approach emphasizing the need to 'fix' things to solve problems. Another reason identified is the easier accessibility of the weaknesses, such as gaps in skills and resources, unlike strengths which are often linked with informal practices and culture, elements not so easy to measure. One aspect is also that strength is often seen as a fortunate condition being able to stand on its own. However, as they refer to a strength-based theory of action, the deeper capacity of human systems comes from affirmation and tapping into sources of commitment and imagination, not from solving problems and fixing things. Actually, focusing on constraints and weaknesses can even decrease motivation and energy and, in turn, increase defensiveness. (Baser & Morgan 2008:112-113).

Rautanen (2016) discusses capacity development from the viewpoint of rural water supply and sanitation, contexts highly relevant to this study. She bases her frame of reference to three levels, where capacity development objectives can be pursued: 1) individual, 2) organizational and 3) enabling environment (OECD 2006:13). In the individual level, the focus is on individual skills, knowledge and attitudes of the personnel of the organizations. They are made available to the organization but are lost when an individual leaves the organizations. When individual skills are shared in organizational level with others they become part of the processes and are incorporated in the culture of the organization. In the organizational level factors such as organizational structure, leadership, definition of roles and responsibilities, appraisal procedures, attitudes and incentives, access to information, infrastructure and technology as well as communication within the organizations are important factors. Finally, at the level of enabling environment external factors such as policies and laws, administrative and legal systems, the general political stability of a country, stakeholders, networks and partnerships and budgets from parent institutions and ministries which create the environment where the organization operates and where its capacity is formed and shaped.

In addition to these three levels, Rautanen (2016) includes in the picture also good local water governance, which is an important aspect of the enabling environment, together with institutions, both formal and informal (Figure 1). Regarding the sustainability of rural water supply, it is important to acknowledge the presence and interaction of these elements with each other.



Figure 1. Three levels on which capacity development can be pursued – individual, organizational and enabling environment. (Rautanen S.-L. 2016)

3. CONTEXTUALIZING THE CASE STUDY IN NEPAL

This chapter gives background information for the reader about the demography and geography of Nepal as a country as well as on the water sector governance. In the end of the chapter, the main elements of Rural Water Supply and Sanitation Project (RWSSP) implemented in Lumbini Zone Western Nepal between 1990 and 2005 are shortly described.

3.1 Geography and demography of Nepal in brief

Nepal is a landlocked country located between China and India with a population of roughly 26.5 million (census 2011) and an area of 147,180 km² (CBS 2012). It is characterized with high mountains and lowlands and is divided into three topographic areas, Terai plain, the Mid-Hills and the Himalayan mountain range. Although Terai plain in the south constitutes only one-sixth of the total land area in Nepal, about half of the population and agricultural land is located there. Inner-Terai is an area of tropical valleys enclosed by the foothills, between Terai plain and hills. In the hilly region, in spite of challenging access and conditions, most of the slopes are cultivated using terrace farming and an estimated 43% of the population lives in the area. Less than 10% of the population lives in the Himalayan mountain range which covers the Northern part of the country until the Tibetan border. The world's highest peak, Mount Everest (8 848 meters from the sea level) is also located in Nepal (MFA 2015)

Nepal's climate is influenced by the Himalayan mountains and the South Asian monsoon. It varies from Terai's subtropical to temperate in the hills and arctic in the mountains. Out of Nepal's total land-area 15 % is covered with snow. The climate can be divided into four distinct seasons: pre-monsoon (March-May), monsoon (June-September), post-monsoon (October-November) and winter (December-February). The average annual rainfall is approximately 1800 mm, with the highest amount of rainfall during monsoon in the eastern part of the country. Temperature tends to be highest in the southern parts of the country and decrease towards the north as well as with altitude. The highest temperatures occur during the pre-monsoon period, the winter season being the coldest time of the year. (Ministry of Environment 2010).

Nepal is divided into five development regions and 75 districts comprising of 58 municipalities (cities and towns) and 3 915 village development committees (VDCs). Each VDC is divided into nine wards having on average 6000 inhabitants (MoFALD 2013). Nawalparasi District, where the study was conducted, is located in the Lumbini Zone and is one of the 16 districts in the Western Development Region. It is located partly in Terai and partly in the Mid-Hills and has a total land area of 2 162 m². The administrative offices are located at the district capital Ramgram (old name Parasi still in use as well). Mahendra Highway, which connects the country from east to west, cuts through the district dividing it into two parts. Nawalparasi District is comprised of 56 VDCs and 7 municipalities.(Nawalparasi DWASHCC 2013)

The location of Nawalparasi district is shown in Figure 2.



Figure 2. The five development regions of Nepal. Nawalparasi district is located in Western development region and the national capital Kathmandu in Central development region. (Source: <http://test.nepalnews.com/images/Photos/Society/nepal-map.gif>, 2.3.2016)

Nepal is a country with high ethnic variety comprising more than 100 ethnic groups and 60 languages. Hinduism is the main religion followed by 81% of the population. Around 83 % of the

population lives in rural areas. Although the overall literacy rate for the population aged 5 years and above in whole Nepal was 65.9 % in 2011 census the the gender gap is still significant in the country. Male literacy rate (75.1 %) is much higher compared to the female literacy rate (57.4%) and although 26 % of Nepali households are headed by women, only 18 % of rural households reported female ownership of fixed assets. Nepal's population is characterized as young with about 35 % of its population being under 14 years and youth aged 15 to 24 years constituting approximately 20% of the total population. For almost half of the population tap or piped water is the main source of drinking water, while tube well/hand pump well provides water for 35 % of the population. The rest of the people use wells and other sources. (CBS 2012)

Migration is one of the special characteristics of Nepalese society. According to the 2011 census, one in every four households reported at least one member of the household to be absent or living out of the country. Two million Nepalese have been estimated to have migrated to live outside the country mostly as labour migrants. (MFA 2014) Young people are the most prominent to leave as the highest proportion (circa 45%) of the absent population was recorded to be from the age group 15 to 24 years. Remittances are a significant source of income. While in 1996 only 23% of the Nepalese households received remittances, in 2011 the figure had increased to 56 %. Nationally remittances constitute on average 17 % of household income, 28 % coming from agriculture and 37 % from non-farm enterprises. Comparing different regions, remittances constitute the highest share (21.5%) of the total household income in Western Development Region where Nawalparasi district is located. (CBS 2012)

3.2 Decentralized decision making and local governance structures in Nepal

Nepal has gone through significant changes in its political environment during the last decades. The story of modern Nepal dates back to 1768 when Shah Dynasty was founded and King Prithivi Narayan Shah named the country as Nepal. The country went through over 200 years of monarchy, from absolute to constitutional, before the promulgation of Interim Constitution ended the monarchy in 2008. After operating eight years with interim constitution Nepal got a new constitution in 20th of September 2015 and Nepal became a federal republic. (The Asia Foundation 2012, MFA 2015)

During the rule of the kingdom, the administration was highly centralized and there was no public representation until the 1990s. The process of decentralization gradually started and election of representatives for local bodies was held in 1992 for the first time in Nepal. The Local Self-Governance Act 1999 is the basis for Nepalese local government system. The local governance institutions are the district development committees (DDCs) at the districts, municipalities in the urban centres and the village development committees (VDCs) in villages, all responsible for socio-economic development. The roles and responsibilities of these institutions are defined in the Local Self-Governance Act (The Asia Foundation 2012).

The decade-long political conflict between the Maoist and the Royal Nepalese Army (1996-2006) had a strong degrading impact on the local administrative systems. Due to political instability the last official elections for district, municipal and village councils were held in 1998. Due to the failure to hold local elections there have been no elected local representatives in the village and district level since 2002 when the last official tenure ended. In practice this has meant that since then VDCs and DDCs and municipalities have been managed in ad-hoc manner by parties or by government employees. The Ministry of Federal Affairs and Local Development (MoFALD) has appointed government officials to take care of the day-to-day functions: VDC secretaries at the village level, Chief Executive Officers in municipalities and Local Development Officers (LDOs) at the districts. In practice this has meant that the local institutions which were meant to increase citizen participation and local democracy have become extended arm of the government. The Local Self-Governance Act 1999 mandates VDCs, DDCs and municipalities to conduct a large number of development activities, but the funding and human resources are often inadequate. The fact that the VDC secretaries, Chief Executive Officers and Local Development Officers are accountable to the central level ministry, not to the community, has also decrease the effectiveness of the local bodies. Lack of elected representatives has also caused a lack of transparency and accountability and poor implementation of programs and service provision and corruption has been identified. (Mallick 2013:3, 31-32; The Asia Foundation 2012).

Although the local governance has degraded due to political instability Mallick (2013:3) also brings out a notion that the gap created by the absence of elected local governments has been

partly filled by the large number of community based organizations (CBOs). While these groups are providing a platform and vehicle to implement local infrastructure projects, to improve access to credit and savings, management of natural resources and community facilities Mallick regards them as an example of community-driven development which has taken place in Nepal. Another example is the formation of ward citizen forums under the Local Governance Community Development Programme (LGCDP) implemented since 2008 in all 75 Districts in Nepal. The aim of the Programme is to improve the local governance and community-led development and increase local-level planning, coordination, monitoring and oversight of local level public services. Ward citizen forums, established in all wards of villages and municipalities, include representatives from different social groups in the community (elites and disadvantaged groups) as well as members from existing local organizations such as (water users committees, forest user groups, youth groups etc.) selected through consensus of all local people. (MoFALD 2013)

3.3 Water governance in Nepal

In order to give the reader a better understanding of the context where rural water supply schemes are being implemented and operated in Nepal, the following chapter presents the complex situation with various players of water governance.

3.3.1 History of water governance in brief

Until the 1970s the rural water supply and other community development was mostly in the hands of community members themselves. The establishment of the Department of Water Supply and Sewerage (DWSS) under the Ministry of Water Resources in 1972 boosted the development of centrally organized water supply services in Nepal. DWSS was the main actor in the sector throughout the 1970s when the water supply development still concentrated on urban areas and district headquarters. Since the 1970s the construction of small-scale village-level water supply schemes was the responsibility of the then Ministry of Panchayat and Local Development (MPLD). However, although some rural water supply development took place in 1970s the water supply sector remained rather undeveloped main activities concentrating on urban centres. (Hänninen 2014:109, Prasain 2003:107-108)

During the 1980s, partly due to the pressure by United Nation's International Drinking Water Supply and Sanitation Decade, the water sector started to gradually open up for NGOs and bilateral and multilateral donors who started to implement water supply schemes also in the rural areas. Some of the major actors included UNICEF, United Mission to Nepal (UMN), the World Bank, the Swiss NGO Helvetas and Asian Development Bank (ADB). In the 1990s as a part of the poverty reduction strategy water sector became one of the priority sectors of government investments. As a result increased amount of rural water supply projects led by private sector and NGOs started to emerge and the focus increasingly shifted to community-based projects as decentralization policies started to take root in Nepal. The Ministry of Panchayat and Local Development (MPLD) was succeeded by the Ministry of Local Development (MLD) under which the Department of Local Infrastructure Development and Agricultural Roads (DoLIDAR) was established in 1997. DoLIDAR then took responsibility for the implementation of small-scale rural water supply projects in coordination with local communities. The Department of Water Supply and Sewerage (DWSS), shifted under the Ministry of Housing and Physical Planning (MHPP) was still responsible of the larger projects. (Hänninen 2014:107-109, Prasain 2003:109, Saarilehto 2006, 36-41).

3.3.2 Water governance at present

Coordination at the national and district level

At present water issues are stretched over various ministries, while key ministries involved with the water sector at the central level are Ministry of Urban Development (MUD), Ministry of Federal Affairs and Local Development (MoFALD), Ministry of Finance, Ministry of Health and Population, and Ministry of Education. The coordination of water supply and sanitation efforts falls mainly under two agencies: 1) Department of Water Supply and Sewerage (DWSS) under the Ministry of Urban Development and 2) Department of Local Infrastructure Development and Agricultural Roads (DoLIDAR) under the Ministry of Federal Affairs and Local Development (MoFALD). At district level DWSS is represented by Water Supply and Sanitation Division Offices (WSSDO) while DoLIDAR is represented through District Technical Offices (DTO), which are responsible of the technical issues. (MPPW 2011) The organizational structure of the main agencies involved in the implementation of rural water supply and sanitation projects in Nepal is presented in Figure 3.

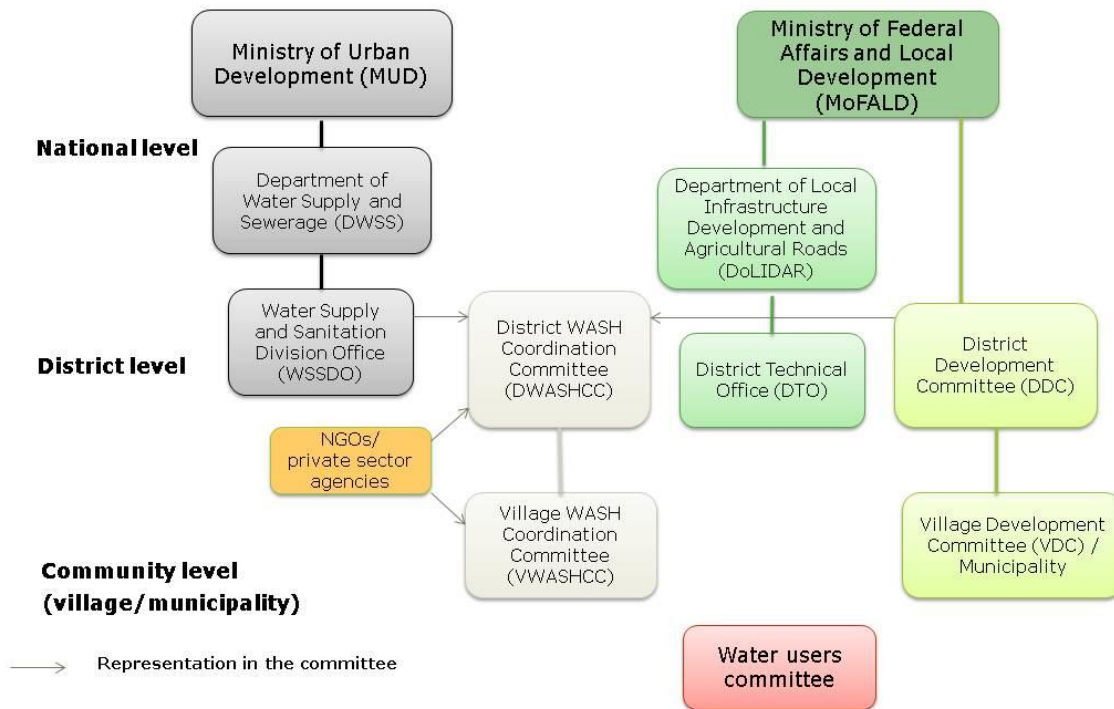


Figure 3. Simplified organizational structure of the main government agencies involved in the implementation of the rural water supply and sanitation projects in Nepal.

On the policy level it is outlined that DoLIDAR is responsible for the implementation of water supply project with less than 1000 beneficiaries while DWSS is responsible for project over 1000 beneficiaries. However, in practice this clear division of roles is not taking place as both agencies are involved in projects with more or less than 1000 beneficiaries. Department of Water Supply and Sanitation (DWSS) and its division offices have a strong engineering know-how and long experience with specialization in water supply and sanitation. DoLIDAR has been working on infrastructure development covering seven sectors (Local Transportation, Housing Building and Urban Development, Water Supply and Sanitation, Small Irrigation and River Control, Micro Hydro and Alternative Energy, Solid Waste Management, and Social Infrastructure). As the activities are stretched out over different sectors, financial and human resources for water supply and sanitation at the District Technical Office (DTO) are limited. Both ministries have their sep-

arate budgets for the planning and implementation of water supply and sanitation projects at the district level. (MPPW 2011)

At present water and sanitation sector in Nepal is characterized by institutional fragmentation, lack of coordination and presence of overlapping roles and responsibilities among different levels of governance and agencies (MPPW 2011, Hänninen 2014). The plan for the Department of Water Supply and Sanitation (DWSS) to phase out from direct implementation of rural water supply and sanitation schemes to hand over the ownership and responsibility for the operation and maintenance to local bodies was set over ten years ago in National Water Supply and Sanitation Strategy 2004. In practice this development has not taken place and as noted by Hänninen (2014:110) the duplication of roles and activities between different ministries had led to a “situation of institutional fuzziness” in the sector. However, challenges with institutional weakness and lack of coordination have been acknowledged also nationally and some actions have been taken to harmonize the water sector. Those have included preparation of National Sanitation and Hygiene Master Plan and establishment of water supply, sanitation and hygiene (WASH) coordination committees at different levels of society. Sector Efficiency Improvement Unit (SEIU) of the Ministry of Urban Development has organized Joint Sector Reviews in 2011 and 2014 to bring together key players in water and sanitation sector from INGOs to government offices to discuss burning issues in the development of the sector. (FCG International 2013)

Overall coordination and information sharing of the water supply and sanitation activities at the district level falls on the District Water Supply and Sanitation Coordination Committee (DWASHCC) which provides a platform for linkage between different agencies. Due to the vast number of actors in the sector, coordination is vital. All actors aiming to carry out water supply and sanitation interventions in the district are required to present themselves at DWASHCC and abide by the local planning process. While the Local Development Officer of DDC chairs the meetings the division chief of the WSSDO works as the secretariat. Various NGOs and private sector agents as well as other relevant government agencies are also represented in the committee (See Figure 3). In theory, a Village Water Supply and Sanitation Coordination Committee (VWASHCC), a structure similar to DWASHCC at district level should be present in each VDC

to coordinate the actors in the community level. However, the actual implementation of the committees is still lacking or the committees are often weak. (MPPW 2011, WaterAid Nepal 2005)

Water users committees

Water Resources Act 1992 and its regulations constitute the main legislation in Nepal which covers the use of water and water source management. The Act states that people interested to use the water resource can establish a users committee for collective benefit of all the users on an institutional basis. In order to be acknowledged as a legal entity, the committee needs to have a constitution and register itself at the District Water Resource Committee (DWRC) within the district it is located in. DWRC is a body with representatives from all district offices engaged in issues related to water resources. The Act further defines that water users committees shall be autonomous continuous organizations with self-governance which has the right to receive, use and sell property, have a separate stamp for the work, and have the right to appeal as a person which may also sue or be sued against. While the roles and responsibilities of users committees have been defined in the Water Resource Act 1992 and its Drinking Water Regulation 1998, Rural Water Supply and Sanitation Policy and Strategy 2004 also define some guidelines for the committees stating that the lead role in constructing and implementing as well for the operation and maintenance (O&M) of rural water supply projects is on communities and users committees. (WaterAid Nepal 2005)

Village development committees (VDCs) and municipalities usually have a small annual budget for water supply and sanitation schemes but if water users committees are in need of getting larger budget support for the O&M activities there are usually two options to apply for funding, either from DDC or WSSDO of the district they are located in. As WSSDOs receive their funding from a different source than DDCs they do not exclude each other. In addition to DDC and WSSDO, users committees may also apply funding from other district level agencies such as District Soil Conservation Office (DSCO), which areas of responsibility include soil conservation and watershed management. (MPPW 2011)

The Federation of Drinking Water and Sanitation Users Nepal (FEDWASUN), established in 2004, is an umbrella organization for water and sanitation users committees in Nepal. It advocates water and sanitation rights at a national level and operates also at district level with an aim to increase the cooperation and good governance among the user committees and service providers. The organization directly represents the water users committees. (FEDWASUN 2009)

According to the Rural Water Supply and Sanitation Strategy 2004 local government bodies at the village and district level are not supposed to directly implement WASH projects but their role is to facilitate with implementation as well as regulation and monitoring of the projects. It states that “VDCs will play the lead role in involving users committees in the construction of rural water supply and sanitation facilities, including assisting the organised communities to mobilize their contributions in cash and kind.” However, the lack of clear understanding on the facilitating roles of different agencies especially between District Technical Office (DTO) and Water Supply and Sanitation Division Office (WSSDO) has resulted ineffective implementation of the policy. Although there have been attempts by some actors to engage VDCs in the monitoring, regulating and facilitating projects the engaging is still lagging behind from the level envisaged in the policy. It can be assumed that this is partly due to the challenges with local administrative systems and lack of elected representatives. (WaterAid Nepal 2010).

3.4 Rural Water Supply and Sanitation Project (RWSSP) 1990-2005

The Government of Finland has been supporting large-scale water supply and sanitation projects in Nepal since the early 1990s. The gravity flow water supply schemes in the focus of this study have been established during the first bilateral water project, Rural Water Supply and Sanitation Project (RWSSP), which was implemented in the Lumbini Zone in the Western Nepal during 1990-2005. The project was partly funded by the Government of Finland and His Majesty’s Government of Nepal. The project was characterized with a community-based approach where communities were given a strong role in the operation and maintenance of the water supply schemes through the establishment of the water users committees with members democratically elected by the water users. After the completion of the scheme, it was handed to the water users committee with the responsibility for the everyday operation and maintenance of the scheme. (RWSSP 2005)

The number of beneficiaries, schemes constructed and contribution made by different stakeholders during different phases are presented in Table 3. In the following chapters the main approaches of the project are shortly described within three phases the project was implemented.

Table 3. Activities, beneficiaries and contribution made by different stakeholders during the RWSSP. (RWSSP 2005)

Activity	Phase I 1990-1996	Phase II 1996-1999	Phase III 1999-2005	Total
Water supply provided (people)	234 000	124 000	242 000	600 000
Sanitation provided (people)	14 000	18 000	323 000	355 000
Water supply provided (schemes)	310	130	380	820
Sanitation provided (schemes)	340	70	550	960
Stakeholder/Contribution				
Contribution of Finland (million Euro)	6,9	2,9	6,5	16,3
Contribution of His majesty's Government of Nepal (HMGN) (million Euro)	1,5	0,7	1,7	3,9
Contribution of Districts (million Euro)	0	0	0,4	0,4
Total contribution	8,4	3,6	8,6	20,6
<i>Additional contribution of users, VDCs and others was around 60 % of the total investment costs during the Phase III.</i>				

3.4.1 RWSSP I 1990-1996

The Phase I of the Rural Water Supply and Sanitation Project took place between 1990 and 1996. In the early 1990s when the project commenced, the water supply and sanitation coverage in the project area was quite low. According to the project document improved water supply coverage varied from 6% in Gulmi district to 28% in Argakhanchi district, figures including also urban centres. The rural coverage of improved water supply in project districts was estimated to be on average 13 % while improved sanitation coverage was only 1%. (RWSSP 1989:8)

The project was implemented in all six districts of the Lumbini Zone (Rupandehi, Nawalparasi, Kapilvastu, Gulmi, Palpa, and Arghakhanchi). The executing agency at the central level was the

Department of Water Supply and Sewerage (DWSS) under the Ministry of Housing and Physical Planning (MHPP). Activities were implemented by the District Water Supply Offices (DWSO) while day-to-day operations were managed by a Finnish consulting company, Plancenter Ltd, which also provided technical assistance for the project. The project had five sub-projects: 1) district water supply development plans, 2) physical improvements to increase water supply, 3) socio-cultural studies, hygiene education and sanitation programme, 4) training and human resource development and 5) community involvement. The idea of district development plans was replicated later by many other organizations such as UNICEF, UNDP and DWSS (RWSSP 2005).

Although the decentralization process had not yet started, a will to use community based approaches in the implementation of the project was expressed at the ministry level in Nepal during project planning. One of the main aspects of community-based approach used was the establishment of water users committee who had the responsibility of everyday operation and maintenance (O&M) of the constructed water supply schemes. Communities also contributed in cash and in-kind work to the scheme construction and a separate O&M fund was created to ensure the sustainability of the schemes. Village maintenance workers (VMWs) were trained in the communities to take care of maintenance activities. However, the main mode of the implementation during the Phase I became contracting, which meant that participation by local communities during the construction of water supply systems remained low. (RWSSP 2005, Saarilehto 2006)

3.4.2 RWSSP II 1996-1999

During the Phase II of the project the nationwide decentralization legislation and operational guidelines was being drafted, finally leading to the establishment of Local Self-Governance Act in 1999. Emerging decentralization legislation increased the emphasis on local bodies (DDCs, VDCs, municipalities) and resulted in the change of implementation modality of RWSSP, when the Ministry of Local Development (MLD) replaced the Ministry of Housing and Physical Planning (MHPP) as an executing agency at the central level. The Department of Local Infrastructure Development and Agricultural Roads (DoLIDAR) took an active role and DWSS was only involved in an advisory role. The work at the district level was done through District Development

Committees (DDCs) while in the village level partnership with Village Development Committees (VDCs) also begun. (RWSSP 2005)

The Phase II was built on a Step-by-Step procedure that was followed during planning and implementation of the projects. A new funding modality, District Water Supply and Sanitation Fund (DWSSF), was established. The governments of Finland and Nepal both allocated 50% of the budgeted funds to the DWSSF. While the community could get 50% of the investment costs from the fund, the other half was partly contributed through in-kind work, and partly as cash contributions from users and VDC. Households needed to contribute 3 000 NPR/tap and part of it was used for investments while the rest was deposited on the O&M fund managed by the users committee. The project insisted that funds for the scheme implementation ought to go through users committee's account, not through the government accounts. A new feature was project implementation in cooperation with Support Organizations (SO) (NGOs community-based organizations and local consultants). According to the completion report of RWSSP the Phase II of the project was one of the 'laboratories' of for the MLD to test decentralized district based working modality in rural water supply and sanitation. Total population coverage was more than 100,000 people in water supply in addition to 20,000 people who had their schemes underway and carried over to from Phase I to Phase II. (RWSSP 2005)

In practice strongest collaboration with HMGN agencies in villages, if not always intentional, has been with the Women's' Development Office and the District Health Office whose VDC level activities through the establishment of Mothers' Groups, training of Female Community Health Volunteers (FCHVs), and operation of a credit an saving fund directed at women have clearly supported RWSSP activities. Collaboration with the health sector has been sought also to support sanitation activities.

3.4.3 RWSSP III 1999-2005

Phase III aimed at taking into account many of the lessons learned from previous two phases. During the Phase III two new Districts, Tanahun and Parbat, were added along the six districts of Lumbini Zone where activities had already taken place during the first two phases. DoLIDAR continued as the main partner at the central level. The project framework changed from project to

programme approach facilitating the implementation of district-based projects with an aim to support the decentralization process. (RWSSP 2005)

The overall objective of the phase III was a “full coverage of water supply and sanitation” and a new “VDC Approach” was introduced aiming at achieving total water supply and sanitation coverage in all the households within an administrative and/or geographical setting. While the use of District Water Supply and Sanitation Fund (DWSSF) with 50:50 funding from Finland and Nepal was continued, the project also establish Self-Reliant Approach where the external funding, 25% of the total budget of the scheme implementation for the self-reliant schemes, came from the Government of Finland and from the district development committees (DDCs). This approach was directed to communities which were willing and capable of funding a larger share of the investments in the scheme construction. (RWSSP 2005)

Support to the districts and VDCs of participating districts in decentralized planning, implementation, monitoring and evaluating the water supply and sanitation development activities and to build up their institutional capacity was done in line with Local Self-governance Act. The work with local support organizations continued. During the Phase III the local participation to the construction of water supply and sanitation schemes was significant as an estimated 25 000-30 000 local users gave their contribution to the implementation of 380 water supply and 550 sanitation schemes. In addition, there were around 130 local consultants employed through support organizations. While the local project staff was around 80 people, there were only two expatriates from Finland responsible of general management and supervision.

Although gender issues were integrated already partly during the Phase II they were further emphasized during the phase III where gender mainstreaming was more strongly included in the project activities and the project also had a gender specialist. According to the gender policy of the Phase III half of the water users committee members and half of the participants in various meetings and trainings were to be women and the target were reported to have been reached towards the end of the Phase III. Also gender sensitive trainings were organized in the communities. (RWSSP 2005)

During the Phase III 1,115 persons were trained by the project as Village Maintenance Workers (VMWs), Local Latrine Builders, Rainwater Harvesting Jar Mistries and Water Technicians. During the Phase III there had been a steady increase in the share of women participating in the trainings. The percentage of women in technical trainings increased from 0% in first year to 17% during the last year of the Phase III. As technical trainings were traditionally considered to be done by men only, participation of women was considered as a significant achievement. In 2004 the project organized a special seminar for women who had received technical trainings to share experiences. Also a monitoring study was conducted to investigate the reality of these women. Based on the findings, many women were active in their communities, and many of the trained women were also active in other community groups, such as Mother's groups, water users committees, community forest groups etc. However, challenges were identified as well, one of the main challenges faced by both male and female technicians being the seasonal availability of work and random payments and even lack of payment completely. The study identified that more institutional support structures and follow-up systems were needed to create opportunities for women to maintain and use their skills. (RWSSP 2001/2002, RWSSP 2004, RWSSP 2005)

According to the Phase II mid-term review report (RWSSP 1998), post-construction activities during phases I and II had been identified entirely in terms of the sanitation sub-sector, while the investments made in the human resources development in water sector had not been followed-up. The noticed weakness in post-construction component resulted in the development of a number of activities during the Phase III. In total 15 post-construction experience sharing workshops for RWSSP Phase I and Phase II schemes were organized during 2002/2003 in all six Lumbini Zone districts. In total, 471 persons representing users committee members, VMWs, some service operators, and district and village level key persons participated. The workshop in Nawalprasi district was organized in 2003. The emphasis of the training activities was on the community based O&M funds and strengthening the human resources of the users committees managing the water supply systems as well as institutional strengthening at the district level. Management trainings for users committees were done by specially trained trainers, many from the more active users committees. A manual to guide the users committee was also developed. However, as the project

woke up to the need of post-construction support only during the Phase III, it was admitted that post-construction and O&M were the components where least success could be noted regarding the phases I and II (RWSSP 2003, RWSSP 2005).

The armed conflict between Maoist and Royal Army between 1996 and 2006 affected the local governance in rural areas resulting to the situation where most of the VDC officials shifted to work from the rural villages into the district headquarters. This led to the eradication of local governance structures in many rural villages affecting also the implementation of RWSSP during the Phases II and III. However, despite the armed conflict, RWSSP continued working with the communities until the end of the project Phase III in 2005. (RWSSP 2005)

4. MATERIALS AND METHODS

4.1 Qualitative research design

The approach taken in the study is qualitative case study which is an in-depth holistic analysis of a bounded system. Qualitative case studies produce context-specific knowledge which is different from the information produced through quantitative studies. They can reveal information about a phenomenon which otherwise could not be accessed and facilitate prediction and documenting of infrequent and non-obvious occurrences which might be missed by standard statistical approaches (Abramson 1992 cited in Merriam 2009:46).

In this research the bounded systems under the study are eight gravity flow water supply schemes located in Nawalparasi district, which were constructed during the Rural Water Supply and Sanitation Project (RWSSP) implemented between 1990 and 2005. As users committees are responsible of the everyday operation and maintenance of the rural water supply schemes they are interesting units for qualitative data collection and analysis related to the long-term sustainability of the rural water supply schemes. The assumption behind the design of the qualitative study is that users committee members are the ones who are best able to answer to the questions regarding their water supply system. However, as users committees do not operate in a vacuum, representatives of stakeholder groups such as water users, local government personnel, local women's groups and technical personnel working for schemes were interviewed. This was done to ensure validity and to introduce diversity in the answers to the questions. As the interest was to study differences of many users committees, the approach used was a multiple case study. The field data was collected during two field visits in Nepal, in May 2014 and in April 2015. During both visits the geographical area in focus of the study was Nawalparasi district located in the Lumbini Zone in Western Nepal. The qualitative sample selection, data collection and data analysis methods are explained in the following chapters.

4.2 Sample selection

Sampling of the schemes of interest and interviews were done in non-random and purposive way. In multiple case study research, a single case is of interest because it belongs to a particular collection of cases that share a common characteristic or condition (Merriam 2009). Regarding

this study the common characteristic among the cases is that all studied users committees are responsible of the operation and maintenance of the water supply schemes constructed with the support of RWSSP. Purposeful sampling was selected as the method to obtain information from the data collection during the field visits as the method “*is based on the assumption that the investigator wants to discover, understand, and gain insight and therefore must select a sample from which the most can be learned*” (Merriam 2009:77).

Criteria for the scheme selection varied in 2014 and 2015. In 2014 the criteria was to identify two water supply and sanitation schemes which had been constructed during the RWSSP and had well-functioning users committee in operation. Due to a high number of schemes implemented in Nawalparasi district during RWSSP it was necessary to narrow the focus. Schemes located in Nayabelhani VDC and Amarapuri town were selected, as they had been identified from the project documents and in discussions with previous project personnel of RWSSP as well-functioning users committees during the project implementation. Thus the interest was to study their current situation 10-15 years after the project implementation.

Snowball sampling is a method of a purposeful sampling where the researcher first identifies few key participants, who meet the criteria for the participation of the study and those are asked to refer to other participants familiar with the topic. Both key informants in Finland and in Nepal were used to identify information-rich sources. In Finland discussions with two persons who had worked as project managers during RWSSP helped to identify schemes to be visited during the first field visit in May 2014.

Based on literature it was known that users committees may face different challenges with the operation and maintenance of the schemes depending on their geographical location and the level of remoteness. In Nepal the access to hilly communities is often not very good due to a poor quality of road network. Thus one criteria for sampling in 2015 was to select two communities, one from lowland Tarai and another from the hills. Another criteria was to select communities which had more than one water scheme constructed during RWSSP. Including more than one scheme per community would enable comparison of the users committees also within a single

community to see whether or not the challenges and approaches varied. In order to have variation among the scheme characteristics schemes constructed during different phases of RWSSP, schemes of different sizes, both small (≤ 150 hh) and large (< 150 hh), schemes with different service level using community taps and private taps as well as rehabilitated and non-rehabilitated schemes were to be selected. The level of cooperation with other community groups in the form of alliances formed by the users committees as well as linkage for external support were also among the characteristics to assess the activity level and networking of the users committees. Choosing users committees which seemed to be managing well and those which did not seem to be doing so good based on the data, was important as I hoped it would reveal factors contributing to the positive and negatives aspects of the capacity of the users committees to manage the schemes.

The selection of the communities to be visited during the field visit in April 2015 was made based on the preliminary data from NAPA WASH survey “Study on Long-Term Sustainability of Finnish Supported Rural Water Supply (RWS) Schemes in Nawalparasi District” which was carried out in 24 VDCs in Nawalparasi District during January-February 2015 covering a sample of 40 gravity flow water supply schemes constructed during the RWSSP. Based on the preliminary data two water supply schemes from Devchuli municipality and two schemes from Ruchang VDC were selected. After reaching the communities, one additional scheme from each community was included in the study. It was done based on the information collected in the interviews, which indicated that study on the schemes would provide valuable information for the research.

The final sample includes eight gravity flow water supply schemes: *Nayabelhani Water supply and Sanitation Scheme* in Nayabelhani village, *Amarapuri Water Supply and Sanitation Scheme* in Amarapuri town in Gaidakot Municipality, *Rambas Sitabas Water Supply and Sanitation Scheme* in Devchuli Municipality, *Aaptari Water Supply and Sanitation Scheme* in Devchuli Municipality, *Munde Water Supply and Sanitation Scheme* in Devchuli Municipality, *Ruchang A Water Supply and Sanitation Scheme* in Ruchang village, *Ruchang B Water Supply and Sanitation Scheme* in Ruchang village and *Ruchang C Water Supply and Sanitation Scheme* in Ruchang village. Among the sample villages and municipalities, Nayabelhani village, Amarapuri town

and Devchuli municipality are located in Inner-Terai while Ruchang village is located in the hills. The locations of the communities are presented in Figure 4. A short description of the characteristics of the studied schemes is presented in Table 3.

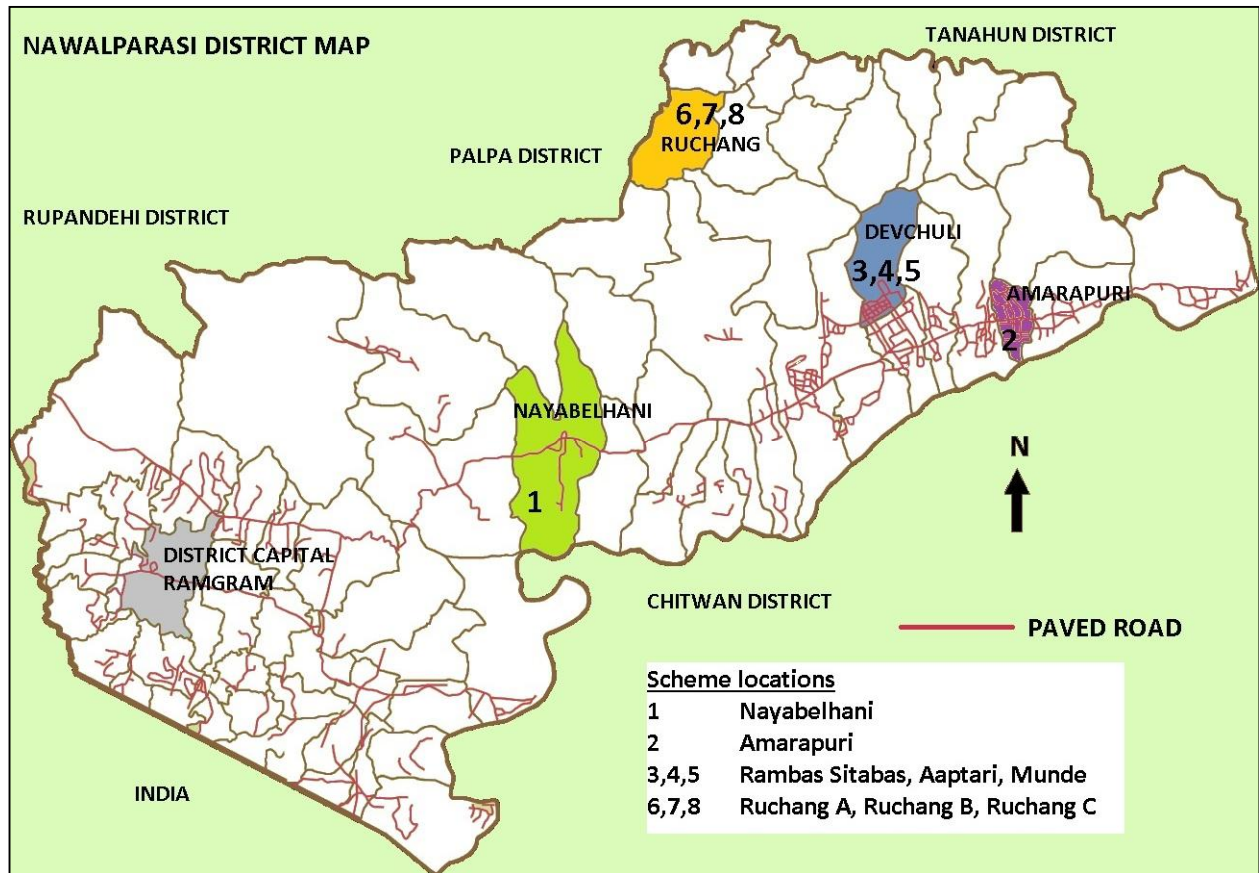


Figure 4. The location of sample schemes within the Nawalparasi district.

Table 3. Basic characteristics of the studied water supply schemes.

Name of the scheme	Location	No of house-holds served by the scheme	Construction time	Water source	Tap category	Weather road connection to highway	Selection method for the study
Amarapuri	Amarapuri town, Inner-Terai	1760	1979 (constructed) 2004 (rehabilitated by RWSSP) Phase III	Stream	1400 private taps and 15 public taps	Yes	Successful users committee during the RWSSP
Nayabelhani	Nayabelhani village, Inner-Terai	300	1996 / Phase II	Spring and spring-fed stream source	17 public taps	Yes	Successful users committee during the RWSSP
Rambas Sitabas	Devchuli municipality, Inner-Terai	500	1999 / Phase II	spring and stream sources	500 private taps	Yes	Identified from NAPA WASH survey data
Aaptari	Devchuli municipality, Inner-Terai	320	1997 / Phase II	Spring and stream sources	320 private taps	Yes	Identified from NAPA WASH survey data
Munde	Devchuli municipality, Inner-Terai	205	2000 / End of Phase II	River	19 public taps	Yes	Identified based on the field interviews
Ruchang A	Ruchang village, hills	160	1994 / Phase I	Spring	17 public taps	No	Identified from NAPA WASH survey data
Ruchang B	Ruchang village, hills	50	1993 / Phase I	Spring and spring-fed stream source	6 public taps	No	Identified from NAPA WASH survey data
Ruchang C	Ruchang village, hills	88	Phase II	Spring	13 public taps	No	Identified based on the field interviews

4.3 Data collection

The first field visit to Nepal was conducted during the 7th – 21st of May 2014. During the visit two rural water supply and sanitation schemes were examined and in addition, government officials and other people working with water supply and sanitation issues at district and national level were interviewed to get better understanding on the current situation in Nepal. The second field visit was conducted during the 1st – 21st of April 2015. In total six water schemes with users committees located within two separate communities, Devchuli Municipality and Ruchang VDC were visited in 2015.

In total 39 interviews were carried out during the field work in Nepal in 2014 and in 2015. The segregation between the type of the interview, location and gender of the interviewees is presented in Table 4. The more detailed list of all interviews is presented in an Appendix 1.

Table 4. Information about conducted interviews.

	Number of interviews conducted			Number of interviewees	
	Focus group interviews	Individual interviews	Household interviews	Female	Male
Location					
Amarapuri	2	1	1	8	7
Nayabelhani	2	2	1	6	28
Devchuli	5	10	2	15	31
Ruchang	3	4	1	4	23
Ramgram	-	3	-	-	3
Kathmandu	-	2	-	-	4
Total	12	22	5	32	96

It was decided before the field visits that users committees would be in the central point of interest in the study. However, a detailed inclusion/exclusion criteria was not set before the field visits. This was mainly because there was not a lot of pre-information on what kind of people one would find in the villages and who would be available for interviews as the time during the visit was limited. The strategy was thus to interview as many people as possible linked with the water supply schemes to collect data. This resulted in adding two schemes to the list of schemes to be studied as they emerged in the discussions with users committees originally selected based on the survey data. Main focus was on interviews with members of water users committees, while water

users and identified key persons in the selected communities were also interviewed. During the field visit in 2014 the researcher wanted to also increase her understanding of the present situation of the water supply and sanitation sector in Nepal. This was done through interviews with officers of government ministries at the district headquarter in Ramgram and in Kathmandu, with experts working with Finnish-supported RWSSP-WN project currently implemented in Nawalparasi district and with representatives of the umbrella organization for users committees in Nepal (FEDWASUN).

Interviews were conducted partly semi-structured, partly unstructured using one-on-one and focus group interviews. Semi-structured interview allows more flexibility for the researcher during the interview. The researcher has a list of questions or themes to be discussed but neither the order of the questions nor the exact wording is determined before the interview (Appendix 2). According to Merriam (2009:90) this method allows the researcher to be open and to respond to the situation at hand, to the emerging worldview of the respondent, and to new ideas on the topic. Focus group interview was relevant approach as the main units, users committees, consist of a group of people. During the focus group interviews participants are able to hear other's responses and comment them. They were also able to consider their own views in the context of the views of the others (Patton 2002 cited in Merriam 2009:94).

Upon arrival to the community the first attempt was to get understanding on the availability of users committee members for the interview. In some villagers the first meetings was with some members of the users committee, in other villages the first contact was with a key person who assisted in contacting the users committees. The village level interviews with users committee members were usually conducted either outdoors in a central place of the community or inside in the office of the users committee. In many cases during the interview directed for the users committee members there were also water users participating, although they had not been intentionally invited. However, a decision was made not to limit people's access to the interviews and everyone was welcome to participate. Depending on the availability of persons, one-on-one interviews and focus group interviews were used. Discussions with key persons were also conducted during the transect walks in the communities while visiting the water sources. The length of

the stay within a single community varied. In 2014 visiting Nayabelhani and Amarapuri schemes the length of the stay in one community was 1-2 nights. In 2015 the visit in Devhuli municipality was 7 nights and in Ruchang village 4 nights. However, in Devchuli and in Ruchang more than one scheme was visited.

The expert interviews were conducted in English but Nepali interpreter was needed during the community visits to assist with the translations during the interviews with users committees and other stakeholder groups. The interviews were conducted so that the questions were first posed to the interpreter in English, after which the interpreter translated them into Nepalese. The questions were answered in Nepalese and again translated into English by the interpreter. The interviews started by the researcher first introducing herself and explaining briefly the rationale behind the research. The interviews were recorded by using a voice recorder. Consent to record the interview was asked prior to the interview. Interview notes were mainly recorded using paper and notebook, but the voice recording was used as a back-up and during the analysis phase some of the voice recordings were re-visited if clarification for notes was required.

Interviewees were asked to introduce themselves, to understand their position related to the study case. Users committee members were usually first asked to describe the current condition of the water supply scheme and the possible challenges faced with the operation and maintenance. For schemes which had shifted from community taps to private taps users committee members were asked to describe the procedure which had led to the shift and how the transition had been carried out. Other topics discussed were the role of women in the committee and in the community in general and networking and linkage of the users committee with other community groups and external support structures. Researcher reacted to the responses given by the interviewees and questions were also asked as they emerged, letting the discussion be only guided by the questions and responses. In some cases researcher had an opportunity to discuss more than once with the users committee members or key persons of one scheme, while in other times there was only a single opportunity for discussion. Interviewees were mostly involved with agricultural activities and household chores, which affected their availability for interviews. Interviews usually lasted from 1-1.5 hours. List of themes discussed during the interviews are listed in the Appendix x.

During the field visit in 2015 the accommodation of the researcher and the interpreter was organized in the homes of private persons'. By coincidence both hosts, in Devchuli and in Ruchang, appeared to have had a key role during the implementation of RWSSP in the communities. Thus the opportunities for informal unstructured discussions during the evenings were used to discuss the issues which had emerged during the interviews with users committees and other stakeholder groups. Additionally, these longer unstructured discussions allowed the researcher to get information on their views about the time during project implementation.

Observations

Observation as well as interviews are the primary sources of data in qualitative research and are often intertwined with each other. Observations take place in the natural setting where the studied phenomenon occurs and thus represent first hand encounter with the event or phenomenon studied. Observations can be used for various purposes, such as triangulate emerging findings from interviews and document analysis to validate the findings, to get better understanding on the context or to record behaviour, to name a few. In situations where people do not want to discuss all topics, through observations it can be possible to get additional information about the situation. (Merriam 2014: 117-118) During the village visits observations were used as data validation during the transect walks in the communities, where the surroundings and the environment were observed. During the interviews interviewee's reactions and presence was also observed. Observations were recorded in the field notes and supported by photographs which assisted in documenting the information observed.

4.4 Data analysis

The field data consisted of transcribed interviews, field notes of interviews, observation notes and photographs. The interviews and other field notes were coded into electrical form using Microsoft Word and Excel. Data analysis is the process of making sense out of the data to be able to answer the research questions. In the analysis, an inductive and comparative method was used. In a comparative method one segment or a piece of information that potentially answers the research questions is compared with other piece of information to determine similarities and differences. These pieces of information extracted from the data are placed into categories and sub-

categories in order to capture recurring patterns and regularities across the data (Merriam 2009). The process of sorting data and forming and re-forming categories took place until the research findings started to formulate into themes and patterns which are presented in a narrative form in chapter 5.

5. RESULTS AND DISCUSSION

In this chapter the results of the data-analysis are presented and discussed in the light of the literature. Data collection was based on interviews and observations during two field visits to Nepal conducted in May 2014 and April 2015. In the following sub-chapters the results categorized on different themes are presented based on the data collected from eight gravity flow water supply schemes which were selected for the case study. Discussion on the results is presented in Chapter 5.2.3 and in Chapter 5.3.4.

Nepal is characterized with three main topographical areas, Terai lowland, hills and mountains. Five of the studied water supply schemes were located in Inner-Terai area while three of them were located in the hills. Inner-Terai is an area of tropical valleys enclosed by the foothills, located between Terai plain and the hills. Studied schemes were located within the area of four communities. From Amarpuri town and Nayabelhani village one scheme from each was included in the study, while from Devchuli municipality and Ruchang village three schemes from each were included in the study. The list of interviewees is presented in the Appendix 1 and the location of the communities where studies schemes were located is presented in Figure 4 in Chapter 4.2. Main characteristics of the studied schemes are presented in Table 5.

Table 5. Main characteristics of the studied water supply schemes

Name of the scheme	Location	Weather road connection to highway	Number of households	Construction time	Water source	Tap category	Water treatment system
Amarapuri	Amarapuri town, Inner-Terai	Yes	1760	1979 (constructed) 2004 (rehabilitated by RWSSP) Phase III	River	1400 private taps and 15 public taps	Water treatment plant (sedimentation tank, roughing filter, slow sand filter and chlorination unit)
Rambas Sitabas	Devchuli municipality, Inner-Terai	Yes	500	1999 / Phase II	spring and stream	500 private taps	
Aaptari	Devchuli municipality, Inner-Terai	Yes	320	1997 / Phase II	Spring and stream	320 private taps	
Nayabelhani	Nayabelhani village, Inner-Terai	Yes	300	1996 / Phase II	Spring and spring-fed stream source	17 public taps	Sedimentation tank
Munde	Devchuli municipality, Inner-Terai	Yes	205	2000 / End of Phase II	River	19 public taps	No water treatment system
Ruchang A	Ruchang village, hills	No	160	1994 / Phase I	Spring	17 public taps	No water treatment system
Ruchang B	Ruchang village, hills	No	50	1993 / Phase I	Spring and spring-fed stream source	6 public taps	No water treatment system
Ruchang C	Ruchang village, hills	No	88	Phase II	Spring	13 public taps	No water treatment system

5.1 Opportunities for rural water supply

In many previously reported studies on sustainability of the rural water supply the focus has been on issues which are lacking, those which are hampering the development. However, it is also possible to identify many positive features, opportunities for the rural water supply that are already present in the society in Nepal.

Migration and remittances

During the interviews it became clear that migration was an issue which touched upon all studied communities with water schemes. Remittances sent back to the family members by those working abroad provided an important source of income improving the economic conditions of people and society in general. Increased income level of households enabled water users of some of the schemes to finance most of the scheme rehabilitation activities themselves, without the need to rely solely on external funding. Some of the people returning back to their communities from abroad had also taken an active role in users committee and other community groups. During the armed conflict between the Maoists and the Royal Nepalese Army (1996-2006) the number of people, mainly young men, leaving from Nepal increased significantly and the outflow still continues even at present.

Mother's groups

One feature brought up by the interviewed women in all studied communities was the establishment of Mother's groups which deal with small scale savings and credit activities. Many women, who receive remittances from husbands and other family members working abroad, have benefited from savings and access to small loans through these groups. According to the interviewees the establishment of Mother's groups has given confidence and independence to the women to interact with others and to share ideas and also to become more active in the users committee, as explained by one of the female members of Aaptari users committee:

“At first we (women) had to defend with our husband for our expenditure. Nowadays we have a Mother's group. Nowadays we have a practice to speak among the Mother's group members. Earlier we hesitated to speak in front of other people. -- At the beginning (during the scheme implementation) women had no practice to go outside the house to do social work and take re-

sponsibility as they were busy in household work. At the beginning only few women were members in the water users committee and they were not educated at that time. Nowadays many men have gone abroad and young girls are educated. Many women have experience now so in the user committee there are more female nowadays.” (Focus group interview with female users committee members and water users of Aaptari scheme in Devchuli municipality, 9.4.2015)

Social work and active key persons

One interesting feature which came up in many of the discussions was the presence of active people who were not only active in the water users committee, but in many other community groups, such as mother’s group, forest user group, youth club, school management committee or irrigation committee. It seemed that those active and motivated key persons were in many cases the ones who had contacts outside the users committees and who used them to get external support for the management of the water scheme as well as for the community in general. Some of the interviewees told about their role in the society referring themselves as social workers using the Nepali word "samaaj sewi". The meaning of social work was considered as doing something good for the society which would benefit a large number of people. Some also linked it closely with Hindu culture as the God was seen to be good to those who were helping others. The idea of helping others through volunteering and social work was also a source of motivation for many to be members in the committees.

Improved road infrastructure

Development of road infrastructure has improved especially the accessibility of many hilly communities. From the studied schemes this was the case for the schemes located in Ruchang village. During the construction of the schemes in 1990s the village was not accessible by vehicle due to lack of road. This meant that all construction materials, such as pipes and cement, used for the construction of the schemes were carried to the village by people on their backs. The vehicle road to the village was constructed around ten years ago improving significantly the access to and from the village and decreasing the time used to travel to the main highway, from where it was possible to access the district headquarters and Kathmandu. Although the road is sometimes blocked by landslides during monsoon, even those times it can usually be travelled by motorbike.

Ward citizen forums

Due to political instability in Nepal there have not been elected local representatives in the village and district level councils since 2002, significantly affecting the local governance and grass-roots level decision making in the country. The establishment of ward citizen forums in the villages and municipalities, which started in 2008, has given an opportunity for the local people to express their voices. Ward citizen forums were appreciated by the interviewees as they brought together different community groups with each ward to discuss and plan together. They were also used to settle small disputes and decide upon issues linked with community development, such as water supply.

Model water supply schemes

Well-functioning water supply schemes with active users committees can be a positive example to the other users committees. Amarapuri scheme and its users committee acts as a national resource centre for community-managed water supply systems receiving national and international guests to learn about water treatment, water safety planning and community management (see more detailed information in Appendix 3). Amarapuri users committee also provides training for other users committees. In the community level users committee members of well-functioning schemes can support and give advice to users committees members of schemes with more challenges with functionality, as was the case observed in Devchuli municipality.

5.2 Challenges for rural water supply

In addition to opportunities, a number of challenges for the functionality of the studied water supply schemes were identified from the data collected (Table 6). Challenges are divided into two different categories; chapter 5.2.1 brings up examples of environmental factors affecting the scheme functionality while chapter 5.2.2 focuses on the social factors.

Table 6. Environmental and social factors affecting the functionality of studied water supply schemes

Name of the scheme	Environmental factors			Social factors			
	Floods / landslides	Depletion of water sources	Aging infrastructure	Population growth	Misuse of water	Gender balance	Disputes with other water supply schemes/users
Amarapuri	x			x			
Rambas Sitabas	x	x		x		x	
Aaptari	x	x		x			x
Nayabelhani	x			x	x	x	
Munde	x				x	x	x
Ruchang A	x		x	x	x	x	x
Ruchang B	x	x	x		x	x	x
Ruchang C	x	x	x			x	

5.2.1 Environmental factors affecting the scheme functionality

Environmental factors affecting the functionality of water supply schemes in this research are understood as factors which are not caused by direct human activity. In case of studied schemes, factors included natural hazards (floods, landslides, decrease of water yield) and aging infrastructure.

Floods and landslides

Gravity flow water supply schemes are systems, which use the force of gravity to transfer water from the source uphill to the water users located downhill below the source. The main components of a gravity flow water supply schemes are the source (spring, river, stream), main pipeline, reservoir storage tank(s), distribution pipelines and tapstands. Due to Nepal's geographical and climate features, in the hilly areas, partly also constituting the Nawalparasi district, heavy rains during the monsoon season cause flooding which further contributes to the occurrence of landslides along the hill slopes. One practical implication of heavy rains can be seen in the Figure 5, showing a road leading to Ruchang village damaged by a landslide. Damage to road net-

work can severely affect the accessibility of some of the rural communities in the hilly areas especially during monsoon. Landslides can also cause damage to water scheme structures by breaking and dislocating pipes and breaking tanks. Flooding may also increase surface run-off and soil erosion around the water intake, which can further increase water turbidity and decrease water quality. Water quality can be improved using filtration systems such as sedimentation or sand filtration. Filtration system is usually placed after the water intake to improve the water quality by removing solid matter and debris from the water. Although floods, landslides and decreased water quality during monsoon was occasional problem in most of the schemes, from the eight studied schemes only two, Nayabelhani and Amarapuri, had a filtration system to improve water quality. While Amarapuri scheme had a treatment plant using sedimentation, slow sand filtration and chlorination, in Nayabelhani only a sedimentation tank placed after the water intake was used.



Figure 5. Road damaged by a landslide along the way to Ruchang village.

Water source of Amarapuri scheme is a stream with a catchment area surrounded by forests. During the monsoon flooding as well as high water turbidity had created occasional problems at the intake area as well as for the water treatment system. Flooding had earlier caused dislocation

of pipes and soil erosion at the source area of in Rambas Sitabas and Aaptari schemes while breakage of pipes had been the most common harm caused by landslides in Ruchang A, Ruchang B and Munde schemes. During the observation walk to the source area of Ruchang A and Ruchang B schemes, uncovered pipelines hanging from small bushes along the hill slopes were observed and some of the damaged pipes had been repaired using materials such as plastic from noodle packets tied around the pipe (Figure 6).



Figure 6. Uncovered water distribution pipes along the hill slopes in Ruchang village. Damaged pipe repaired using a piece of plastic.

In Munde scheme, flooding and landslides were told to have been damaging the scheme structures annually. Repeated harm had caused dissatisfaction among water users as it could take two to three days to fix the damage caused by a landslide to the pipe system. Meanwhile people were forced to fetch water from irrigation channels and other sources with poor water quality as water was not available in the tap. In Nayabelhani the water source was a spring next to a river bank and flooding during the monsoon was common. Although the scheme had a sedimentation tank, its effectiveness could be questioned as users had attached fabrics around public taps to filter leaves and other debris, and even small frogs, which were occasionally told to be coming from the taps especially during the monsoon. Flooding causes soil erosion and the eroding force of water in Nayabelhani source can be seen in Figure 7, which also presents a dam constructed by Nayabelhani water users to protect the sedimentation tank from floods.



Figure 7. On the left: Dam structure constructed using gabion box to protect sedimentation tank of Nayabelhani scheme has been damaged several times during floods. On the right: Impacts of soil erosion caused by flooding visible near the water source of Nayabelhani scheme.

Depletion of water sources

An example of another environmental factor that had caused challenges to some of the schemes was decrease in the water yield at the source. Along the years the water yield at the spring source of Rambas Sitabas and Aaptari schemes had gradually decreased, which had required adding a pipeline to a stream source for some months during the driest time of the year to meet the water demand. In case of Ruchang B the water yield at the spring source had decreased after the diameter of an inlet pipe of another scheme upstream had been increased, forcing the users committee to add another source from a stream. Water at the source was not considered sufficient and the quality was also questionable as the water was told to have red colour from which the scheme had even got its name “Rato Paani”, meaning red water.

Scattered housing and hilly terrain was generally told to create problems with water distribution

in Ruchang village, having resulted to many small water supply systems to be implemented (Figure 8.). Currently the worst situation seemed to be in Ruchang C scheme, which is comprised of eight small water schemes located within one ward. Small water sources dry out completely during a period of few months in the dry season before monsoon. The problem was told to occur annually and seasonality of water sources force people to fetch water directly from streams and springs during this time. Water users of Ruchang C scheme have planned to unite all existing small water sources and to search for a new water source to improve access to improved water supply within the ward. Due to lack of initiative and support, the plans have not yet been put into practice, although the DDC had already provided a grant which had been used to purchase some pipes. Water users had found a water source but a survey had not been done due to lack of funds.



Figure 8. Scattered housing on the hilly terrains of Ruchang village cause challenges for water distribution.

Aging infrastructure

Aging infrastructure was reported to cause challenges especially by the users committee of Ruchang A and Ruchang B schemes, which were constructed almost 20 years ago during the first phase of RWSSP. Deteriorating pipelines were prone to leakages while some of the water tanks were also told to be leaking. Due to leakages part of the water supplied by the system is lost on the way before reaching the consumers.

5.2.2 Social factors affecting the scheme functionality

In addition to environmental factors described in previous chapter, there are also social factors affecting the functionality of the schemes. Water supply schemes constructed during the RWSSP were designed to provide water to a certain number of population and technical factors, such as the selection of water source, volume and number of reservoir storage tanks, inlet and distribution pipe diameter and number of water distribution points, were decided based on the projected need for the next 15-20 years. All studied schemes except Amarapuri had been designed and constructed to provide water for users solely through public taps. In Amarapuri during the time of rehabilitation in 2004, most users fetched water from public taps, but there were also some private taps available and their number steadily increased along the years. As the idea was to optimize the location of taps within the community to reach as many people as possible, a common policy applied during RWSSP was that a minimum number of six households were required to be located close to each other before a tap was constructed.

Population growth

The impact of population growth to the scheme functionality was reported especially by the schemes located in Inner-Terai (Nayabelhani, Amarapuri, Rambas Sitabas and Aaptari). All of the schemes were located within an easy access to national highway. According to the interviewees in Devchuli, reasons attracting people were availability of good quality schools and favorable climate as well as a good location between hills and lowland Terai. In Amarapuri, located along the mahendra highway, the population had increased by 400 households since 2004 when the scheme was rehabilitated with the support from RWSSP. Due to population growth the Amarapuri scheme was unable to provide water for 24 hours a day, thus water was available only 3 hours in the morning and 3 hours in the evening. In Rambas Sitabas, Aaptari and Nayabelhani

schemes the number of households served by the schemes had doubled or even tripled since the construction of the schemes. In Ruchang A the population had also increased in each of the three wards served by the scheme but the increase had been only by some tens of households per ward. Population growth during the years had increased the water use and caused pressure to the existing water systems to provide adequate amount of water for all users. Increased water scarcity had required rationing of water in certain periods, to ensure its availability for all users at least for certain hours a day.

Misuse of water

One factor closely related to the increased water use in studied schemes was the presence of unofficial temporary connections observed in Ruchang A, Ruchang B, Munde and Nayabelhani schemes. These connections were thin plastic pipes connected from the public taps to distribute water from the taps to water tanks located on the yards of private households (see Figure 9). These connections do not have any official definition, but the term ‘unofficial temporary connection’ was decided to be used to describe best the situation. All schemes where these connections were observed, were designed to provide water to the users only through public taps shared by many households. Unofficial connections can be thus regarded as misuse of water and public resources by private persons. Connections were temporary, as they were only attached to the public tap occasionally to fill the tank at the household. Some users were told to be using the connections openly during the day and night, others only during the night time. One of the water users of Munde scheme with unofficial connection told how she had applied for the household connection from the users committee, and a village maintenance worker (VMW) had come to install the tap. There seemed to be clearly an inconsistency between the actual practices and the rules of users committee of Munde scheme, which stated that household connections from public taps were not allowed.

Many people were observed to be using the public taps even for washing or bathing which meant that only part of the users were enjoying the convenience of “own” pipe connection which the unofficial temporary connections provided. The use of these connections gives a significant advantage and convenience for people using them, as it enables storing water for long-time without

need to rely solely on the water fetched from the public tap. As public taps with unofficial temporary connections lacked water meters, water use was not measured and people using these connections only paid a fixed water tariff which was equal for all water users in the scheme area. This practice clearly put water users in an unequal position decreasing social cohesion within the community.

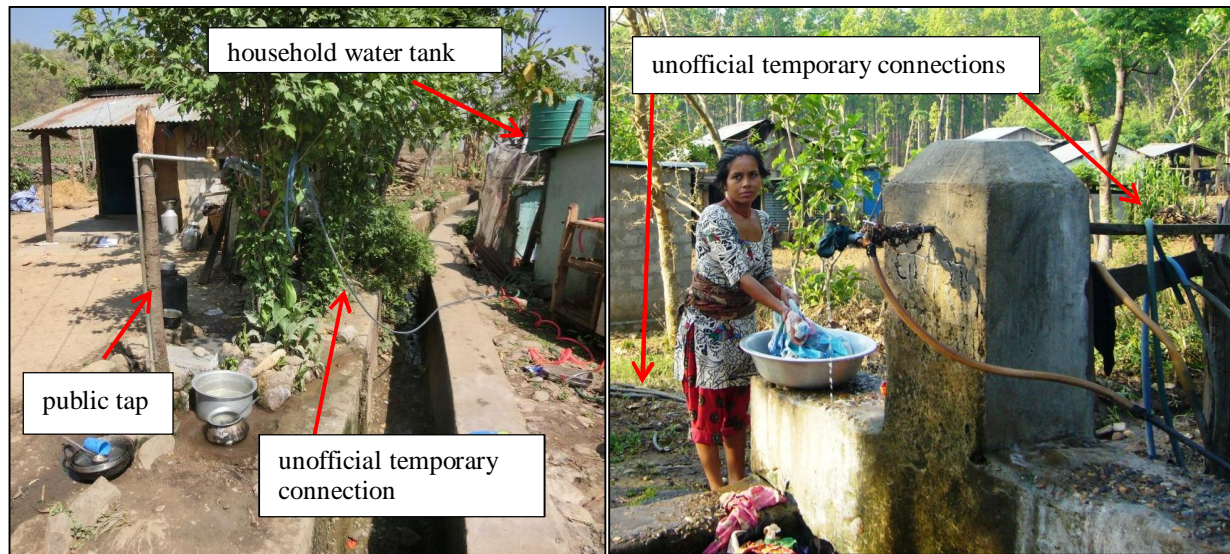


Figure 9. Unofficial temporary connections observed at the public taps of Munde and Nayabelhani schemes.

Some of the users committee members and users of water schemes which currently had private taps (Aaptari and Rambas Sitabas) explained that in their schemes the practice of unofficial temporary connections had started some years after the scheme was constructed and had been there for many years before the official shift from public taps to private taps had taken place. Sometimes it had even occurred that the first ones to have started the practice had been the users committee members themselves. During the discussions with Aaptari and Rambas Sitabas users committee members it became clear that the misuse of water through unofficial connections had been the source of prolonged conflict between users as there had been water scarcity due to increase in population and in water use. Finally conflicts over water use had ignited the change within Rambas Sitabas and Aaptari schemes to shift from public taps to private taps.

In Rambas Sitabas and Aaptari schemes misuse of the source area for bathing or bringing cattle to drink there had also earlier caused disputes.

Gender balance

Participation of women in the decision making is important in order to have their voice heard. Women are responsible of the household management and are usually responsible of fetching water together with children if household connections are not available. Thus water issues are closely linked with their everyday life. Mother's groups with small scale saving and credit activities have increased the level of activeness of women in many of the studied communities. National water policy states that there needs to be minimum 33% representation of women in water users committees. However, among the studied schemes only Amarapuri and Aaptari users committees were meeting the target, even though women in Nayabelhani and Rambas Sitabas scheme area were also told to have been active in Mother's groups for many years already.

One of the interviewed users committee members of Munde scheme told openly that they were aware of the policy but women in their committee were literally only present in paper. In case there was a need to apply for funding or other support from the municipality, female members were asked to sign the application but otherwise they were not active in the committee. Reasons for inactiveness were told to be lack of education and lack of interest to participate in the committee. Many women in the ward were told get married at an early age and to drop from school before completing the primary education. In Ruchang similar thoughts were expressed by users committee members of Ruchang C who proposed that women were inactive as they were busy with household chores and work in the fields, not getting help from children who were at school. Lack of confidence was also stated as one of the reasons. Active women from the Women's Committee in Ruchang shared the men's views on low participation of women in committees. However, they claimed that in recent years after the establishment of Mother's groups and the village-level women's committee, women had gradually started to become more active to interact with each other, even if the participation in the committees was not active.

Should be noticed, however, that being passive in the committees did not mean that women would not participate in any means to the activities in the society. Indeed, women in the studied communities were the ones who were told to be doing majority of the community works related

to construction and repair of water supply systems such as digging the soil and carrying materials while men were mostly doing work that women could not do such as fixing and connecting pipes and fixing taps. During the rehabilitation of Rambas Sitabas scheme each household had to contribute 15 days of work as in kind-work. While workers had represented all ages between 20 to 85 years, a striking 80 % of them had been women. Participation to the meetings was also considered by many people as a waste of time, something that would not benefit them. The situation was crystallized during the focus group interview with water users and users committee members of Ruchang C scheme, where all committee members present were men, when one of the participants told that: *“There are many men present here (in the focus group interview), but if here would be work, here would be more women”*. (Focus group interview with users committee members of Ruchang C in Ruchang village, 16.4.2015)

Disputes with other water supply schemes / water users

The service area of a water supply scheme may follow the administrative area, namely ward, in the villages or municipality, like was the case with Nayabelhani and Ruchang B scheme, which both served all households within a single ward. Larger schemes may cover many wards, such as Ruchang A scheme, stretching over three wards and Amarapuri scheme, serving the whole town (previously village). It is also possible, that within one ward there can be more than one water supply scheme, each serving part of the households, like was the case with the schemes in Devchuli municipality. Some examples of relationships between different schemes are described in the following, with an aim to give the reader some idea of the complex social issues which users committee may need to face when managing the schemes.

Rambas Sitabas scheme was serving households within two wards called Rambas and Sitabas. Munde scheme served households in two wards called Munde and Mudabas. Aaptari scheme served households in Aaptari, Bisaltar, and Mudabas wards. The studied schemes were not the only ones within the area, as another scheme called Bisaltar was also serving some households in Bisaltar and Mudabas wards. Few years earlier, during the transition from public taps to private taps within Aaptari scheme, some users committee members and water users from neighbouring Bisaltar scheme had approached Aaptari users committee to request help to improve the condi-

tions of five households located in Bisaltar scheme area. Households in question were located in higher elevation than the reservoir tank of the Bisaltar scheme and pressure in the pipes was not strong enough to lift water adequately to their houses, even if they were using very narrow distribution pipes. Thus they had asked about a possibility to connect households to the Aaptari scheme. Users committee had agreed to support the households by joining them to Aaptari scheme through private connections, but they had made the decision without asking the consent of the users. Aaptari water users protested, cut the installed connections and decided in the meeting that all current users would need to get private connection before any new households could be joined. The incident caused the users committee chairperson to resign, and still, three years after the incident, those five households from Bisaltar scheme had not been joined to the Aaptari scheme.

Before the construction of Finnish supported water supply schemes started in Devchuli, there was only one gravity flow water supply scheme called Ranibel, constructed in 1984 by United Mission to Nepal. It was still in operation, but due to leaking pipes and old infrastructure water was available in 20 public taps only few hours in the morning and in the evening. The scheme was in clear need of rehabilitation. Users did not pay any monthly tariff for water. The scheme served circa 80 households in the area of two wards. Circa 50 households located in Mudabas ward were told to be using water from Ranibel and Munde schemes both, while ca. 30 households located in Rambas ward were solely relying on Ranibel scheme for their water. Even some of the users committee members of Munde scheme told they were using water also from the Ranibel scheme. While I was asking about the possibility to merge Ranibel and Munde schemes to have one scheme which would provide water for all users, one of the key persons in the community, who acted as an advisor for all water schemes, told that to his understanding merging was not possible. This was because ca. 50 households which were using water from both Ranibel and Munde schemes represented one ethnic group, the same as most water users in Munde scheme, while the rest were from another ethnic group. There were plans for both schemes, Munde and Ranibel, to shift from public taps to private taps but there seemed to be a strong expectation for external financial support for the rehabilitation, for both schemes.

Ruchang A scheme provides water to households within an area of three wards, numbers 6, 7 and 8. However, not all households within the wards were served by the scheme, including a cluster of 12 houses located called Raudi. During the time when Ruchang A was constructed there were only two houses in Raudi, which meant that no public taps were installed. In the end of 1990s a village development committee (VDC) office was constructed in the cluster and since then there have been twelve houses in the cluster. It would be technically feasible to provide water connection from Ruchang A scheme for the households in Raudi as they were located relatively close by downhill from the storage tank of the scheme in ward 6. However, for many years the only water source in Raudi was an unprotected spring source 5-10 minutes walking distance from the houses. People living in Raudi claimed that they had requested water connection from the users committee of Ruchang A scheme for few times during the years, always receiving negative answer. According to people in Raudi the reason given had been that as they had not participated in the construction of the scheme they could not be joined later on. According to the chairperson of Ruchang A users committee, there had been discussion about connecting the cluster to the scheme but no final decision had been made.

Finally in 2013, to improve their condition, people living in Raudi applied funding from the VDC and constructed by themselves a small gravity flow water supply system which provides water from a nearby spring source directly through pipe connection to the VDC office. There are no reservoir tanks or public taps, but users fetch water directly from the pipeline by disconnecting two pipes. A person who had worked six years as a VMW for Ruchang A and had lived in Raudi since the year 2000 had used the skills he had learned during the RWSSP to search for the water source and to connect the pipelines. Although the scheme was observed to supply water, it was not considered as a sustainable solution by the users, because it was prone to landslides and the water quality was questionable. A plastic bag was used to collect water at the source as a collection chamber initially constructed at the source had been destroyed during a landslide. Due to this, water was not considered suitable for drinking by the users and was only used for washing and bathing while drinking water was fetched from the old unprotected source. There were plans to construct a reservoir tank, but due to lack of funds, it had not been constructed.

Aforementioned examples linked with Aaptari, Munde and Ruchang A schemes give some idea of the complex social issues faced by the users committees managing the water supply schemes. While it is usually very easy task to join new households to the scheme technically, solving the conflicts at the background requires the users committee to have capacity to negotiate, to listen to all the parties and to make decisions. If the users committees do not have the capacity to take actions and make decisions, the conflicts may escalate.

5.2.3 The implications of opportunities and challenges

Various studies and evaluations on the functionality of water supply and sanitation systems have been carried out in Nepal in recent years by government agencies, international non-governmental organizations (INGOs) and international development agencies (NEWAH 2006, Helvetas 2013, WaterAid 2010, FCG International Ltd. 2013, MPPW 2011, DWSS 2011). The challenges with studies like this is that as they try to cover a large number of water supply schemes they need to categorize the finding under larger headings. This often means that they need to compromise between providing general statistical data on a larger number of schemes and providing deeper going information on the challenges at the scheme level in individual schemes. That is why in this study the decision was to go behind the statistical data to give examples of the challenges and opportunities faced in the community level.

Natural hazards, such as landslides, floods and depletion of water sources, which have been pointed out by this study, have been widely recognized as factors affecting the functionality of gravity flow water supply schemes in Nepal (Helvetas 2013, WaterAid Nepal 2010, FCG International 2013, NEWAH 2006). The social factors usually stated in the aforementioned reports referred to inadequate managerial skills of the users committee, low technical skills at scheme level, absence of village maintenance workers (VMW) and lack of supportive services. Management issues will be presented and discussed more in detail in Chapter 5.3. From the social factors mentioned in Chapter 5.2.2, the findings related to the misuse of water resources through practice of unofficial temporary connections comply with the findings of FCG International (2013) and Helvetas (2013). Inability to restrict misuse of water can also be seen as a sign of weakness of the users committee to implement and follow the rules and that have been agreed.

Reviewed studies generally concentrated on the issues which were lacking or things which were not functioning, not on the opportunities which might have been there for the schemes that were doing better. Baser and Morgan (2008) discuss that one reason to focus on weaknesses and gaps is because they are often easier to measure than the strengths which often are linked with informal practices and culture, not so easily measurable. At the same time strengths are seen as fortunate conditions able to stand on their own. Because of this, bringing up opportunities for water supply was considered important in this study, to remind the reader that many things which do not necessary directly link with rural water supply may be a source of support and strength for the management of the systems. The opportunities, in this study, can be related to social capital, which is defined as social norms, social bonds, expectations and their interaction, as well as trust and networks which allow cooperation (Casson et al. 2008 cited in Rautanen S.-L. 2016:24; Pretty 2003).

While migration was in some of the reviewed studies mentioned as the reason for the lack of trained VMWs in the villages, none of the studies discussed the impact of remittances to the increased income level of households or the increased role of women in the communities where many men had moved abroad. The female participation in the users committees was used as an indicator for well-functioning users committee in some of the studies (FCG International 2013, Helvetas 2013). However, there was no linkage in the reviewed studies between the activeness of women in the users committee and the activeness and presence of Mother's groups, neither on the role of women as unskilled laborers in the physical works. Yet, based on the findings of this study, Mother's groups have had an important role in increasing the confidence and independence as well as social interaction among the women as well as with the men. This had further given women confidence to take active role in the water users committee, like was the case with women in Amarapuri and Aaptari users committees.

Yet, activeness of women in one committee did not necessary mean that all users committees within the same community would have active participation of women. An example of this was the users committee of Munde scheme, which is, like Aaptari scheme, also located in the Devchuli municipality. Interviewed users committee members (male) of Munde expressed how

women were passive and were only representing the committee on paper. It also seemed that although women had recently started to activate in Ruchang village through Mother's groups, they had not been ready yet to take an active role in the users committees. The policy states that the water users committees in Nepal should have minimum 33 % female members, but the findings of this study and many other studies in Nepal have shown that the target is not met in many schemes. Nepal has traditionally been very patriarchal society and participation of women in the decision making has not been active. Thus increasing the share of women in the committees means changes in the traditional practices. North (1990) has discussed the issue from the viewpoint of institutional change being a complicated process which may take place due to changes in the rules or the effectiveness of their enforcement, or due to informal constraints in the society. Informal constraints such as traditions, customs and codes of conduct can hinder the actual implementation of the rules and policies in the society. North (1990) also acknowledges that changes in informal constraints cannot take place overnight unlike formal rules or policies, which may go over rapid changes as a result of political decisions. In this light, implying a policy to have a 33 % share of women in the committees can lead to a situation where women are present just on paper, if the actual change in the informal rules has not taken place. However, practices such as formation of Mother's groups can be a means to ignite change of these informal rules and practices.

Approach to women participation and gender issues evolved from one phase to another during the Rural Water Supply and Sanitation Project (RWSSP). Project document for Phase I (RWSSP 1989) stated simply that "*gender-specific questions would not have a separate status but be integrated in the general project planning and implementation*". During the mid-term review of Phase II in 1998 it was realized that the integration of gender issues had been mainly understood in terms of quotas for involvement of women, not on strategies based on the roles of women and men in the water supply and sanitation sector. Yet, the project acknowledged the positive impacts of the activities done by Women's Development Offices and District Health Offices, which had established Mother's groups and savings and credit funds for women as well as trained Female Health Volunteers in the villages (RWSSP 1998). The lessons learned contributed to the development of gender sensitive approach including a gender policy within the RWSSP, strongly

focused on during the Phase III. In the project document for Phase III it was stated that *“Programme will ensure that women’s participation in decision-making and training opportunities is actively facilitated, that all information collected or used as a basis for planning, monitoring and evaluation is gender disaggregated, and that gender sensitive indicators are developed for all Programme activities”*(RWSSP 1999). In addition to setting and meeting the target where half of the users committee members and half of the participants in various meetings and trainings should be women, the project activities included gender sensitization. It meant more holistic approach on gender, not solely focusing on the water supply and sanitation committees but communities on a wider scale. A special focus on the training of female technicians in the villages was also taken during the Phase III. (RWSSP 2004, RWSSP 2005) The importance of women and the role they play in the sustainability of water supply, as thought by the project, is expressed in the citation from an evaluation report of female technicians trained during the RWSSP:

“A woman’s name is easy to write in a list of participants to get a gender balance in a meeting or a committee. Yet, to give that name a voice and a face is another matter.” -- We argue that women have always participated in the technical field in the rural areas, yet, usually as unskilled labourers carrying materials. -- We further argue that ignoring the women’s potential and creativity as skilled persons, half of the total human potential is simply missed. It would be of everybody’s benefit that the women were given an equal opportunity to increase and fully utilize their productive role. We also join those who argue that women have a key role to play in the sustainability of the water supply facilities and continuity of sanitation improvements as these are close to women’s traditional domain: home. (RWSSP 2004:33)

The evolution of gender approach could be also seen in the studied schemes. In Ruchang, where the RWSSP had taken place mainly during the Phase I, with no emphasis on gender issues, the Mother’s groups had also been established only recently. In Devchuli some of the interviewees recalled having participated to a sanitation trainings during the Phase II and after that established a Mother’s group, which meant that those groups had been there over ten years. The focus on gender sensitivity during the Phase III was clearly visible in the case of Amarapuri scheme where interviewees emphasized the importance the trainings and sensitizations which had taken

place during the project as before the women had been shy to express themselves but now they were actively participating.

5.3 Management of water supply schemes

5.3.1 Operation and maintenance

Gravity flow water supply systems use simple technology, which does not require energy to run, so the operation costs are low. Maintenance is usually understood in three levels: 1) Preventive maintenance in the form of regular inspection and servicing to preserve assets and minimize breakdowns, 2) Corrective maintenance - minor repairs and replacement of broken and worn out parts to sustain reliable facilities and 3) Crisis maintenance - unplanned responses to emergency breakdowns and user complaints to restore a failed supply. Rehabilitation is required when repairs and maintenance are no longer economically viable or technically feasible to keep the water supply system in good condition rehabilitation is necessary. It is common that during the first years after construction there might not be a lot of need for repairs, while the need increases along the years. During the implementation of RWSSP the users committees were established to take the responsibility of operation and maintenance of the water supply system and some of the community members were trained as village maintenance workers (VMWs). Operation and maintenance of water supply schemes requires funds to pay for the salary of recruited staff as well as to purchase spare parts and tools. Regarding the studied water schemes, there was variation in tariff collection. In schemes with private connections (Amarapuri, Rambas Sitabas and Aaptari) each household had a meter system and the tariff was based on the amount of actual water used. In the rest of the schemes with public taps all user households paid the same monthly tariff regardless of the amount of water they used or the number of members in the household. Summary of the operation and maintenance arrangements in the studied schemes is presented in table 7.

The schemes that clearly stood out from others by the way they had been organized were Amarapuri, Rambas Sitabas and Aaptari which all served users through private taps. Each scheme had an active users committee meeting monthly and preventive maintenance was implemented through continuous monitoring of the water supply system.

Amarapuri scheme

In Amarapuri scheme the daily operations were run by a team of seven employed staff members including a manager, three VMWs, a water meter reader, a person looking after the intake and the treatment plant, as well as a lab technician, who also acts as a field coordinator responsible of training activities. The users committee of Amarapuri is responsible for supervising the overall operation and maintenance (O&M) activities at the water sources, main pipelines reservoir tanks, treatment plant and 15 community taps, as well as provision of new water connections. Households are responsible of the maintenance of their private connections, but when in need, may ask technical support for the users committee. A computerized billing system is used to keep track of the water payments while reward system is in place to motivate users to pay fees on time. Under the main users committee of Amarapuri there are separate committees for water safety planning (WSP), sanitation and accounting, with clearly defined roles and responsibilities for the members. Regardless of the water scarcity and rationing, Amarapuri scheme is considered as a national resource centre for water safety planning, water treatment and community management. A construction of a second water treatment plant to meet the water demand was under planning during the field visit in 2014. Water safety planning (WSP) approach has been implemented within Amarapuri scheme area since 2010. The WSP approach uses a comprehensive risk assessment and risk management approach that covers all steps in water supply from catchment to consumer, including also work how to protect the water supply system from disasters. It emphasises water quality issues linking them with sanitation and hygiene and overall environmental cleanliness.

Table 7. Summary of the operation and maintenance arrangements in the studied scheme

Name of the scheme	No of households served by the scheme	Number of wards where the scheme operates	Number of recruited staff	Tap category	Monthly water tariff	Minimum revenue collected monthly	Monthly revenue adequate to cover O&M expenses	Additional income sources for users committee	Use of the collected tariff	Approach to maintenance
Amarapuri	1760	9	7	~1400 private taps and 15 public taps	Private taps/meter system: minimum rate 110 NPR/ 10 units (1 unit = 1000 liters) Community taps/flat rate 385 NPR/tap	~160 000 NPR	Yes	Connection charge, visitors fees	O&M, including salary of 7 staff members	Preventive and corrective maintenance
Rambas Sitabas	500	2	3	500 private taps	Meter system: minimum rate 55 NPR/ 10 units (1 unit = 1000 liters)	~27 500 NPR	Yes	Connection charge for new connections, loans with interest	O&M, including salaries of 2 VMWs and an office secretary	Preventive and corrective maintenance
Aaptari	320	3	3	320 private taps	Meter system: minimum rate 55 NPR/10 units (1 unit = 1000 liters)	~17 600 NPR	Yes	Connection charge for new connections, loans with interest	O&M, including salaries of 2 VMWs and an office secretary	Preventive and corrective maintenance
Munde	205	2	1	19 public taps	Flat rate: 40 NPR/ household	~ 8 200 NPR	No	None	O&M, including salary of VMW	Preventive, corrective and crisis maintenance
Nayabelhani	300	1	1	17 public taps	Flat rate: 20 NPR/ household	~ 6 000 NPR	No	Renting of office space and land, connection charge for new households and house-builders	O&M, including salary of 1 VMW	Preventive, corrective and crisis maintenance
Ruchang A	160	3	3	17 public taps	No water tariff collected	0 NPR	No	Connection charge for new households	No tariff collected. 3 VMWs paid by grain collected from households, repairs paid by users.	Corrective and crisis maintenance
Ruchang B	50	1	0	6 public taps	Flat rate: 5 NPR/ household	250 NPR	No	None	No VMW. Repairs partly paid from tariff and partly by users.	Corrective and crisis maintenance
Ruchang C	88	1	0	13 public taps	No water tariff collected	0 NPR	No	None	No tariff collected. No VMW. Repairs paid by users.	Corrective and crisis maintenance

1 NPR ~ 0,008 €

Rambas Sitabas and Aaptari schemes

Rambas Sitabas and Aaptari schemes share the same source, and have formed a joint source committee comprised of key persons from each users committee. In addition to two VMWs, both schemes have an office secretary responsible for administrative tasks such as water meter reading, revenue collection, communication with municipality and support for users for writing applications for new connections. Both schemes were rehabilitated in 2013 to improve the functionality, which had been affected by population growth, water scarcity and conflicts over water use. Interviewee, who was member of the Rambas Sitabas users committee prior to the rehabilitation, described the situation as follows:

People used to use the public water taps. People used to fetch the water from far away but now people do not have such difficulties. People have private taps. Community-wise also running this programme was very difficult. Very much difficulties were here. And we committee members were also getting such difficulties. Because we had to provide sufficient water to our people. We were leaders. So it is the duty of leaders to serve their people. Committee is the group of leadership. So leaders should serve their people very nicely. During that time we used to go to the main source Goman Singh Mul, it is very far from here. The main source was also not properly built up. Now there is cement, but that time during floods the pipes were here and there scattered. This was before. But now you have seen that it is built up properly and it is well cemented now. (Interview with ex-member of Rambas Sitabas users committee, 10.4.2015)

Rehabilitation works included of pipelines and installation of private taps in each household as well as improving the source area protection against flooding (Figure 10). For Rambas Sitabas scheme two new reservoir tanks were also constructed. Users committees of Rambas Sitabas and Aaptari had applied and received some external funding for the scheme rehabilitation, but it had been funded by the users themselves, who also contributed manual labour during the works. Water tariff is set in a way that it is enough to cover the costs of O&M.



Figure 10. On the left: Gabion box used at the water source area of Rambas Sitabas and Aaptari schemes to protect water intake from flooding. On the right: Fenced source area of Rambas Sitabas and Aaptari schemes with collection chambers.

Munde scheme

The users committee of Munde scheme had only been operating since one year. None of the current members had been in the previous committee, which was told to have been inactive for four years. Currently the committee was active meeting monthly. The scheme had one trained VMW who had been taking care of repairs. Previously the approach taken by the users committee had been on corrective and crisis maintenance; mainly to repair damages caused by flooding and landslides which had occurred annually. An attempt for preventive maintenance was done in early 2015 when the users committee had conducted source protection works together with the water users. Gabion boxes filled with stones had been constructed to protect the intake are from landslides and soil erosion using funds collected from water users and Devchuli municipality. The users committee had an idea to shift from public taps to private taps, but no clear plans had been made. The complex relationship between Munde and Ranibel schemes also seemed to have its effect on the planning (see Chapter 5.2.2). The users committee members admitted that they would require external support to improve their situation and to shift from public taps to private taps.

Nayabelhani scheme

Nayabelhani users committee is comprised of 23 members, including a tap representative from each of the 17 public taps. Although interviewed users committee members and water users told that the number of men in the village is low due to migration and the role of women is higher, there were only four women in the users committee. In Nayabelhani scheme households were responsible of the maintenance around tap area and occasional monitoring of the pipeline based on rotating shifts. Occasionally users also helped with cleaning the reservoir tanks and their surroundings to prevent harm from forest fires. If users were not able to fix a broken tap themselves, they could ask help from a trained VMW working for the scheme, who was mainly responsible of monitoring the source area and reservoir tanks and doing small repairs (Figure 11). In case there was a need for larger maintenance, users committee would request support from Nayabelhani VDC office. The scheme was annually affected by flooding, which had numerous times damaged a dam constructed using gabion box to support the sedimentation tank. The intake was also vulnerable to the damage caused by flooding, as it was located on the riverbanks but there were no protective structures around it to protect it from flooding and soil erosion. The monthly tariff collected by the users committee (20 NPR ~ 0.016€) was not adequate to cover O&M costs, but Nayabelhani users committee claimed that as the community had refused to pay more they had not been able to increase the tariff. Each of the households in the scheme area were told to have a family member working abroad sending remittances, so the lack of income was not an issue. According to the interviewed water users, they had refused to pay more because of mistrust towards to users committee members on the use of funds. As the users committee had been able to received annually funds from the VDC and local community forest groups and had other sources of income (Table 7), they seemed not to be too concerned of the inadequacy of the tariff.



Figure 11. On the left: Village maintenance worker of Nayabelhani scheme cleaning the water source area located on the river banks. On the right: Women fetching water at the public tap in Nayabelhani scheme were users are responsible of the maintenance around tap area.

Schemes in Ruchang village

The schemes in Ruchang village were constructed during Phase I and were around 20 years old and would be in need of rehabilitation. The present actions of the users committees and their inability to take action to improve the functionality of the schemes was clearly visible. The Ruchang B users committee was the only one meeting monthly. The approach for maintenance had mainly been corrective or crisis maintenance, or lack of maintenance altogether. None of the schemes had a trained VMW. Three VMWs of Ruchang A scheme had learned their skills on the job while Ruchang B and Ruchang C did not have any VMWs. The users committee of Ruchang B was the only one of the studied schemes in Ruchang village which was meeting monthly.

While the users committee members in Ruchang A, Ruchang B and Ruchang C listed many factors affecting the scheme functionality, they also told that current water tariff was not adequate to cover the costs of operation and maintenance. Short left-over pipes from the construction time had been used to repair some of the leaking pipes of Ruchang A and Ruchang B schemes (Figure 12). The approach used was not considered sustainable by the interviewed users committees members, who acknowledged that poor quality of pipes and high number of short connections still made pipes prone to leakages. While the lack of funds was stated as the reason for not being able to purchase new pipes, the users committees of Ruchang A and Ruchang C did not collect

any water tariff and the monthly tariff collected by the users committee of Ruchang B from 50 households it served was very small, equivalent only to two euros. The users committee of Ruchang A scheme was told to have around 75 000 NPR (~600€) as O&M fund at the bank account, but the fund had been used only once during 20 years to change taps. If there was a need for repairs, the funds were collected from users, not taken from the bank account.

In case of Ruchang C the current small water sources of eight small gravity flow schemes dried out during the dry season before monsoon forcing people to fetch water from traditional unprotected water sources. Water users had had a plan for eight years already to unite all existing small water sources and to find one bigger source which would provide water for all 88 households within the ward year round. Water users had even received a fund of 700 000 NPR (~5 700 €) from the DDC which had been partly to buy new pipes. The first source they had found had dried out but in 2014 another source had been found in the area of ward 4 below other water sources supplying water for Ruchang A and Ruchang B. Due to the lack of funds no survey had been done to know if water at the source was adequate. According to the interviewees more funds were also needed to construct a reservoir tank and to purchase more pipelines, as the source was far. Inability to make decisions seemed to be a problem as eight years had passed

Within the ward 8, also served by the Ruchang A scheme, the ward citizen forum had made a plan for the coming year to repair a leaking reservoir tank located in the ward. According to the chairperson of the Women's Committee in Ruchang, who was also vice-chairperson of the ward citizen forum in ward 8, some funds had been collected from each household and there had also been a plan to construct another reservoir tank in the ward 8. It seemed that the ward citizen forum, not the users committee, had taken the initiative to improve the situation. One of the key persons of Ruchang B also explained that ward citizen forum was used as a means by the users committee to approach the VDC office.



Figure 12. On the left: Leaking pipe from Ruchang A scheme repaired using old leftover pipes from the construction time. On the right: Water users and users committee members of Ruchang C scheme during the focus group interview.

5.3.2 Capacity development

The way how users committees had approached trainings and capacity development also differed among studied schemes. The users committee of Amarapuri scheme had been active in training the community members and other users committees already during the RWSSP. They were still actively training 100 households per year on issues linked with water safety planning, which includes water source protection, water use, hygiene and sanitation practices and general environmental cleanliness. It was important to train especially the new households moving to the community to educate them about the practices. Other two main groups trained were secondary school students and religious leaders, as both were considered important in increasing the awareness within the community. The lab technician of the Amarapuri scheme was responsible of organizing the training activities within the community as well as for the users committees of water supply schemes in the neighbouring areas. While Nayabelhani users committee had been training other users committees during the RWSSP, they were not providing any trainings anymore during the time of the field visit in 2014.

In the society where many people leave the villages to search for a work abroad the challenge of keeping skilled workers in the communities is always present. To tackle this challenge the chairperson of Aaptari users committee had come with an idea to train annually 12 persons from the community to gain technical skills of VMWs. Five women and seven men, all above 28 years old

and married had been selected among the water users and had received first trainings organized by Amarapuri users committee. The criteria with age and marital status was used to select people who would be less potential to leave the community for work. During the time of interview, only part of the planned trainings had been completed. Users committee of Aaptari was also showing a good example in the gender balance, as five out of eleven users committee members were women, three of them in key positions of vice-chairperson, vice-secretary and treasurer. The VMWs of Aaptari scheme had also trained all users committee members to carry out some simple maintenance tasks and female users committee members proudly told about their ability join pipelines, change washers and repair leaking pipes using local materials.

Aaptari and Rambas Sitabas users committees had also received training on water safety planning from the Amarapuri users committee. After the training Aaptari users committee had organized a one day training in each of the seven clusters of the scheme area to educate water users. A water safety planning (WSP) committee in each of the clusters had also been formed. The purpose of the formed WSP committees is to teach other households about the importance of the use and storage of safe water and clean household environment. Each cluster-wise committee was also responsible of monitoring the activities at the household level.

One of the approaches common for the more successful Amarapuri, Rambas Sitabas and Aaptari schemes was the establishment of an advisory committee. Users committee members are elected for a term specified in the constitution of the committee and in the end of the term during the election of a new committee sometimes the whole committee is changed while in other cases some of the old members may be re-elected for another term. As a lot of knowledge and experience is possessed by individual members, especially the key persons such as the chairperson, secretary and treasurer, keeping the knowledge within the committee after selection of new members may prove to be challenging. Users committees of Rambas Sitabas and Aaptari had approached the issue by establishing an advisory committee, which consists of selected community members as well as some of the members of previous committees. In Amarapuri the advisory committee consisted of members from political parties, municipality administration and district water supply and sanitation engineer. The role of the advisory committee is to give support

and advice when needed by the users committee. Transfer of knowledge from previous to the next committee was regarded very important. Other issues important for successful users committees, as identified by the interviewees in Amarapuri, Rambas Sitabas and Aaptari schemes were unity, clear division of roles and responsibilities among committee members and good leadership. As one of the users committee members of Rambas Sitabas scheme described, the shift from public tap to private taps was not a big challenge for them, as there was unity and key persons were active. The users committees of Rambas Sitabas, Aaptari and Amarapuri schemes had many active key persons who used their networks to get support.

Some of the interviewed committee members in Amarapuri, Rambas Sitabas and Aaptari schemes told about the trainings organized during the RWSSP. One of the water users of Aaptari scheme recalled how she had participated in a three day sanitation training in 1999 organized by the project and after that formed a Mother's group with other women. The gender sensitive trainings in Amarapuri during the RWSSP had, according to the interviewees, played an important part gradually increasing the level of activeness of women in the society. Fifteen days training provided for the management staff and water users committee members of Amarapuri scheme after completion of the rehabilitation of the scheme was told to have increased their understanding on the linkage between water quality and open defecation. This had ignited the campaign to improve sanitation conditions through construction of toilets and training water users. In 2009 Amarapuri village (VDC) was declared open defecation free (ODF) and was selected as one of the pilot cases for national total sanitation program supported by World Health Organization (WHO) and Department of Water Supply and Sanitation (DWSS). In 2013 Amarapuri VDC was declared as the First Total Sanitation VDC in Nepal meaning it had achieved all indicators of total sanitation and was reported to be free from waterborne diseases.

5.3.3 Post-construction support

In Nepal, the systematic post-construction support mechanisms for rural water supply schemes are not in place at the district level as it would require a person who would coordinate the activities. A positive estimation by an interviewed DoLIDAR official at the national level, was that it might take at least 2-3 years to implement the post in all 75 districts in Nepal. However, considering that the process had not even started in May 2014 during the interview, it can be considered

a rather positive estimation. The funding for rural water supply sector was seen problematic, as most of the funds budgeted nationally for water supply and sanitation were told to be directed to large-scale water supply projects in Kathmandu valley, while the funds available for rural water supply were very minimum.

Based on the interviews with government officials in Nawalparasi district, the absence of post-construction support unit at the district level made it challenging to coordinate possible post-construction activities. At the same time the main emphasis at the district level seemed to be on the construction of new water supply schemes, as many communities were still without improved water supply systems. Another focus area was sanitation, where the nationwide aim was to end the practice of open defecation in the communities through Open Defecation Free (ODF) campaign. According to the Water Supply and Sanitation Division Office (WSSDO) official, provision of technical support to the communities with water supply system was not seen as a problem, except during the monsoon, when some of the hilly communities are inaccessible. Supporting the users committees financially was considered more challenging due to limited funds. In case a committee needs support, the first step is to approach the government officials at village (VDC) or municipality level. If VDC/municipality cannot support, the next step is to contact district development committee (DDC). If they also cannot provide support, the last step is to contact the WSSDO. In case financial support is needed, the request is forwarded to the government, which then might or might not provide financial support considering the availability of funds.

Interviews with users committee members revealed that the access to post-construction support varied a lot among the schemes. The linkage for support by the users committees of studied schemes is presented in Table 8.

Table 8. Users committees' linkage to external support.

Name of the scheme	Source of support (financial/technical/capacity development)				
	VDC/ Municipality	District Development Committee (DDC) / District Technical Office (DTO)	Water Supply and sanitation Division Office (WSSDO)	District Soil Conservation Office (DSCO)	NGO/ Other organization
Amarapuri	x		x		x
Rambas Sitabas	x	x	x	x	
Aaptari	x	x	x	x	x
Nayabelhani	x			x	
Munde	x				
Ruchang A	x				
Ruchang B	x				
Ruchang C	x	x			

Three users committee, which were the most active (Amarapuri, Rambas Sitabas and Aaptari) also had a direct contact with WSSDO, which has a strong engineering knowledge from the field of water supply and sanitation. According to the key person of Aaptari users committee the reason to ask advice directly from the WSSDO was because in that way the problem could be solved much faster compared to asking help from the VDC/municipality. Amarapuri scheme had been rehabilitated during the RWSSP and currently another water treatment plant was under construction to answer to the increased water demand. Part of the funding for the new treatment plant was coming from the WSSDO. Although Aaptari and Rambas Sitabas had been able to finance most of the rehabilitation with funds collected from the users, a significant reason for this, according to the interviewees, had been the remittances, which had improved the income level of the households in the scheme area. During the rehabilitation process external technical support from WSSDO, DTO and neighbouring Pragatinagar VDC had been used for the survey and technical design and installations works. Funding had been also received from District Soil Conservation Office (DSCO).

Munde scheme had not been rehabilitated, but the users committee had received funds from the municipality for source protection works in 2015. Users committee was planning to shift from public to private taps and expressed that they would need external support for the works, but did not state any plan from where to request for the support.

The users committee of Nayabelhani scheme had a linkage with the VDC office, receiving annually funds for O&M. According to the interviewees they had always been able to obtain funds when in need. In addition the users committee had linkage to DSCO and community forest group, though which they also received funds. The ex-VDC chairperson lived in the Nayabelhani scheme area, which might have also partly explained the good connections to the continued VDC level support. The users committee had recently received a large fund from a local community forest users group, and was planning to use the funds to cover part of the expenses of the shift from public to private taps.

The situation in the Ruchang village seemed to be the most challenging. The VDC secretary, a government employee at the village level, has his office at Kawasoti municipality, at a distance of a 4-hours' drive from Ruchang. The office was shifted to Kawasoti during the armed conflict time already in 1990s and was not shifted back to Ruchang even after the conflict ended in 2006. Ruchang VDC has a special budget for natural calamities (floods, landslides etc.) but according to the interviewees, the funds were very limited due to scarce resources. There are no government employees with technical skills present in the village and lack of technical support was identified as one of the main problems for the users committees, who also felt that it was very difficult to reach any INGOs or government officials outside the village. However, there was a person in the community, who had worked six first years as a VWM for Ruchang A scheme had learned his technical skills through trainings from the project staff of RWSSP. Later on he had used the skills to search for a new water source and to join the pipes for a cluster of houses called Raudi, located in wards 6 and 8, which were not served by the Ruchang A scheme. However, the reason he told he had stopped working as a VMW for Ruchang A had been, because he had been told that if there were need for repairs and maintenance, water users could do them by themselves. There was a local NGOs, Suaahara which had provided occasionally trainings on sanitation.

While the lack of technical skills at the VDC office and difficulty to access external support were identified by the interviewees as key challenges faced, at the same time a large scale community-

managed gravity flow water supply project from Ruchang to Dedgaun village was being constructed by the Water Supply and Sanitation Division Office (WSSDO) of Nawalparasi. The aim of the project is to provide water for over 1 000 households in Dedgaun village located over 20 kilometers away from Ruchang. The source for the scheme is a stream located in Ruchang, below the sources of Ruchang A and Ruchang B and above the source that the users of Ruchang C had identified as a potential new source. The Dedgaun project came up in almost all discussions held in Ruchang village. Although the contract to use the source in Ruchang had been signed already in 2011, there seemed to be a lack of clarity among the interviewed users committee members and water users of the studied schemes on how the implementation of the Dedgaun scheme would affect the water use of their schemes. The water source for Dedgaun project is located in the area of ward number 4, where many water sources are located.

Although municipalities with more staff have better prerequisites to support users committees, even they may lack skilled workers, as was the case with Devchuli municipality. During the time of the interview in April 2015 there were only two sub-engineers and three social mobilizers available for the whole municipality, which had been formed by merging three VDCs in 2014. In total, only 12 of the 29 vacancies had been filled. Although there were plans to increase the number of social mobilizers to 15 during the next fiscal year, the Chief Executive Officer of the municipality was concerned about the slowness of the recruiting process.

Nawalparasi was described as a 3-storey district, which has a lot of ethnical variation and different needs in different areas. According to the interviewees at the district level in the southern part close to the border with India most of the people use hand pumps and were told to be reluctant to pay for water. In the hilly areas the need for water in many places was considered very high but many people are rather poor. Communities located close to the highway were told to be often more developed and educated and there are more funds available so the projects are often more successful. Based on the findings the description matched with the studied schemes. The schemes located closer to the highway had developed more than the schemes in Ruchang village located in the hills. They also seemed to have a better access to external support.

5.3.4 Finding the keys to sustainability of rural water supply

At some point of the lifetime of community-managed water supply schemes, all communities face challenges affecting the operation of the system. Yet, it is the community's approach and response which eventually determines whether the schemes will be sustainable or not. The findings of this study are summarized in Figure 13, which represents the main elements (community management, sufficient water source and operation and maintenance (O&M)) necessary to ensure the sustainability of rural water supply systems. Natural hazards and increased water demand through population growth and misuse of water are some of the common factors having a negative contribution to the functionality of the schemes. Yet, this study also wants to point out examples of enabling factors contributing to the formation of social capital which can make positive contribution and support the actions towards the sustainability of the schemes. Social capital can be associated with issues such as voluntarism in the committees as an example of social work valued by people, feeling of cohesion and unity in the community, presence of key persons with networks and linkages, or increased level of confidence and skills gained by women through Mother's groups engaged in savings and credit activities and community development.

In communities with social capital, people are likely to invest in collective activities knowing that others will also do so. This, in turn, facilitates cooperation and decreases actions which might have negative outcomes, such as degradation of natural resources (Pretty 2003). This is relevant for community-managed water supply systems as well, where the collective action of the community is necessary for scheme sustainability. While social capital can support the community in the management of water resources, it can also be harmed by the actions taken by the members of the same community. The presence of unofficial temporary connections from public taps to private households (see Chapter 5.2.2) is an example of practice which creates inequality among the users and decreases social capital. While all users pay the same water tariff, the ones with unofficial connections get unfair benefit as they can have the convenience of storing and using water at home, not needing to fetch it from the public tap further away. In the communities where these connections were observed, they were not hidden, but clearly visible. Initially people had used them in discreet, only during the night time, but gradually it had become more acceptable practice. Even if it was admitted that the official rules did not allow private connections from

public taps. The users committees are supposed to follow that commonly agreed rules and regulations are being followed, but if no sanctions are posed to the ones breaking the rules, this can gradually decrease the social capital and cause disputes. It can further hamper the O&M of the scheme, if users become reluctant to participate in the maintenance activities such as community work during repairs of scheme structures after landslides or protective works.

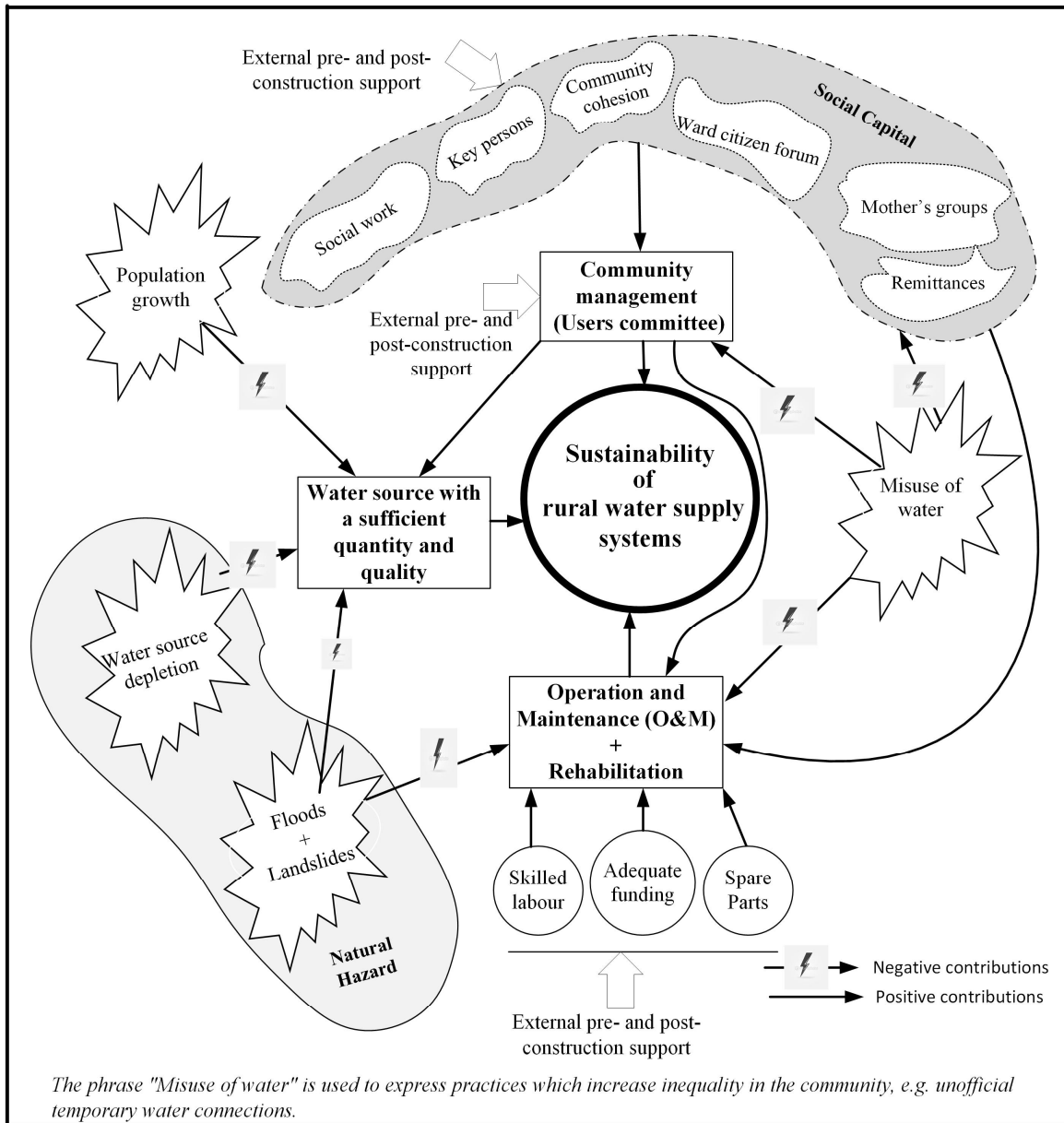


Figure 13. Main elements of sustainable community-managed water supply systems including factors contributing negatively and positively to the functionality and sustainability. (Source: Author)

Some of the social factors can have both negative and positive side. Through migration many skilled persons can leave the community, creating a gap in the human resources available. Yet, remittances received by family members staying in the communities provide a significant source of household income enabling people to improve their housing or provide education for their children. In addition, as many men move abroad, the role of women in the decision making has also increased. This is an example of an issue which can both increase and decrease the social capital of a community. Another example is population growth, which puts pressure to the existing water supply infrastructure as water use within the scheme area increases, possibly causing water scarcity or even internal disputes among users. However, at the same time increased population can mean increased number of people sharing the cost of operation and maintenance and even new investments in case of rehabilitation. In Rambas Sitabas, during the time of the rehabilitation, the number of households was over 300, it had more than doubled since the construction time. The increase in population after the scheme construction resulted in decreasing per capita (household) cost of the rehabilitation. Comparing the situation with the Ruchang B scheme with only 50 households, where the population has remained rather constant since the construction time, the per capita cost for rehabilitation would need to be relatively larger compared to the Rambas Sitabas scheme. That is because sources of gravity schemes are often located far from the users, and the length of pipeline can be many kilometres in a difficult terrain. The size of the population served by the scheme can affect the design of the reservoir tank size, but not on the length of the pipeline. During the rehabilitation or repairs, works such as digging the trenches, need to be done manually, and those works are usually contributed mainly by users. Rehabilitation of a scheme with less households would thus require significantly larger contribution, both financial and that of unskilled labour, compared to a scheme with larger number of households having the same distance from the source to the taps. Thus different schemes are not in equal position and some may need more external support for scheme rehabilitation than others.

It has been generally acknowledged that both pre-project and post-project factors affect the sustainability of rural water supply systems (Bakalian & Wakeman Eds. 2009, Gebrehiwot 2006, Rautanen S-L. 2016). Comparing the list of pre-project factors presented in Table 1 (Chapter 2.1.2) to the approaches taken during the Rural Water Supply and Sanitation Project (RWSSP), it

can be said, that many of the factors such as technical design and quality, serving the unserved, strengthening the capacity of communities and institution and community participation were present, but the way they were emphasized developed from one phase to another. During the Phase I the approach remained rather centralized with users committees and community members mainly providing a source of labour during the scheme construction, and capacity development activities were quite minimal. During the Phase II, an increased emphasis to support the national decentralization process led to a creation of new working modality, where cooperation with local government institutions began and the funds for procurements were directed directly through users committees' accounts increasing their role and responsibility. The development of step-by-step approach with clearly defined procedures during planning and implementation of the water supply schemes supported community participation. During the Phase III the further increased emphasis on community participation, gender issues, trainings and capacity development on sanitation and post-construction support for operation and maintenance (O&M) were signs of approaching to the lessons learned from previous phases. Various trainings to the communities and government officials were also organized to develop their capacity.

Considering the long history of over 200 years of centralized governance practices in Nepal, the change from centralized to decentralized governance cannot be expected to take place overnight. The lack of locally elected representatives, armed conflict and lack of coordination of different ministries and departments are issues which were out of the sphere of influence of the Rural Water Supply and Sanitation Project (RWSSP), or other individual water supply projects implemented by donors or the government agencies. Despite the challenges faced by the RWSSP, the decision to work together with village and district level bodies can be seen as a good decision, because they are the permanent structures present in the country which can continue supporting the communities when the donors have gone.

As presented in the Figure 13, O&M requires skilled labour, adequate funding and spare parts, all issues widely recognized in the literature. During the implementation of the studied schemes village maintenance workers (VMWs) had been trained by the RWSSP to carry out scheme maintenance and repairs while O&M funds and tariff collection were introduced to ensure the

communities would have funds to purchase spare parts and tools and to pay for the VMWs. Based on the findings trained VMWs and regular water tariff, adequate to cover daily operation and maintenance costs, was present in only part of the committees (Chapter 5.3.1). Preventive maintenance, including continuous monitoring of the systems to detect possible damages and leakages at an early phase and to take protective measures for the scheme structure against flooding and soil erosion, was done by the better-performing users committees.

Committees which were not performing so well seemed to be lacking the leadership skills and ability to take action to improve the condition, even in situations when the functionality of the scheme had been decreased for a prolonged time. The approach to maintenance in those committees was usually corrective or even crisis maintenance trying to repair a damage caused, not trying to act before the problems would escalate. In the schemes with inadequate revenue collection through monthly tariff, the financial resources needed to fix the damage were either collected from the users as per need (all schemes in Ruchang village), or users committee used external sources to cover the costs (Nayabelhani scheme). In schemes with no trained VMW users carried out the repairs. However, using unskilled labour for repairs, as was the case with all studied schemes in Ruchang village, had led to poor quality of work. When short left-over pipes and plastics from noodle packets had been used to repair leaking pipes, repaired pipes continued to be vulnerable for damage. Many pipes had also not been covered with soil, but were left to run on the soil surface or hanging from bushes (see Figure 6 in Chapter 5.2.1). Reason for not purchasing new pipes was told to be lack of funds, even within the Ruchang A scheme, which still had some O&M funds available in the account of the users committee. The inability of the users committees to mobilize resources for O&M had been recognized already during the RWSSP, as the mid-term evaluation of Phase II pointed out that in many cases the funds available in the account were not used for small repairs as it was easier to collect funds from the users than get the funds from the bank, which might have been located far from the village. In case of larger maintenance needs, the funds in the account were not adequate to cover the costs. (RWSSP 1998)

Liski (2016) studied the frequency of natural hazards and their impacts on water supply service functionality in rural communities in Nepal constructed during the RWSSP. Findings of this study comply with her findings about natural hazards, especially floods and landslides, being frequent in the study area. According to Liski (2016) disasters causing physical damage of the scheme structures seem to cause easily chronic problems as the damaged infrastructure is often not fixed adequately, making the scheme even more vulnerable for future disasters. This is clearly an issues linked with the operation and maintenance of the schemes, and the approach by many of the communities not to try to prevent the damages, but only act after it has occurred, is clearly a problem for sustainability.

The challenges faced by the communities related to O&M issues were acknowledged especially during the last phase of RWSSP, when the project started to organize post-construction workshops and seminars for the users committees of the schemes constructed during the Phases I and II. A specific O&M framework was created in 2003 to emphasize the need for routine O&M of the schemes, as studies during the project had revealed that village maintenance workers (VMWs) in many of the schemes constructed during the previous phases were dormant and users committees felt that they had been left alone. Although the need for the implementation of an O&M systems were recognized, at the same time the project acknowledged the limited resources and time available for the implementation, as the framework was created in 2003 and the project was planned to phase out in 2004 (though later extended until 2005). As a results, the good intentions of the project to institutionalize O&M systems into the government office in the village and district level was not completed, but only partially implemented in few of the eight programme districts during the Phase III (RWSSP 2005). Nevertheless, many of the proposed ideas, such as creating a specific O&M support unit at the district level to provide post-construction support to the communities and strengthening the technical support for VMWs at the village level were very relevant approaches. And unfortunately, still were not present in Nawalparasi district during the time of this study, ten years after the project had ended.

Based on the findings it is clear that the lack of trained staff, unaddressed issues of O&M and absence of cost-recovery, all identified as factors hampering the sustainability of small-scale community managed projects already in 1990s, are still the pressing challenges present today

(Cornwall 2002 cited in Behailu et al. 2015:382, Lockwood & Smits 2011). Yet, positive examples were also found among users committees which had taken an initiative to rehabilitate and expand their schemes. It seemed that social capital, especially cohesion and active persons with social networks were supporting the activities of the users committees. A step towards professionalization of management practices was also observed in three of the better performing users committees of Amarapuri, Rambas Sitabas and Aaptari schemes. Amarapuri scheme, which was significantly larger (~1,700 households) than the other studied schemes, was run by seven staff in the management, while the users committee had the overall supervision role. Rambas Sitabas (~500 households) and Aaptari (~320 households) both had an office secretary responsible of the meter reading of private taps, tariff collection and other office tasks, as well as two VMWs. This trend from complete voluntarism in the management of the scheme towards professionalization has been acknowledged by Lockwood & Smits (2011) who call it 'community management plus'. This can be seen rather natural approach when the scheme size increases and communities shift from public taps to private taps.

Availability of post-construction support has been identified as one of the most significant factors of sustainability of community-managed rural water supply systems (Bakalian & Wakeman Eds. 2009, Harvey & Reed 2003, Schouten & Moriarty 2003, Rautanen S.-L. 2016, WaterAid 2011). The lack of locally elected representatives in the district and the village/municipality level and the fuzziness of water supply and sanitation sector with many actors and lack of clear coordination and division of roles has not made it easy for the communities and users committees to get support. In this light, it is even surprising that still so many water users committees are present and water supply schemes are actually functioning. Findings of this study are consistent with the literature as it could be seen that the schemes where users committees had received external support for technical and management issues as well as financially, were functioning better than the schemes where the level of support for the users committee had been lower. Active committees had also used different sources for the financial support. The presence was not enough to mean that all users committees would get the support they would need. At the national level, the lack of implementation of policies emphasizing the need to allocate part of the budgets for repairs and rehabilitation of water supply schemes has been recognized (MPPW 2011). At the dis-

district level, limited human and financial resources, lack of coordination between different ministries and agencies, lack of post-construction unit and focus on the construction of new water supply schemes, meant that there was not an active stretch out from the local government to the communities.

It seemed that an ability of the users committee to reach for the support was one of the keys. In practice this meant that those users committees which had actively sought for support and approached the government bodies at the district level had received support. One important element identified was the presence of active key persons within the communities and the users committee, who use their networks and contacts to reach for the external support. A lack of these key persons, or their inability to reach for the support, meant that the users committees were left by themselves to try to sort out the challenges they had faced.

Lockwood and Smits (2011) argue that the presence of post-construction support mechanisms where communities can apply funding from various agencies for the investments needed for scheme rehabilitation, can even discourage communities to make their own contributions and investments for the improvements in the scheme infrastructure. Although this may be the case with some communities, it was not the case with users committees of Rambas Sitabas and Aaptari, which had been able to mobilize the local resources for scheme rehabilitation. While most of the rehabilitation was done with financial and in-kind contributions from users, some financial support was received from external agencies. However, it was clear that both communities had required technical support for survey and implementation. Thus it is important to notice, that there are different types of external support that can be given, and although communities might have financial resources, they rarely have adequate technical skills for rehabilitation.

One of the paradoxes with inability to access external support was found in Ruchang village, where the interviewees felt that they had been unable to access external technical and financial support, while the condition of the schemes was degrading. The management skills of the users committees seemed to be weak with an inability to take actions for scheme improvements. Committee of Ruchang C told how a survey would be needed for the newly found water source,

but the community lacked funds to implement it. At the same time a large scale gravity flow water supply project from Ruchang village to Dedgaun village at 20 kilometers distance was being constructed by Water Supply and Sanitation Division Office (WSSDO) of Nawalparasi. The source for the scheme is located in Ruchang, below the sources of Ruchang A and Ruchang B schemes and above the source that the users of Ruchang C had identified as a potential new source. The scheme, upon its completion is to provide water to over 1,000 households in Dedgaun village, thus it can be assumed to have an effect on the possible water source of Ruchang C downstream. Dedgaun project came up in almost every interview in Ruchang village, and the concern of the people was on how it would affect the water use of the schemes in Ruchang. Although a government agency with technical knowledge was implementing a water project in the neighbourhood, users committees were lacking the support needed for the rehabilitation of the schemes.

Based on the findings, the need of external support differs depending on the situation. During the first years the need for external support may not be required, if the scheme functions well and provides users with water. In case there is a natural hazard such as flood or a landslides, users may be able to repair the damage if it is within their capacity. However, in case of natural hazard such as landslides, to repair a caused damage may be outside the capacity of the community and may require external technical and financial support. The need for technical support due to damage and malfunctioning of the system is quite easily detectable by the communities themselves when the scheme functionality and availability of water is altered. As technical support focuses on the maintenance and repairs of physical structures engineering approach to fix the actual technical problems can be used.

However, the findings of this study suggest that many of the challenges faced by the communities were related to social issues and management practices of the users committees. The lack of trust by users towards the committee and increased inequality in access to water through unofficial temporary water connections creating conflicts and disputes over water use, were issues tackled by the committees. Social issues cannot be solved through engineering practices as they involve human relations. They are issues which may develop over a long period of time. This

calls for increased importance for software components in the post-construction support to increase the management capacity of the users committees, through trainings, facilitation and mentoring, as they have to be able to make important decisions related to the O&M of the schemes.

Ward citizen forums established in the communities to enhance local decision making were identified as opportunities also to support the community-management and access of communities for external support. Future research is needed on the possibilities that ward citizen forums could provide, especially in facilitating possible internal conflicts in the communities, as well means to support inactive users committees to improve the practices and to reach for the external support in situations when the capacity of the community is not enough to tackle the challenges.

6. CONCLUSION

6.1 Limitations and ethical questions

This study was conducted as a qualitative case study with eight gravity flow water supply schemes as the cases. Due to time constraints in the field, it was not possible to study one particular scheme until the collected data would have been saturated, meaning that no more information on the topics could be collected. However, as many schemes with different characteristics were included in the study, it was possible to collect data, which together would provide information on opportunities, challenges and approaches taken by the users committees. However, it is acknowledged that the researcher can never be totally neutral in her position as she is always representing something to the interviewees and can affect the way they answer to the posed questions, both intentionally or unintentionally. Prior every interview, it was made clear to the interviewees that the researcher was an independent researcher studying the issues, not a representative of Finland or the NAPA WASH project which the study contributed to. However, as the legacy of Rural Water Supply and Sanitation Project (RWSSP) supported by the government of Finland seemed to be still strong among many interviewees, as a Finnish researcher, I could not cast away a shade of being a representative of the country that supported the villages many years ago. Thus, it is possible that not everything was told as it is in reality, or things were described to be worse than they are in hopes of getting support for the communities.

As most of the interviewees were fluent only in the Nepali language, I needed to rely on the interpreter to pose questions and to get answers during the interviews in the communities. Having to use an interpreter puts the researcher into a different position compared to a person who is able to communicate directly with interviewees using the same language. During translations, the meaning of words can change when translated from one language to another. It may also occur that the interpreter does not translate the whole response but just the part which answers the initial question. It is possible that the interviewee has expressed issues which are relevant for the researcher to know more about, but which she was not aware of to ask about. An additional challenge was posed by the fact that English is not my mother tongue, again leaving probability for interpretation. In order to decrease possible bias linked with the translations, discussions with the

interpreters both in 2014 and in 2015 were held to emphasize the importance to describe the responses in as detail as possible. Along the field visit topics for discussion were repeated with different users committees and other stakeholder groups which also gave confidence and experience for the interpreter to be familiar with the concept used.

While in Nayabelhani and Amarapuri some female members of users committees also participated in the focus group interviews organized for the users committees, in Devchuli and in Ruchang there were only male members present. The only exception in Devchuli was a focus group interview which was specifically organized for female users committee members and water users of Aaptari scheme. Participation in the interviews was voluntary and the reason for all members not to participate was not asked for. Due to time constraints it was not possible to arrange a separate focus group discussion for women in all schemes. One possibility for bias could be in situations where men were talking on behalf of women about their roles and level of activeness in the committees and in the society. However, the level of participation of men and women in the interviews can also give some idea of the prevailing situation of the roles of women and men in the communities.

Prior coming to Nepal in 2015 my idea was to select another community than Devchuli for a field visit. However, upon arrival to Nepal I heard about a national strike which was going to block the traffic in main roads for several days during the time I was supposed to move from village to another. It would have severely affected to my field schedule and possibility to reach villages. Devchuli municipality had been selected by another Finnish student researcher within the NAPA WASH project who focused on functionality issues. Because we travelled to Nepal at the same time in 2015, I made the decision to travel with her to Devchuli to stay there for one week to study the selected schemes, as they still met the sampling criteria. She had decided to stay over a month only in Devchuli to study all the schemes constructed during the RWSSP. As she studied the long-term sustainability issue from a different viewpoint, visiting the same community and partly the same schemes was not seen a problem, as it can even enable comparison of findings and increases the validity of the results.

Nepal is a country with over 100 different ethnic groups and social structures and norms can have an impact on the management of water supply schemes in Nepal. However, due to the complexity of the issue, a decision was made since the early days of the study to exclude the social practices linked with caste and ethnic groups from the scope of the study. However, it is acknowledged, that relationship between different ethnic groups and their representation in the users committees and other community groups can have an impact on the management of the rural water supply systems, should be acknowledged when intervention to implement new schemes or post-construction support to the existing schemes is planned. However, it would be a topic for another study.

6.2 Conclusions and recommendations

This study aims to address three questions related to the long-term sustainability of community-managed water supply systems: 1) What opportunities and challenges are there for community-managed rural water supply systems in Nepal? 2) What differences can be identified in the approaches taken by better performing and poorer performing water users committees?, and 3) What type of external support for the water users committees can be identified to be the most crucial for the management of water supply schemes?

At some point of their lifetime, all rural water supply systems experience challenges, which affect their operation and functionality. Natural hazard, aging infrastructure and social factors such as population growth or misuse of water affect the operation and maintenance (O&M) and scheme functionality. Yet, it is the community's approach and response to these challenges which eventually determines whether the schemes will be sustainable or not in the long run. As functionality is a snapshot view, always taken in specific time, it does not tell about the situation of yesterday or tomorrow. A well-functioning scheme may face a damage caused by a landslide tomorrow, but within a month if the damage is repaired, the scheme can be functioning again. Users committees of the studied schemes had used different approaches to manage the schemes. Preventive maintenance, including continuous monitoring of the systems to detect possible damages and leakages at an early phase and to take protective measures for the scheme structure against flooding and soil erosion, was done by the well-performing users committees. Organization and share of roles and responsibilities and transparency towards the users were also im-

portant. Passing the knowledge from previous committee members to new members through mentoring and through establishment of advisory committees, were also identified as effective ways to develop the capacity of the users committee. Committees which were not performing so well were often lacking the leadership and ability to take action to improve the condition, even in situation when the functionality of the scheme had been decreased for a prolonged time. The approach to maintenance in those committees was usually corrective or even crisis maintenance trying to repair a damage caused, not trying to act before the problems would escalate.

Many studies focusing on the functionality and long term sustainability focus on the negatives, things which are missing and causes for poor performance. Yet, this study also wants to point out examples of enabling factors contributing to the formation of social capital which can make positive contribution and support the actions towards the sustainability of the schemes. Social capital can be associated with issues such as voluntarism as an example of social work valued by people, feeling of cohesion and unity in the community, presence of key persons with networks and linkages, or increased level of confidence and skills gained by women through Mother's groups engaged in savings and credit activities and community development. While migration is one of the causes for skilled labour to leave the communities, it is also a source of improved income level of households through remittances. By concentrating on the available resources and opportunities within the communities, also recognizing the issues to be developed, it is possible to harness the potential that is present in all communities to make water supply systems more sustainable in the long run.

The findings of this study suggest that post-construction support is very important for the sustainability of community-managed water supply systems. Depending on the need, the support required can be financial, technical and management support and facilitation. Yet, just the mere presence of support structures is not enough, but the ability of the users committees to actively request for the support seemed to be the key. However, not all committees seemed to have the capacity to reach for the support. It is also important to notice that along the years there can be changes in the social capital which support the sustainability of the schemes. Some communities may experience internal conflicts, decrease of trust or fatigue with voluntarism requiring external facilitation or mediation to solve the issues. If they lack the means to reach for the support, the

problems may escalate or become chronic. Some of the physical damages cause by natural hazards can be too wide to be managed by the skills and resources available in the community. As the scheme approach the end of their design life, rehabilitation is often needed to face the demands of community. A shift from public taps shared by many households to private taps in each individual household requires investments as well as technical skills which are rarely available in the communities. Although some communities may be able to finance the investments by themselves, technical support in design and implementation is usually required externally. In case of small schemes which serve less people, like the case with Ruchang B scheme with 50 households, the need for external financial support for financing the investments may be required, as otherwise the capital costs per household may be unbearable by the community.

The approach taken by the Rural Water Supply and Sanitation Project (RWSSP) implemented jointly by the governments of Nepal and Finland in 1990-2005 was to support the decentralization process in Nepal and to work in collaboration with local government agencies. This was an ambitious goal in a country which had experienced over 200 years of centralized ruling and where the newly started decentralization process was further hampered by an armed conflict between 1996 and 2006. Despite the circumstances, the project continued to implement community-managed water supply and sanitation schemes until the end of the project and many of the approached, especially with community participation in scheme implementation and construction, developed and results were successful.

Many of the practices implemented during the project, such as the support provided to the users committees, establishment of O&M funds, sanitation and hygiene components and gender sensitisation through supporting the participation of women, also in technical field, were issues very important for the sustainability of the systems. However, post-construction support was clearly an issue which was not adequately addressed since the beginning of the project, neither effectively institutionalized in the local governance structures. As a result the support for most of the water supply schemes constructed during the phases I and II remained quite shallow, mainly just including post-construction support workshops and seminars organized during the Phase III for selected members of the users committees. The lack of financial and human resources prevented

more practical support to be given to most of the schemes where schemes would have actually been visited and the whole users committee would have received capacity development support.

However, the legacy of the RWSSP is still visible in Nepal especially through Amarapuri scheme, which is recognized as a significant resource centre for water safety planning and community-management in the whole Nepal. Prior to the RWSSP intervention, the scheme was in really poor shape but the extensive support given by the project to the community through scheme rehabilitation and training of the community was the seed that kept growing as it was nurtured by the community. The role of external pre- and post-construction support in enabling Amarapuri to reach the stage where it is now cannot be denied. Yet, it would not be where it is without active participation of the users committee and collective action of the community to actively develop its practices. The work with post-construction support initiated by the RWSSP is visible in the work done by Amarapuri users committee in the way how they keep sharing their knowledge and experience by training other users committees and community members in order to bring positive development and increase the sustainability of rural water supply systems in Nepal.

The following recommendations are given based on the findings of this study:

Users committees require support especially with issues related to decision making, solving conflicts and addressing other social issues in the community. Advisory committees established successfully to some of the studied schemes to support the users committees, can help the communities to retain knowledge and experience also when new committees are selected. Encouraging communities to establish advisory committees is recommended.

There were clear differences in the level of activeness of women in the users committees and in the communities. In communities where women are passive in the committees, just posing quotas for the number of women in the committees does not enhance their activeness. One way to increase the activeness of women in the committees could be to involve the women through the Mother's groups in capacity development activities, together with the users committee members, and sensitize the communities, both men and women, on the importance of the participation of both genders.

Findings of the study showed a clear need for the development of external post-construction support structures in the district and village level. The recommendations already given by the RWSSP on the need for institutionalized post construction support mechanisms is still valid today. Post-construction support units for O&M of the schemes in each district, with clearly defined roles and responsibilities and adequate budget allocations, would be necessary to ensure the sustainability of the schemes. During monsoon, when most of the natural hazards occur and the need for technical support due to damages would be the highest, many hilly villages are inaccessible by car and district support cannot reach the communities. Thus, it would be necessary to increase the technical capacity in the village and municipality level, to have a person(s) employed by the government with technical skills and an ability to provide support for village maintenance workers (VMWs). This might also support the communities to respond on the O&M needs on an early phase before the problems become chronic.

Inability of the users committees to take action to improve the condition of degrading schemes and to solve conflicts present in the communities can lead to decrease in social capital and collective action required for community management. Identification of the communities in need and providing external software support through trainings and facilitation to increase the management capacity can improve the prerequisites for sustainability. However, this requires active monitoring and adequate financial and human resources by the district level agencies to be aware, which communities would be in the need of support.

The recent establishment of a new Ministry of Water Supply and Sanitation in January 2016 raises expectations of improved coordination in the future among different actors in the water supply and sanitation sector.

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APPENDIX 1

List of interviews conducted in Nepal in 2014 and 2015

Field visit 7th -21st of May 2014

11.5.2014, Amarapuri: Focus group discussion with members of Amarapuri users committee, water safety planning committee and sanitation committee, (7 persons: 2 female, 5 male)

12.5.2014, Ramgram: Interview with Divisional Chief Engineer of Water Supply and Sanitation Divisional Office (WSSDO) of Nawalparasi District (male)

12.5.2014, Ramgram: Interview with Chief District Engineer at District Technical Office (DTO) (male)

12.5.2014, Ramgram: Interview with Nawalparasi WASH advisor of Finnish supported RWSSP-WN (male)

12.5.2014, Nayabelhani: Focus group discussions with Nayabelhani users committee members (6 persons: 4 men, 2 women)

13.5.2014, Nayabelhani: Focus group discussion with users committee members and water users of Nayabelhani scheme (23 persons: 20 men, 3 women)

13.5.2014, Nayabelhani: Discussions with water users at the community tap, transect walk in the community and interview at a household (1male, 3 female)

12.5.2014, Nayabelhani: Discussion with VDC-secretary at the Nayabelhani VDC office (male)

13.5.2014, Nayabelhani: Transect walk at the water source area of Nayabelhani water supply scheme and discussion with users committee chairperson and village maintenance worker (VMW) (2 male)

14.5.2014, Amarapuri: Transect walk at the water source and water treatment plant of Amarapuri scheme, interview with lab technician of Amarapuri scheme (male)

14.5.2014, Amarapuri: Focus group discussion with female members and water users of Amarapuri users committee (5 female)

15.5.2014, Amarapuri: Household visit and discussion with a family who was representing dalit caste. (1 male, 1 female)

16.5.2014, Pokhara: Interview with management information system specialist of RWSSP-WN who used to work for RWSSP (male)

19.5.2014, Kathmandu: Interview with National president of FEDWASUN (male)

19.5.2014, Kathmandu: Interview with senior divisional engineer of DoLIDAR (male)

Field visit 1.-21.4.2015

6.4.2015, Devchuli: Interview with advisor for all water supply schemes in Devchuli (male)

7.4.2015, Devchuli: Focus group discussion with Rambas Sitabas and Aaptari users committee members and a transect walk at reservoir tanks and water source area (5 male)

7.4.2015, Devchuli: Interview with Aaptari users committee chairperson (male)

7.4.2015, Devchuli: Focus group discussion with WUSC and advisory committee members and water users of Aaptari, Rambas Sitabas and Ranibel schemes (11 male)

8.4.2015, Devchuli: Household interview with water user (female)

8.4.2015, Devchuli: Household interview with water users (1 male, 3 female)

9.4.2015, Devchuli: Focus group discussion with female member and water users of Aaptari scheme (7 female)

9.4.2015, Devchuli: Interview with Aaptari office secretary (female)

10.4.2015, Devchuli: Interview with ward chairperson for wards 6,7,8,9 in Devchuli municipality (male)

10.4.2015, Devchuli: Discussion with ex-users committee member of Rambas Sitabas scheme (male)

11.4.2015, Devchuli: Focus group discussion with users committee members and social mobilizer of Rambas Sitabas after participation in the General Assembly meeting of Rambas Sitabas scheme (1 female, 3 male)

11.4.2015, Devchuli: Interview with restaurant owner and water user of Munde scheme (female)

11.4.2015, Devchuli: Focus group discussion with users committee members of Munde schemes (4 male)

11.4.2015, Devchuli: Discussion with Ranibel VMW at her house (female)

12.4.2015, Devchuli: Discussion with the manager of the Pragatinagar Water Supply and Sanitation Association (male)

12.4.2015, Devchuli: Interview with the Chief Executive Officer of Devchuli Municipality (male)

13.4.2015, Ruchang: Discussion with the host living in the Raudi cluster in Ruchang village (female)

13.4.2015, Ruchang: Focus group discussion with VDC vice-chairperson, local teacher, social worker of ward 8, social mobiliser, VDC office assistant, users committee members from Ruchang A and Ruchang B (9 male)

14.4.2015, Ruchang: Interview with ex-VWM of Ruchang A scheme (male)

15.4.2015, Ruchang: Interview with ward nro 4 key person, principle of the primary school (male)

15.4.2015, Ruchang: Focus group discussion with users committee members of Ruchang B scheme (4 male)

15.4.2015, Ruchang: Interview with the chairperson of the users committee of Ruchang A scheme (male)

16.4.2015, Ruchang: Focus group discussion with users committee members and water users of Ruchang C scheme (8 persons: 6 male, 2 female)

17.4.2015, Ruchang: Interview with the chairperson of the VDC-level Women's Committee (female)

APPENDIX 2

Interview themes

Themes for expert interviews

- Roles and responsibilities of district level offices
- reasons behind the success / failure of users committees
- Role of FEDWASUN
- post-construction support for the schemes / available resources
- guidelines for monitoring the functionality of water supply and sanitation schemes
- focus areas at the district level (construction of new schemes/rehabilitation of old/capacity building)

Themes for focus group interviews

- Introduction of participants (name, position, membership in other community groups)
- Current condition of the scheme
- Challenges faced by the users committee, actions taken
- Organization of the users committee (roles and responsibilities, tariff collection, meetings, selection of new members etc.)
- Source of motivation for users committee members
- Sources and types of external support received by the users committee
- Level of cooperation with other community groups
- Shift from community taps to private taps, reasons for shifting (only for schemes with private taps)
- Role of women in the committee and in the society
- Trainings (needs, experiences)
- Ideas how to support users committees not functioning well

APPENDIX 3

A case of Amarapuri – Learning through positive experience

Amarapuri water supply and sanitation scheme serves ~1700 households in Amarapuri town (Amarapuri VDC until May 2014) in Gaidakot municipality. Amarapuri is currently an important resource centre for water safety planning and water treatment issues in the whole Nepal. In addition to national and international delegates, nursing students from 20 colleges in Nepal visit Amarapuri annually as part of their studies to learn in practice about water purification systems. There are also about 30 users committees visiting Amarapuri annually and by request trainings to other users committees on topics such as O&M, water safety planning, water quality testing and financial management are provided.

The gravity flow water supply scheme with river source was initially constructed in 1979 and was under the government management until 1999, when it was handed over to the community. After the establishment of the users committee, a local community forest group in Amarapuri had taken the initiative to approach Rural Water Supply and Sanitation Project (RWSSP) to sign a contract to get support for the rehabilitation of the water supply scheme, which was in poor condition. The rehabilitation of pipelines, water intake and taps was supported by RWSSP and a decision to construct water treatment plant was made to improve the drinking water quality, as people had been drinking raw water from the river source. The construction of the treatment plant was completed in 2004 and at the end of the Phase III of RWSSP in 2005 a water quality laboratory used by the RWSSP was donated to Amarapuri.

The holistic approach taken by the RWSSP in Amarapuri covered the whole community, and in addition to trainings on operation and maintenance (O&M) of the water system, trainings on sanitation and hygiene as well as gender issues were organized for the community members. According to the interviewees, women had been shy to express themselves, but gradually practices had started to change and people thought that various trainings and sensitization on gender issues had played a significant role in igniting the change. Currently discrimination of women or different caste groups in the community was reported to be absent.

A 15-days training on O&M of the treatment plant and water quality issues been organized by RWSSP for the users committee key persons and the management staff after completion of the construction of the water treatment plant in 2004. The most important lessons from the training had been an increased understanding on the risks of polluted water and the importance of drinking safe water, methods for water treatment and understanding the direct linkage between open defecation and water pollution. Training had given an incentive for the users committee to start more extensive awareness creation on hygiene and sanitation issues in the community as only 30 % of the households had a toilet at that time. More organized toilet construction with the support from RWSSP and VDC had been started together with training 100 community members on sanitation and hygiene issues annually, a practice which still continued during the time of the interviews in 2014.

After the phase out of RWSSP in 2005, the users committee continued to receive support from the Amarapuri village development committee (VDC) and Department of Water Supply and Sanitation (DWSS) for the construction of toilets and for awareness creation. In 2009 Amarapuri was declared open defecation free (ODF), which meant that all households had a toilet and people did not go anymore to help themselves in the bushes. The same year Amarapuri was selected as one of the pilot cases for national total sanitation program supported by World Health Organization (WHO) and DWSS where emphasis was on post-ODF situation. This led to the adoption of water safety planning (WSP) approach where the focus is to cover the whole water supply system from the catchment area to the transmission line, water treatment units, reservoir tanks, distribution networks and water taps and identify possible risks and hazards to the system. Main indicators monitored are sanitary conditions of all households, use of toilet, use of safe water and safe food, practice of hand washing with soap, clean house environment and environmental cleanliness in the whole community including public places. Monitoring of water quality is also emphasized. In 2013 Amarapuri village was declared to be the First Total Sanitation VDC in Nepal having achieved all indicators of total sanitation and was reported to be free from water-borne diseases. During the field visit the high level of environmental cleanliness in Amarapuri could be observed with no trash or rubbish lying on the ground. It was obvious that people in the community were actively taking care of their environment (Figure 1).



Figure 1. Views from Amarapuri where community members practice total sanitation including environmental cleanliness in households and public places.

Amarapuri water supply system is run by seven paid staff; including a manager, three plumbers (VMWs), a water meter reader, a person looking after the intake and the treatment plant, as well as a lab technician who also acts as a field coordinator responsible of training activities. Under the main users committee there is a water safety planning (WSP) committee and sanitation committee, which also have sub-committees in each ward. An internal account committee comprised of three community members monitors monthly the income and expenditure. Users committee and account committee each serve a three year term and members can be re-elected in the general assembly in case they perform well, while WSP and sanitation committee comprise of experienced persons whose position is more fixed. Unity, clear identification of roles and responsibilities for committee members, working for the consumers and not for their own benefit, transparency and accountability in front of the community as well as presence of paid staff responsible of the operation of the scheme were identified by the users committee members as the significant factors for their success. When in need of external support and advice, users committee had approach an advisory committee comprised of representatives of political parties, VDC chairperson and engineer at WSSDO office at the district.

Trainings and awareness creation in the community has continued as the committee still keeps training 100 persons per year focusing especially on women and people who have recently moved to the community in order to make them aware of water safety planning. In addition, reli-

gious leaders and school students were regarded as significant groups in the community to be trained on water safety issues.

The lab technician who is also a field coordinator responsible of organizing the trainings used to work as a team leader for a local NGO which was one of the service providers for RWSSP during the Phase II of the project since 1997. He had received training from RWSSP and had been responsible of training users committees on issues such as O&M, community action plans and post-construction activities. In Amarapuri he started as a treasurer of the committee in 2000 and later became the lab technician, and continued training other committees and the community. During the years he has been actively training himself to get more experience and skills. Also some of the other users committee members had taken trainings to be able to train others. From his vast experience in working with and training a large number of users committees, the lab technician identified four most critical issues for the scheme functionality and management of the scheme: 1) knowledge on O&M, 2) presence of plans and policies, 3) transparency and 4) feeling of ownership and responsibility. Recruited staff responsible of the operation of the water supply system was also seen as one of the prerequisites for functioning schemes.

Amarapuri has also faced challenges along the years. The catchment area is surrounded by forests and flooding as well as high water turbidity during the monsoon creates occasional problems at the intake and for the water treatment system. Increase in water demand through increased population has put pressure for the supply system causing water to be available only 3 hours in the morning and three hours in the evening. During the field visit in May 2014, the construction of a new water treatment plant was in the process. When completed, it would enable 24 hour water supply for the whole community. Amarapuri users committee is cooperating with other community groups, especially forest user group and mothers' group. There is also close cooperation with the local health post whose doctor is a member of the WSP committee providing monthly health data for the committee. In a large scheme such as Amarapuri, the data can be useful for tracking the situation in a certain ward. In case there is an increase in the occurrence of water borne diseases among people living in a certain ward, it is possible to check the water quality and possible maintenance and treatment needs. Ability to focus on a specific ward facing

problems improves the response system and the service level.

In addition to be known for its water supply system, Amarapuri is also known for its community forest. Those two are closely linked with each other, as the watershed area is surrounded by community forest. Many of the active individuals in the users committee who had been present during the rehabilitation of the scheme and construction of the water treatment plan had also been active with community forest initiatives and were still playing an active role in the community (Figure 2.). The chairperson of the users committee had been serving his post since the establishment of the committee and the lab technician had been there since the establishment of the laboratory. One cannot deny the important role of external support received by the community, first extensively by the Finnish-supported RWSSP and government agencies (VDC, DDC, WSSDO) and later by the World Health Organization (WHO). Yet, the presence of motivated key persons, both men and women, who had been developing the management systems and community approaches, can be seen as a very important factor for the sustainability of the water supply system. As one of the users committee members emphasized, financial support is not enough to make the system sustainable, hard work by the people is also needed. Amarapuri is also a good example of a users committee, which has received support and wants to continue to pay forward the good things, by providing support for other users committees through trainings, facilitation and mentoring. That, is truly valuable.



Figure 2. The researcher together with active community members of Amarapuri scheme.