TAMPEREEN TEKNILLINEN YLIOPISTO
TAMPERE UNIVERSITY OF TECHNOLOGY

Sanna-Leena Rautanen

Access to Water? Dynamic Capacity Change for Sustainable Rural Water and Sanitation Services for All

Julkaisu 1373 • Publication 1373

Tampere 2016

Tampereen teknillinen yliopisto. Julkaisu 1373
Tampere University of Technology. Publication 1373

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Thesis for the degree of Doctor of Science in Technology to be presented with due permission for public examination and criticism in Rakennustalo Building, Auditorium RG202, at Tampere University of Technology, on the 18th of March 2016, at 12 noon.

Tampereen teknillinen yliopisto - Tampere University of Technology
Tampere 2016

ISBN 978-952-15-3707-3 (printed)
ISBN 978-952-15-3718-9 (PDF)
ISSN 1459-2045

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ABSTRACT

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ABSTRACT OF DOCTORAL DISSERTATION

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Name of dissertation: Access to Water? Dynamic Capacity Change for Sustainable Rural Water and Sanitation Services for All

Abstract

The lack of adequate safe drinking-water together with poor sanitation and hygiene imposes an extremely high disease burden on millions of children and adults. This compromises well-being and productivity, and aggravates the cycle of poverty. Cultivating capacity for change is an important element of practically every policy reform, development programme, and country strategy aiming to improve well-being of its citizens, and with it also, e.g., water services and sanitation. The purpose of this dissertation was to recommend ways for rural water and sanitation sector specific programmes and projects to inspire capacity change for continued learning, adaptation, and innovation in the face of ever-new challenges in a volatile and unpredictable local and global environment, while the system in itself was assumed to be complex and wicked already at the present time.

The specific objective was to develop futures-oriented frame of reference that can be applied for policy, programme, and project purposes. It draws from a wide range of action research the author has been involved with in Nepal, Guyana, Tanzania, and Bangladesh. It consists of six international peer-reviewed scientific articles and three case studies. The approach is constructivist and actor-oriented, it pays attention to agency and institutions, is plural rather than singular, differentiating rather than generalizing. The frame of reference is based on three analytical levels: 1) individual, 2) organizational/institutional, and 3) enabling environment.

Rural water sector must pay attention to rural livelihoods and cross-sectoral issues to truly benefit rural development and well-being. This can be done through the multiple-use water services paradigm, adding ecological sanitation. Two of the articles studied a bi-lateral water project in Nepal that combined water supply, sanitation, irrigation, and hydro-energy with livelihoods, small cottage industries and micro-finance (cooperatives) within one project operating through local government. Conceptually and policy-wise complex system translated into tangible benefits and positive impacts in the poorest and remotest corners of Nepal once the enabling environment was conducive to allow this. It proved out to be a useful instrument for making change happen, empowering communities and encouraging continuous learning, innovation, and adaptation. Empowerment is here defined as group's or individuals' capacity to make effective choices and then transform these choices into desired actions and outcomes and with these, into services and benefits.

Capacity related interventions need to have a vision that goes further than just the present state of affairs. Appreciating the complexity and dynamic nature of the rural water sector, the system should not be split into individual components or activities, such as individual training courses or narrow mandates that do not consider the broader framework within which they must operate and change. The 'capacity cube' in this dissertation represents the 'present' that moves across its different dimensions simultaneously and is in constant change in time. Framing the 'cube' allows the project or programme planners to establish the external layers of reference to give shape for the time dimension, the expected results ('services'), the external and internal drivers and barriers to change in terms of enabling environment, and the institutions and humans therein. Among others, it recommended to further study scale application of multiple use water services with ecological sanitation in the livelihoods context and the rural water service delivery paradigm.

Keywords: water, sanitation, rural, capacity, livelihoods, future, change

Language: English **Number of pages**: 112

Publication: TUT Publications 1373

TIIVISTELMÄ

Tampereen teknillinen yliopisto
PL 527, FI-33101 TAMPERE
http://www.tut.fi

TIIVISTELMÄ

Tekijä: Sanna-Leena Rautanen

Julkaisun nimi: Saatteko vettä? Dynaamisten toimintavalmiuksien vahvistaminen maaseudun kestävän vesihuollon ja sanitaation järjestämiseksi kaikille (Access to Water? Dynamic Capacity Change for Sustainable Rural Water and Sanitation Services for All)

Käsikirjoituksen päivämäärä: 23.01.2016 **Väitöksen päivämäärä**: 18.03.2016

Tiivistelmä

Puhtaan ja riittävän juomaveden ja sanitaation puute koskettaa erityisesti kehittyvien maiden maaseutua, jossa kahdeksan asukasta kymmenestä kärsii edelleen riittävän juomaveden puutteesta, yhdeksän kymmenestä huonosta sanitaatiosta, ja neljänneksellä asukkaista ei ole minkäänlaisia käymälöitä. Toimintavalmiuksien vahvistaminen (*capacity development*) muutoksen aikaansaamiseksi eri tasoilla sisältyy lähes kaikkiin kehitysstrategioihin tavalla tai toisella, vesi- ja sanitaatiosektori mukaanluettuna. Tämän väitöskirjan tarkoituksena on rakentaa tulevaisuus-suuntautunut viitekehys, joka toimii alati muuttuvissa tilanteisissa ja pystyy vastaamaan muuttuviin haasteisiin. Nämä haasteet voivat olla niin paikallisia kuin globaaleihin muutoksiin liittyviä, haasteita joita ei voi eikä tarvitsekaan täsmällisesti tietää etukäteen. Maaseudun vesi- ja sanitaatiopalvelut nähdään kompleksisena systeeminä ja myös ns. 'ilkeänä ongelmana'.

Väitöskirja rakentuu kirjoittajan suorittamalle toimintatutkimukselle Nepalissa, Guyanassa, Tansaniassa ja Bangladeshissa vuosina 2000-2015. Työ koostuu kuudesta vertaisarvioidusta artikkelista ja kolmesta tapaustutkimuksesta sekä näiden synteesistä. Tutkimuksen lähestymistapa on konstruktiivinen ja tulevaisuus-suuntautunut. Se kiinnittää huomiota kohderyhmän ja instituutioiden mahdollisuuksiin ja kykyyn toteuttaa palveluita ja tehda päätöksiä muuttuvan tilanteen vaatimalla tavalla. Toimintavalmiuksia lähestytään 1) yksilötasolla; 2) organisatorisella ja instituutioiden tasolla, ja 3) suotuisan toimintaympäristön näkökulmasta.

Maaseudun vesisektorin on kiinnitettävä huomiota maaseudun kehitykseen sen laajemmassa viitekehyksessä ja läpileikkaavasti, koska vesi on tärkeä tekijä monessa elinkeinossa. Vesihuoltopalveluita voidaan toteuttaa siten, että ne palvelevat veden moninaiskäyttöä ja yhdennettyä suunnittelua myös yhteisötasolla ja paikallisina ratkaisuina. Tähän voidaan liittää myös ekologinen sanitaatio. Kaksi tämän väitöskirjan artikkelia käsittelivät veden moninaiskäyttöä Suomen tukeman kahdenvälisen Nepalin vesihankkeen yhteydessä. Hanke toteutetttiin paikallishallinnon kautta alueilla, jotka lähes kaikilla kehitysmittareilla mitattuina ovat Nepalin köyhimpiä ja vähiten kehittyneitä piirikuntia. Toimintamallit voimaallistuttivat kyliä ottamaan aktiivisen roolin muutoksen suunnittelussa, toteutuksessa ja myös palveluiden ylläpidossa, samalla kun tilaa jätettiin paikallisille sovelluksille. Voimaallistumisella tarkoitetaan tässä yksilöiden ja ryhmien kykyä tehdä päätöksiä ja toimiä niiden mukaisesti yhteisten hyötyjen kuten vesihuoltopalveluiden saavuttamiseksi.

Toimintaympäristön muutosta tukevien hankkeiden, ohjelmien ja politiikkojen pitää olla tulevaisuussuuntautuneita. Niiden pitää myöntää toimintakentän kompleksisuus ja 'ilkeiden ongelmien' läsnäolo dynaamisessa ympäristössä. Yksittäiset koulutukset ja kurssit eivät vielä ratkaise ongelmia ja takaa palveluiden saatavuutta, vaan on katsottava laajempaa toimintaympäristöä ja siinä tapahtuvia muutoksia. Väitöskirja esittelee toimintavalmiuksien vahvistamiseen liittyvien toimenpiteiden suunnittelun tueksi 'kuutio-ajattelua', jossa ensin määritellään eri ulottuvuuksien reunaehdot, rajoittavat tekijät, mahdollisuudet ja ääritapaukset: menneisyydessä, nykyisyydessä ja tulevaisuudessa.

Avainsanat: vesi, sanitaatio, maaseutu, toimintavalmiudet, tulevaisuus, muutos **Kieli**: Englanti **Sivumäärä**: 112

Jakelu: TUT Julkaisut 1373

ACKNOWLEDGEMENTS

This dissertation was prepared at the Faculty of Built Environment, Department of Civil Engineering, Tampere University of Technology, Finland. In practice four out of the six peer reviewed articles, and practically all related other studies and conference papers were prepared over several years of working in the field with the rural communities in three continents, in the work-related contexts. These remote rural areas continue to inspire me to learn more, to constantly seek for ways to do better.

I would like to express my deep gratitude to my supervisors Adjunct Professor Tapio S. Katko and Dr. Jarmo J. Hukka, for their patient guidance and encouragement over the years. My grateful thanks for the pre-examiners Dr. Martin Mulenga, UNESCO-IHE Institute for Water Education, and Dr. Vilja Varho, Natural Resources Institute Finland (Luke), for their useful critiques of this synthesis. My grateful thanks also to my opponent, Dr. Julie Fisher.

I wish to thank the Academy of Finland for the first year when I worked as a researcher in the *Governance of water and environmental services in long term perspectives* (GOWLOP #210816) project, and Maa- ja vesitekniikan tuki r.y. for the final year, for giving an opportunity to finalize this long process. In between, I wish to express my great gratitude for the Ministry for Foreign Affairs, Finland, Plancenter Ltd/FCG International Ltd., and UNICEF-Guyana, all of whom created enabling working environments where it was possible to combine my research interests with the actual project or programme work to mutual benefit.

The encouragement from the various team members of the Capacity Development in Water and Environmental Services (CADWES) research group is hugely appreciated. Without this anchor point to Tampere University of Technology I might have got lost in the remote fields without ever completing this work! I wish to dedicate this dissertation to the late professor Matti Viitasaari, who significantly affected my choice of devoting my professional career to rural water and sanitation in developing countries.

My special thanks are extended to my close colleagues and lovely friends in Nepal, Finland, Guyana, and Tanzania for their enthusiastic encouragement, inspiration, and friendship over the years. Let the adventure continue!

Last but not least, my heartfelt thanks to my parents Aila and Matti for never giving up thinking that one day this work is completed, and to my partner Pekko for all his support and company.

May All Beings Be Happy!

Sanna-Leena Rautanen
January 23, 2016, Pokhara, Nepal

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I. Rautanen, S.-L., Luonsi, A., Nygård, H., Vuorinen, H., & Rajala, R. (2010). Sanitation, Water and Health. *Environment and History,* 16(2), 173-194. doi:10.3197/096734010X12699419057250

II. Rautanen, S.-L., van Koppen, B., & Wagle, N. (2014). Community-Driven Multiple Use Water Services: Lessons Learned by the Rural Village Water Resources Management Project in Nepal. *Water Alternatives,* 7(1): 160-177. Retrieved March 29, 2015 from http://www.water-alternatives.org/index.php/alldoc/articles/vol7/v7issue1/239-a7-1-10/file

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VI. Gerwel-Jensen, L., Rautanen, S.-L., & White, P. (2015). Strengthening Behaviour Change Communication in Western Nepal - how can we do better? *Waterlines,* 34(4), 330-346*.* doi:10.3362/1756-3488.2015.030

AUTHOR'S CONTRIBUTION

I. Article I: Sanna-Leena Rautanen wrote the article and is the corresponding author. Antero Luonsi, Henry Nygård, and Heikki Vuorinen commented the overall article and contributed insights into specific thematic areas, such as history of epidemiology and health, and Riikka Rajala gave it its final editorial treatment after the peer review comments.

II. Article II: Sanna-Leena Rautanen defined the research scope, objectives, and methodology, and wrote the article. Rautanen is the corresponding author. Barbara van Koppen commented and contributed the multiple-use insights. Narayan Wagle contributed to the conclusions and recommendations.

III. Article III: Sanna-Leena Rautanen defined the research scope, objectives, and methodology, and wrote the article. Rautanen is the corresponding author. Usha Baaniya facilitated the research process, mobilized the interviewers, and coordinated the related workshops, as well as presented the related conference papers.

IV. Article IV: Sanna-Leena Rautanen defined the research scope, objectives, and methodology, and wrote the article. Pamela White commented and contributed insights especially into gender equity and social inclusion related items, as well as to livelihoods aspects.

V. Article V: Sanna-Leena Rautanen wrote the article and is the corresponding author. Eeva-Liisa Viskari commented and provided inputs to technical and micro-biolgical aspects of dry sanitation, and contributed to the further development of the conceptual graph that was further taken forward in this dissertation by adding multiple-use water systems and services into the same conceptual frame with ecological sanitation,.

VI. Article VI: Sanna-Leena Rautanen was the corresponding author who wrote the first draft. The article builds on the field work and related consultancy report prepared by Lene Gerwel-Jensen, with contributions from Pamela White for sharpening various aspects of the article.

LIST OF SUPPORTING DOCUMENTS

FOR ARTICLE I

Juuti, P., Mäki, H., & Rautanen, S.-L. (2005). A Comparative Study – Governance of Water and Environmental Services in Long-term perspectives in Selected Countries*. 4th International Water History Association (IWHA) Conference, Paris, France, December 1-4, 2005.* http://www.iwha.org

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ABBREVIATIONS AND ACRONYMS

CADWES	Capacity Development in Water and Environmental Services
CBO	Community-based Organization
CDD	Community-driven development
FAO	Food and Agriculture Organization of the United Nations
GESI	Gender Equality and Social Inclusion
GLAAS	Global analysis and assessment of sanitation and drinking-water
GOWLOP	Governance of water and environmental services in long term perspectives
GWP	Global Water Partnership
HESAWA	Health through Sanitation and Water
HRBA	Human Rights Based Approach
IWHA	International Water History Association
IWRM	Integrated Water Resources Management
KAPB	Knowledge, Attitudes, Beliefs and Practices
MDG	Millennium Development Goal
MUS	Multiple-use of water services
NGO	Non-governmental Organization
O&M	Operation and Maintenance
OECD	Organisation for Economic Co-Operation and Development
RVWRMP	Rural Village Water Resources Management Project
RWSSSP	Rural Water Supply and Sanitation Support Programme
RWSSP-WN	Rural Water Supply and Sanitation Project in Western Nepal
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
US$	US Dollar
WASH	Water supply, sanitation and hygiene
WHO	World Health Organization
WSP	Water and Sanitation Program
WUG	Water User Groups
WUMP	Water Use Master Plan
WUSC	Water Users and Sanitation Committee

1 INTRODUCTION

1.1 Background and justification

The lack of adequate and safe drinking water and sanitation, coupled with poor hygiene, imposes an extremely high disease burden on millions of children and adults through a number of diseases, including many types of diarrhoeal diseases, intestinal worms, hepatitis, typhoid, and others. Water and sanitation related sicknesses put severe burdens on people and health services and compromise well-being, productivity, and even school performance, aggravating the cycle of poverty. The main benefits of improved water and sanitation have been seen to be the reduced transmission of water-borne diseases, and benefits that relate to being healthier: savings in time, savings in medical costs, better school performance, among others. Improving the water security and sanitation of poor people will help to eradicate poverty and support sustainable development in terms of health and in terms of direct and material ways. Investments in water and sanitation are central to poverty reduction, both in terms of investment in infrastructure itself but also in terms of capacity for change (Soussan, 2004).

Public health has been the traditional concern of the water sector, and this concern is still valid. World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) have estimated that globally 1.8 billion people use a drinking water source that is contaminated with faeces, the contaminated water causing more than 840,000 people to die each year from diarrhoea (WHO/UNICEF, 2014). Of all the deaths attributable to diarrhoeal diseases in developing countries, 90% are children under 5 years old, compared to only 9% in developed countries (WHO/UNICEF, 2010). On the positive side, the number of children dying from diarrhoeal diseases has steadily fallen over the two last decades from approximately 1.5 million deaths in 1990 to just above 600,000 in 2012 (WHO, 2014). In 2015 the situation was improved with regard to drinking water supply but not with regard to sanitation. The Millennium Development Goal drinking water target coverage of 88% was met in 2010 but even then, in 2015, 663 million people still lack improved drinking water sources. Coverage of improved sanitation increased from 49% in 1990 to 68% in 2015 but still in 2015 there are 2.4 billion people who do not have access to improved sanitation (WHO/UNICEF, 2015, pp. 4-5).

Focusing on rural water and sanitation continues to be justified even in the era of growing urban problems. Water is a satisfier of a basic need and a human right, essential for all aspects of life, also to rural populations. According to WHO (2014), eight out of ten people in rural areas are still without improved drinking water sources, and one billion people still practice open defecation; nine out of ten of them are in rural areas (pp. 4–5). Hutton (2012) estimated the total global economic losses associated with inadequate water supply and sanitation were estimated at US$ 260 billion annually, or 1.5% of Gross Domestic Product of the 136 countries included in the study. It concluded that even with conservative cost benefit estimates, the economic returns were at least two-fold for investments in drinking water supply and at least five-fold for investments in sanitation. The study further confirmed that drinking water supply and sanitation continue to be economically viable (p. 47). Earlier in 2004 Hutton and Haller (2004) with less conservative assumptions concluded that the cost-benefit ratio of water and sanitation interventions is high when all benefits are included, standing at around between US$5 and US$11 economic benefit per US$1 invested for most developing world sub-regions and for most interventions. In some cases the ratio was significantly higher (p. 39).

Despite the efforts of many governments and development agencies, many people still lack access to basic and sustainable water and sanitation services as was indicated by the global figures in the previous paragraphs. The negative impacts of inadequate water and sanitation are being felt especially by women and children. Rural water remains a social service and highly relevant for those women and children who continue to carry water every day, often for long distances, and for those millions who get sick every year and thousands who die. Both ill health and carrying water for long distances keep children out of school. Water is critical to the ecological and environmental services on which the poor depend. The poor both in rural and peri-urban areas need access to water for productive use, such as for irrigation or animal husbandry, to provide basic food security and a livelihood. The poor are in many cases left to make their own, often inadequate, arrangements to meet basic survival needs. The poor are also more likely to be vulnerable to water-related disasters and are the victims of water conflicts, their communities being often located on marginal lands.

Water sector has made several efforts to improve water supply since the International Decade for Water Supply and Sanitation (1981–1990). In the 1980s, the importance of household level practices in transfer of pathogens was recognized and consequently hygiene and sanitation education were integrated into water projects. At that time, the approach was centralized, health-based, and supply-oriented, which has left a strong legacy to many water supply and sanitation projects worldwide. It has been realized that investing in water infrastructure alone with the supply-driven and centralized approach did not result in sustainable and continued services. The Millennium Development Goal (MDG) 7 relating to drinking water and sanitation (target 7c) was set to "*halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation*". In this regard, the Joint Monitoring Programme defined improved drinking water source and safely managed drinking water services. The improved water sources, as defined by the Joint Monitoring Programme, include piped water, public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs, and rainwater

collection. The detailed definitions for both improved sanitation and improved water sources, as well as the different issues that influence access, can be found in WHO/UNICEF (2014, p. 33). The service level and overall services thinking is increasingly in the agenda in this regard.

Later on, the "International Decade for Action: Water for Life" started in 2005 and renewed effort to MDGs. At that time it was also appreciated that improved water management, sanitation, and hygiene can contribute to realizing *all* of MDGs: health, reducing hunger, increasing income, and improving the living conditions of the urban poor. In the 1990s, holistic and cross-sectoral approaches to change, institutional economics, and governance were introduced into development debates. At this time, United Nations Development Programme (UNDP) introduced its often-cited and applied capacity-development framework with its interrelated dimensions: individual, entities, or the system as a whole. Individual learning, organization, and an enabling environment were the three guiding elements that are also taken as the external frame of reference in this dissertation (UNDP, 1997).

In 2014, the United Nations Water global analysis and assessment of sanitation and drinking water (GLAAS 2014) results indicated that to improve access and reduce inequalities beyond 2015, much needs to be done to effectively implement and monitor water supply, sanitation, and hygiene (WASH) policies at national level. The GLAAS 2014 found that the governments show strong support for universal access to drinking water and sanitation, and that two thirds of the 94 countries studied recognize both drinking water and sanitation as a human right in national legislation. Yet, regardless of political aspirations, they are impeded by weak *capacity* at country level to set targets, formulate plans, undertake implementation, and conduct meaningful reviews. The GLAAS 2014 found critical gaps in monitoring decision-making and progress for poorest, the weak monitoring *capacity* being one of these critical gaps. It also highlighted that neglect for WASH in schools and health care facilities undermines a country's *capacity* to prevent and respond to disease outbreaks. On the positive side, it found that international aid for WASH has increased and regional targeting has improved, and countries' *capacity* to absorb donor commitments has increased. Yet, lack of *human resources* constrains the sector, sanitation in rural areas needs more effort, and hygiene promotion is lacking behind (WHO, 2014, pp. ix–xi).

The human rights based approach (HRBA) to development places the poor at the centre of the initiation, design, oversight, and evaluation of the development projects, programmes and policies that affect them particularly. Non-discrimination, inclusiveness, and equality underline development programmes and policies, and corruption, inefficiency, and overall non-transparency are considered ethically wrong, constituting an aggression against humanity. The rights-based approach also calls for connecting people's participation and voices with national and international policy processes and international rights frameworks (Ackerman, 2005, p. 7). Many countries, including Finland, have committed to HRBA. Finland's development policy is an integral part of Finland's foreign and security policy. Finland's Development Policy and Programme Government Decision-in-principle 16.02.2012 is committed to a rights-based approach. It is essentially a value-based development policy that promotes the core human rights principles such as universality, self-determination, non-discrimination, and equality. All

people have an equal right to influence and participate in the definition and implementation of development. The policy makes specific reference to the need to improve the availability and quality of water (Ministry for Foreign Affairs of Finland, 2012, p. 11).

This dissertation takes the United Nations General Assembly resolution 64/292 "*the human right to water and sanitation*" and the Human Rights Council resolution A/HRC/18/1 on "*the human right to safe drinking water and sanitation*" as the core justifications for the study. The General Assembly resolution 64/292 recognizes the right to safe and clean drinking water and sanitation as a human right that is essential for the full enjoyment of life and all human rights. The Human Rights Council resolution 24/L.31 recognizes that the human right to safe drinking water and sanitation *entitles everyone, without discrimination, to have access to sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic use and to have physical and affordable access to sanitation, in all spheres of life, that is safe, hygienic, secure, socially and culturally acceptable and that provides privacy and ensures dignity* (A/HRC/24/L.31). HRBA integrates the norms, principles, standards, and goals of the international human rights system into development plans and processes. It is closely linked to national and international legal responsibilities, and identifies rights-holders and duty-bearers. These are the rationale for this dissertation: strengthening the capacity of rights-holders and duty-bearers is of utmost importance for rights to be realized. Also the cross-cutting themes are highlighted: gender equality, reduction of inequality, and climate sustainability are the cross-cutting objectives of Finland's development policy and development cooperation, and highly relevant for the water sector as will be discussed in this dissertation.

Poverty is complex, multidimensional, and varied in both its causes and forms. Conventional measures of poverty, such as level of nutrition or daily income expressed in monetary terms, are important indicators but do not describe the real nature of poverty or the potentials that exist to lift people out of poverty (Soussan, 2004). Success in rural development is crucial for the eradication of poverty. In this dissertation, the multiple-use of water services (MUS) and livelihoods context are highlighted, taking the need for water beyond the basic need. These are the reasons why this dissertation will not limit its scope to domestic drinking water supply only, but rather, seeks to operationalize the Integrated Water Resources Management (IWRM) concept to community-context through the MUS paradigm. For more on MUS, see MUS Group website for links.

1.2 Study context

In rural water sector, such paradigms as participatory approaches, demand-driven approach, community management, and local water governance give opportunities to address the level where the services are meant to be delivered in terms of getting access to water and sanitation: at the community level. Decentralization of water services and good local water governance are relevant themes, even if the more recent trend does appear to be to shift attention from the community level back to the central level, the sector-wide programmes and budget support

arrangements relying on the (often centralized) government structures to deliver the necessary support functions and capacity-related tasks at the community level.

At the same time, the development of sustainable capacity needs greater and more careful attention to avoid failed development efforts. In this regard, capacity development is a leading theme in the Paris Declaration on Aid Effectiveness (2005) that has guided the donor community over the past decade. Here capacity development is taken as a necessarily endogenous process, strongly led from within a country, with donors playing a supporting role. According to this vision, political leadership and the prevailing political and governance system are critical factors in creating opportunities and setting limits for capacity-development efforts. (Box 1.1). The Accra Agenda for Action (2008) stated that *"without robust capacity – strong institutions, systems, and local expertise – developing countries cannot fully own and manage their development processes"* (Organisation for Economic Co-Operation and Development (OECD), 2005/2008, p. 16). The Accra Agenda agreed that the aid effectiveness principles cannot be equally applied in fragile situations, such as in countries emerging from conflict. Investing in capacities for sustainable development continues to be high in the agenda, as are the new proposed post-2015 Sustainable Development Goals.

Box 1.1 Capacity development in the Paris Declaration

> The capacity to plan, manage, implement, and account for results of policies and programmes, is critical for achieving development objectives from analysis and dialogue through implementation, monitoring, and evaluation. Capacity development is the responsibility of partner countries with donors playing a support role. It needs not only to be based on sound technical analysis, but also to be responsive to the broader social, political, and economic environment, including the need to strengthen human resources.
>
> Partner countries commit to: Integrating specific capacity-strengthening objectives in national development strategies and pursuing their implementation through country-led capacity development strategies where needed.
>
> Donors commit to: Aligning their analytic and financial support with partners' capacity development objectives and strategies, making effective use of existing capacities, and harmonising support for capacity development accordingly.
>
> Source: OECD, 2006. Paris Declaration on Aid Effectiveness (2005)

Development aid is undeniably a factor in this study. Most of the data originates from a project context: four of the peer-reviewed articles and one of the case studies are embedded into the bi-lateral project context, and two of the case studies into multilateral project context. Yet, these were not traditional project contexts as such but rather, hybrids in between the "project" and "programme" approaches. All the projects studied were embedded into the local government structures, not aiming to bypass any country systems but actually to strengthen them.

The entire dissertation stems from the author's personal work experience with the bi-lateral and multilateral water and sanitation development cooperation since 2000. This is hereby acknowledged as a possible source of bias, and attention is paid to what extent the interpretations made can be influenced by personal, first-hand positive experience in the field.

At the same time, the author has made an attempt to examine the projects with open eyes, considering both successes and failures and paying attention to the results as they are and as they are reported or documented during the research process.

Ideally, dynamic capacity change could be an endogenous process, triggered from inside, not dependent on external financial or other support, something that is taking place and will take place whether or not there is any external intervention. From the external intervention point of view, we can identify at least three main layers that influence change: 1) no external support at all (self-help paradigm); 2) external support from the national government to the local governments to the communities (government programmes); and 3) external support from specific projects and/or programmes through a range of arrangements (donor supported projects and programmes, both through governmental and non-governmental organizations). All these are valid contexts for this dissertation.

The study context is also considered as complex. Complex systems can behave in non-linear ways and produce escalating levels of unintended consequences through spontaneous self-organization. Baser and Morgan (2008) note how *"complex systems such as organisations, if they are to develop their capacity, must learn and evolve as they face discontinuous changes in their context over time. They must self-organise, adapt and create some sort of a new order and state of coherence*" (p. 15). Baser (2009) prefers to apply the theory and practice of complex adaptive systems to appreciate the fact that there are also emergent properties in the system that are not simply a sum of the different elements but "*which has to do with the constant need of complex systems to organise themselves into patterns and structures*" (Baser, 2009, p. 124). Baser (2009) further suggests that single interventions such as training alone "*are not likely to make a significant difference to system behaviour unless they represent a key point of leverage that can shift system behaviour*" (pp. 123–124). In this dissertation references are made to 'institutional bricolage' that is essentially about self-organization as introduced by Cleaver (2012): "*a process in which people consciously and non-consciously draw on existing social formulae to patch together institutions in response to changing situation*" (p. 45).

1.3 Problem statement

In many countries, both the community and the local government level institutions are still struggling to deliver sustainable and equitable water and sanitation services, as is evident from the figures given in Chapter 1.1. The global impacts of these missing services were also described in the previous chapters. Several authors, as discussed in the following chapters, have identified the challenge of still missing or non-functional rural water services and lack of sanitation, despite the achievements made over the past decades. There are a range of recommendations accordingly, often making a reference to capacity and institutional development.

The problem is complex. While rural water and sanitation technology as artefacts may be very simple and not particularly expensive, the overall management and governance system, and its dynamics, are complex. Here complexity indicates a degree of difficulty in defining causal linkages of an event – we may be able to identify individual reasons for successes and failures in rural water and sanitation services, yet, the individual linkages cannot explain all the reasons and causal linkages there are, especially when adding an increasingly long-term time dimension. Complexity also implies difficulty of determining the boundaries of effects to make it possible to manage them with any degree of accuracy and confidence that makes sense: water flows through many types of livelihoods, interests, and boundaries, including administrative boundaries and ones created by various uses of water and sectors linked therein. The question of the right to water as a human right is also highly complex. In this dissertation, the multiple-use water services paradigm broadens the scope from *drinking water* to water for both domestic and productive uses.

This study considers the research problem as a potentially *wicked problem* that is embedded with notions of complexity. In planning and management policy, according to Fitz Gibbon and Mensah (2012), the term wicked problem is used to refer to adverse social and environmental situations that overwhelm existing practices and persist even after the application of best-known practices. According to the authors, wicked problems will not be solved by the same tools and processes that have created them, but rather, solutions must be explored via mechanisms and paths different from those that have perpetuated the problem in the first place. Fitz Gibbon and Mensah (2012) further note that from an interventionist perspective, a "do-nothing" approach can be a reasonable option for a problem that defies best intervention practices. In this dissertation, however, a "do-nothing" approach to rural water and sanitation problems is not an acceptable option from the human rights perspective.

The research task for this dissertation is the need to develop futures-oriented frame of reference to enable programming for a dynamic capacity development of both the duty-bearers and the rights-holders in the rural water and sanitation sector programmes and projects, considering that the dilemma is potentially both complex and wicked, and changing in time.

1.4 Objective, purpose, and research questions

The overall objective, i.e., the broader development objective to which this study contributes, is to increase the number of rural water and sanitation sector specific policies, programmes, and projects that meaningfully address the dynamic futures-oriented capacity development needs of both the duty-bearers and the rights-holders at the local government and community levels.

The purpose, i.e., the specific objective and expected end-result of this dissertation, is to provide a futures-oriented frame of reference that can be used to develop policies, programmes, and projects to inspire continued learning, adaptation, and innovation in the face of ever-new

challenges in a volatile and unpredictable local and global environment, in a system that is already complex at present time. Achieving the purpose contributes to achievement of the overall objective which also depends on other contributing factors.

The leading research question is: what kind of frame of reference would guide formulation of rural water and sanitation relevant policies, programmes, and projects that inspire continued learning, adaptation, and innovation in the face of ever-new challenges in a volatile and unpredictable local and global environment? This task is addressed by asking the following sub-questions with reference to six peer reviewed articles and three case studies:

1. What has triggered positive lasting change in the past? What kind of barriers to change and challenges are evident?
2. What is learned with regard to human resource development? What are the lessons that relate to organizations and institutional development? What is learned with regard to the enabling environment, and what seems to be missing?
3. How can the present frame of reference be improved by including futures-thinking to make it more dynamic and responsive to change that may not always be predictable?

The research process is cyclic, the various results building on each other (Figure 1.1). The process as such is iterative and looking back is allowed. It is also in line with action research that guided four out of six peer reviewed articles, encouraging continuous learning also in this regard. The futures context adds the long-term time dimension, and as such serves evidence-based and futures-oriented policy making. At this point in time, this synthesis reaches the point where the new frame is entering its real-life application stage. It has been tested and validated with the colleagues in Nepal when finalizing this synthesis, but not applied at scale.

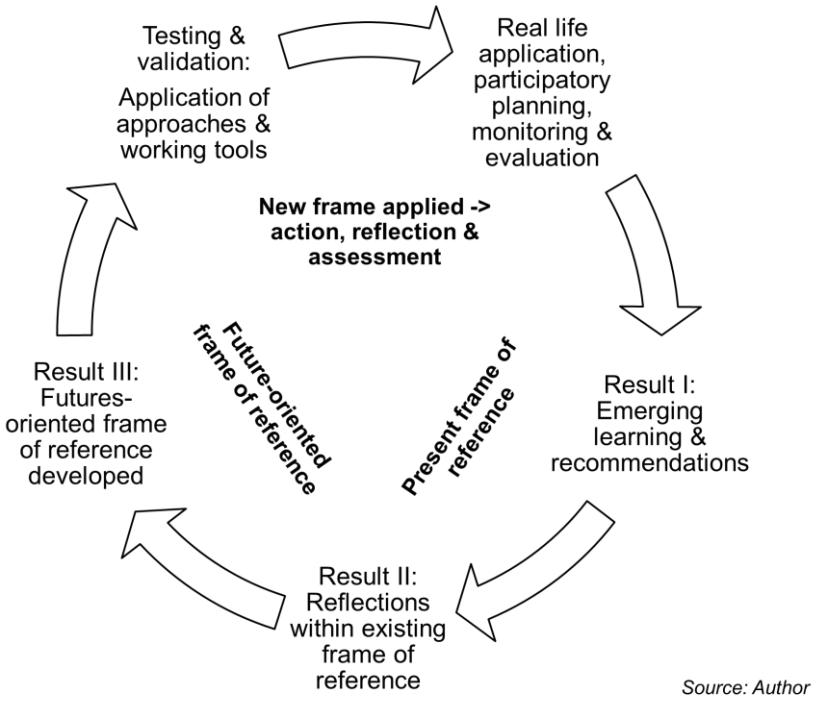


Figure 1.1 Research process

1.5 Structure and scope of research

This dissertation draws from a wide range of activities and assignments the author has been involved with over the past fifteen years working on four continents and in five countries in Finland, Nepal, Guyana, Tanzania, and Bangladesh. This study consists of six international peer-reviewed scientific articles and a scientific synthesis based on these articles, other supporting documents, and a literature review, as well as the three case studies from Bangladesh, Guyana, and Tanzania.

Chapter 2 provides the wider theoretical framework. It seeks conceptual clarity through literature review to define the key dimensions of this study. Chapter 3 outlines the methodological considerations that apply to all materials used in this dissertation. Chapter 4 introduces the Articles I to VI and the case studies in more detail, and elaborates findings with regard to research question areas 1 and 2 (Results I and II). These are further discussed in Chapter 5 where the futures-thinking is added (Result III). This chapter also includes the triangulation, notes on validity and reliability of the results, assessment, and self-evaluation. Chapter 6 concludes the findings and recommends the need for further research. Figure 1.2 shows the structure of the research.

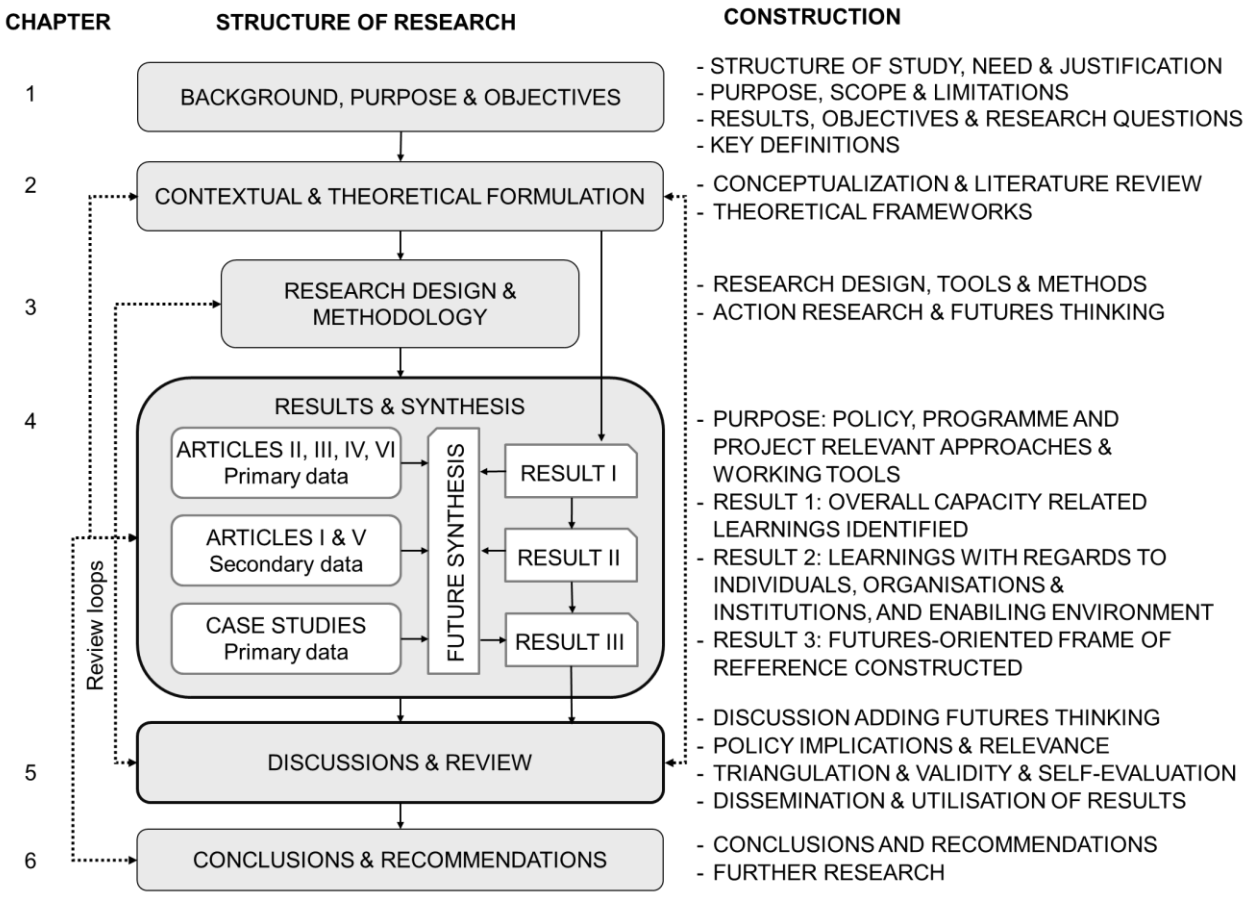


Figure 1.2 Structure of the research

Article I explored the historical long-term changes in understanding the links between sanitation, water, and health in the global context. The drivers and triggers for change from the past are used in this study in the future context, looking at the evidence that relates to capacity development. This article brings in the historical elements.

Article II focused on the key theme of this dissertation: rural water systems and service delivery for poverty alleviation through MUS, improved environmental conditions for health, and sustainable livelihoods. The empirical data originates from the poorest and remotest corner of Nepal, showing how capacity change processes at different levels through holistic participatory planning and implementation.

Article III provided insights into gender and water through a case of training women in water-related technical works in Nepal. It added real-life capacity development experience while mainstreaming gender policies in water sector. These are further reflected in the present-day context of rights-based approach which, in addition to gender equality, is also concerned about social inclusion. All these are valid elements for the frame of reference.

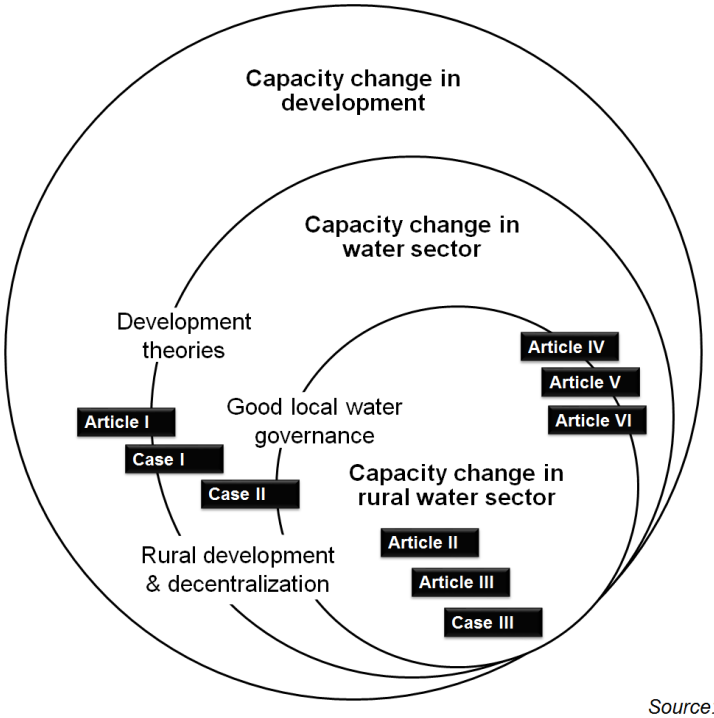
Article IV studied MUS for both domestic and livelihoods purpose, building the capacity of the water users' committees and related stakeholders and making it happen through inclusive planning and learning-by-doing. This article highlights the holistic local government level planning context as an element of an enabling environment.

Article V explored a range of research and real-life experiences dealing with one sector alone: sanitation. Similarly to Article I, this article has a global perspective but focuses on one precise sector alone: ecological sanitation.

Article VI explored behaviour change triggering and related communications in the context of sanitation and hygiene. Behaviour change triggering is here considered an increasingly important element of capacity development that aims to change how people *behave*, not only what people *know*.

The Case Bangladesh provides the local government perspective in a country where there is a strong civil society and private sector; the Case Guyana focuses on the human resource development; and the Case Tanzania describes the perspective of the local governments and water users who benefited from a bi-lateral water programme. All these themes are evident in Articles II, III, IV, and VI. The author has also presented, debated, and disseminated the findings through a number of international conferences which as such have added further global perspectives through expert dialogue during these events. Some of these have been used as references in this dissertation.

Figure 1.3 below places the articles and case studies into different spheres as reviewed through literature in the following chapter, each nesting in each other.



Source: Author

Figure 1.3 Wider theoretical framework

2 THEORETICAL FRAMEWORK

2.1 Key definition: capacity

This sub-chapter focuses on the key definition of the core concept only: 'capacity'. There are a number of expressions for changing capacity, all with their own connotations: "capacity-building", "capacity development", "capacity-strengthening", and "capacity enhancement." The more recent literature also uses the terms "knowledge and capacity development", "capacity change", and "dynamic capacity change". It is a complex and multi-dimensional concept, and consequently there is an ambiguity of the capacity-related concepts that are consequences of various heterogeneous definitions made over the decades. The different definitions provoke different connotations and interpretations and related practical applications. "Capacity" can defined as "*the ability of people, organisations and society as a whole to manage their affairs successfully"* (OECD, 2006, p. 12).

The definitions vary from a narrow definition focused on strengthening organizations and skills to a much broader definition that encompasses levels of capacity from the individual to the whole of society (Gwin, Ed., 2005, p. 7). Capacity "enhancement" and "strengthening" give an idea of improving something that already exists, while "capacity-building" gives an impression of building something new. This expression is getting outdated as the "building" metaphor suggests a process starting with a plain surface and involving building a new structure based on a preconceived design, while experience suggests that capacity is not successfully enhanced in this way (OECD, 2006, p. 12). Also Pultar and Rabitsch (2011) add that capacity-*building* was taken for a long time as a process that was initiated by external institutions who were also responsible for it (pp. 6–7). UNDP (2009), among others, assumes now that the developing countries should own, design, direct, implement, and sustain the process themselves, and that UNDP's capacity development should focus on empowering and strengthening endogenous capabilities.

These definitions highlight a successful capacity development as "*an endogenous change process that must be initiated by the actors concerned, i.e. individuals, organisations and society*

as a whole in the partner countries, and that they also must take over the responsibility for it" (Pultar & Rabitsch, 2011, pp. 6–7). Otoo, Agapitova, and Behrens (2009) propose two operational definitions: capacity *for* development and capacity development (or capacity-building). Here "capacity *for* development" is related to the availability of resources and the efficiency and effectiveness with which societies deploy these resources. Increasing the capacity *for* development, by extension, is a process of socio-political, policy-related, and organizational change, and learning is seen as a strategic instrument of economic and social change. "Capacity development*",* in turn, is considered as a locally driven learning process by local agents of change that brings about changes in socio-political, policy-related, and organizational factors to enhance local ownership for and the effectiveness and efficiency of efforts to achieve a development goal (p. 3).

Global Water Partnership (GWP) has given a range of definitions, for institutional capacity is a highly valid concern for successful implementation of IWRM principles. GWP defined IWRM in its often-cited publication in 2000, describing institutional capacity-building as a means of enhancing performance. Specifically in the context of IWRM, capacity-building was considered as "*the sum of efforts to nurture, enhance and utilise the skills and capabilities of people and institutions at all levels – locally, nationally, regionally and internationally – so that they can make better progress towards a broader goal. At the basic conceptual level, building capacity involves empowering and equipping people and organisations with appropriate tools and sustainable resources to solve their problems, rather than attempting to fix such problems directly*" (p. 50). This is linked to institutional mandates and devolution of institutional responsibilities, functions, and jurisdictions (p. 51). Capacity of an institution should match its institutional mandate.

The term "knowledge and capacity development" draws attention to the fact that development is about capacity that rests on *knowledge*. Polanyi in 1958 distinguished between *explicit* (or *focal*) and *tacit knowledge*, where tacit knowledge is the tool to handle what is being focused, and which often is taken for granted. Its transfer requires different learning processes: "*information in itself is low-value and receives its meaning only through the context of tacit knowledge*" (Alaerts, 2009, p. 7). Alaerts considered knowledge management as an important dimension of capacity change, noting that knowledge and capacity are intricately linked. He defines capacity as "*the capability of a society or a community to identify and understand issues, to act to address these, and to learn from experience and accumulate knowledge for the future*" (Alaerts, 2009, p. 12).

Another approach to capacity is to study it from the performance point of view. Sastre Merino and de los Ríos Carmenado (2012) present a framework to analyse the critical elements of capacity at individual and social levels that promote success over time, dividing them in three dimensions: technical, behavioural, and contextual. Within this framework, the changes in capacity can be analysed by looking at changes in performance and outcomes (p. 965). Engel, Keijzer, and Land (2007) proposed a five-step model for assessing capacity and performance. The qualitative pointers aimed to focus on the process, opportunities, and key moments rather

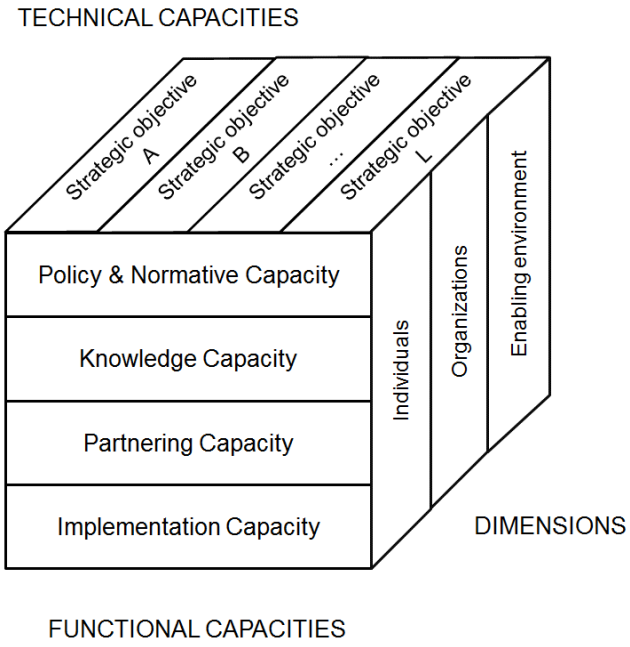
than on precise types of changes that are not predictable in advance. In other words, what we expect to see (or not) are changes in: the capability to survive and act; the capability to generate development results; the capability to relate; the capability to adapt and self-renew; and the capability to achieve and maintain coherence (p. 10). Baser (2009) suggests five central characteristics or aspects of capacity that can give it substantive and operational shape (pp. 127–128):

- Capacity is about empowerment and identity, properties that allow an organisation or a group to be aware of itself, to grow, diversify, survive and become more complex (…)
- Capacity has to do with collective action—the collective capabilities that allow groups, organisations, or groups of organisations to be able to do something with some sort of intention, with some sort of effectiveness and at some sort of scale over time;
- Capacity as a state or condition is inherently a systems phenomenon. (…) It comes out of a complex interplay of attitudes, assets, resources, strategies and skills, both tangible and intangible. It has technical, organisational and social aspects. It emerges from the positioning of an organisation or system within a particular context. And it usually deals with a soup of complex technical, organisational and social activities that cannot be addressed through exclusively functional interventions;
- Capacity is a potential state. It is about latent as opposed to kinetic energy, about being not doing. Performance, in contrast, is about execution and implementation or the result of the application and use of capacity. Given this latent quality, capacity is dependent to a large degree on intangibles (…);
- Capacity is about the creation of public value. (…) the strengthening of the capacity of a group or system to produce public goods and public value.

Here the "empowerment" is defined as a group's or individuals' capacity to make effective choices and then transform these choices into desired actions and outcomes (Alsop, Bertelsen, & Holland, 2006, pp. 10–11), and with these, into services and benefits.

Food and Agriculture Organization of the United Nations (FAO) recognizes that capacity development is at the core of its mandate and one of its most important result areas within its work on agriculture and rural development. FAO (2010) takes the Paris/Accra Aid Effectiveness Agenda as the point of entry for its corporate strategy on capacity development. FAO's capacity-development framework is based on the enhancement of technical and functional capacities across three dimensions (Figure 2.1): individual, organizational, and the enabling environment. Technical capacities are needed to achieve the number of food and agriculture related strategic objectives, such as to intensify production sustainably, to manage natural resources, and to eventually improve food safety and security for all (FAO, 2010, p. 5). Four functional capacities "*enable countries and (sub)regions to plan, lead, manage and sustain change initiatives in agriculture and rural development to ensure that technical know-how is embodied in local systems and processes in a sustainable way: a) Policy and Normative: capacities to formulate and implement policies and lead policy reform; b) Knowledge: capacities to access, generate,*

manage and exchange information and knowledge; c) Partnering: capacities to engage in networks, alliances and partnerships; d) Implementation: management capacities to implement and deliver programmes and projects, from planning to monitoring and evaluation" (FAO, 2010, p. 4–5). (Figure 2.1).



Source: FAO, 2010, PC 104/3

Figure 2.1 Capacity-development framework in FAO

The dynamic *capability* refers to the ability of an organization to learn, adapt, change, and renew over time (Teece et al., 1994, in Güttel & Konlechner, 2010). The European Commission introduces the Dynamic Capabilities Approach which is based on key assumptions related to effectiveness of organizations and systems: capability development is a core mandate for managers, and capabilities are not static, for they are based on accountability and engagement for performance and development impacts. Dynamic Capabilities Approach as defined by Le Blanc and Beaulieu as "*a strategic approach to the logic that is needed to transform political demands and policies (in the form of development objectives through national plans) into realistic frameworks for the transformation of organisational abilities, key-assets and required empowerments into the goods and services provided by the State enable to generate the required outcomes and impact*" (Capacity4Development-website, accessed 17.05.2015). Baser and Morgan (2008) described the five capabilities in further detail, including the capability to commit and engage (pp. 27–29); the capability to carry out technical, service delivery, and logistical tasks (pp. 29-30); the capability to relate and attract support (pp. 30–31); the capability to adapt and self-renew (p. 32), and the capability to balance diversity and coherence whereby 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 (p. 33). Table 2.1 summarizes how the thinking has evolved, and Box 2.1 captures some of the definitions in further detail.

Table 2.1 Predecessors of capacity-development/knowledge networks

Term	Time	Capacity-building approaches
Institution building	1950s – 1960s	Provide public sector institutions; focus on and design individual functioning organizations; models transplanted from the North; training in Northern universities.
Institutional strengthening & development	1960s – 1970s	Shift to strengthening rather than establishing; provide tools to improve performance; focus still on individual organizations and training in the North.
Development management & administration	1970s	Reach target groups previously neglected; focus on improving delivery systems and public programmes to reach target groups
Human resource development	1970s – 1980s	Development is about people; emergence of people-centred development; key sectors to target are: education, health, and population.
New institutionalism	1980s – 1990s	Capacity-building broadened to sector level (government, non-governmental, and private); focus on networks and external environment; attention to shaping national economic behaviour; emergence of issues of sustainability; shift focus from projects to programmes.
Capacity development	Late 1980s – 1990s	Reassessment of the notion of technical cooperation; stressed importance of local ownership and process, introduction of the demand-driven development concept; participatory approaches as the key; seen as 'the way' to do development.
Capacity-development & knowledge networks	2000s	Change process at the level of individuals, organizations and societies; increased participation in capacity-building; emphasis on continuous learning and adaptation; balancing results-based management and long-term sustainability; systems approach and emerging talk of complex systems; emphasis on needs assessment/analysis; spreading of ICT-based knowledge networks; increased donor coordination.
Adaptive capacity and resilience	2000s	Learning to live with change and uncertainty; nurturing diversity for resilience; combining different types of knowledge for learning; creating opportunity for self-organization towards socio-ecological sustainability; development through bricolage.
Capacity for development	2009	The availability of resources and the efficiency and effectiveness with which societies deploy those resources to identify and pursue their development goals on a sustainable basis.
Dynamic capacity and capabilities approach	2014->	Transforming political demands and policies (in the form of development objectives through national plans) into realistic frameworks for the transformation of organizational abilities, key assets, and required empowerments into the goods and services provided by the State to enable to generate the required outcomes and impact.

Sources: Lusthaus et al. (1995); Whyte (2004); Folke, Colding & Berkes (2002); Cleaver (2012); Otoo et al. (2009); Capacity4Development, website (2015)

Box 2.1 Capacity-building and capacity-development related definitions

Definitions compiled by Whyte (2004, p. 25):

United Nations (2002): "Capacity development or building is the process by which individuals, institutions and countries strengthen capacities or abilities."

UNICEF (1996): "Capacity development is any support that strengthens an institution's ability to effectively and efficiently design, implement and evaluate development activities according to its mission."

OECD-Development Assistance Committee (1999): "Capacity development is the process by which individuals, institutions and societies develop abilities to perform functions, solve problems as well as set and achieve goals. It is premised on ownership, choices and self-esteem."

Netherlands Ministry of Foreign Affairs (2000): "Capacity development refers to approaches, strategies, methods applied to increase the capacity of organizations and/or institutions."

Canadian International Development Agency (2002): "Activities, approaches, strategies and methodologies that help organizations, groups and individuals to improve their performance, generate development benefits and achieve their objectives over time. It often involves broad participation, building on local interests and expertise, offering opportunities for learning and linking at micro, meso and macro levels to build ownership and sustainability."

German Technical Cooperation Agency (2003): "Process of strengthening the abilities of "individuals, organisations and societies to make effective use of resources, in order to achieve their own goals on a sustainable basis."

Definitions compiled by Pearson (2011, p. 9)

European Centre for Development Policy Management: "The process of enhancing, improving and unleashing capacity; it is a form of change which focuses on improvements."

Norwegian Agency for Development Cooperation: "Capacity development is a process by which individuals and organisations increase their abilities to successfully apply their skills and resources toward the accomplishment of their goals and the satisfaction of their stakeholders' expectations."

OECD: "The processes whereby people, organisations and society as a whole unleash, strengthen, create, adapt and maintain capacity over time. Many agencies have decided to adopt this definition" (OECD, 2006, p. 12).

Swiss Agency for Development and Cooperation: "The process to improve performance at the individual, organisational, network and broader system levels with the aim of increasing management and resource potentials."

UNDP: "The process through which individuals, organisations and societies obtain, strengthen and maintain the capabilities to set and achieve their own development objectives over time." "Capacity development" in a similar way as "the process by which individuals, organisations, institutions and societies develop abilities (individually and collectively) to perform functions, solve problems and set and achieve objectives" (UNDP, 1997, p. 3). "The process through which individuals, organisations and societies obtain, strengthen and maintain the capabilities to set and achieve their own development objectives over time," and that the process "must bring about transformation that is generated and sustained over time from within" (UNDP, 2009, p. 5).

United States Agency for International Development: "Approaches, strategies, or methodologies used (…) to change, transform, and improve performance at the individual, organisational, sector, or broader system level."

World Bank Institute: "A locally driven process of learning by leaders, coalitions and other agents of change that brings about changes in socio-political, policy-related, and organisational factors to enhance local ownership for and the effectiveness and efficiency of efforts."

2.2 Capacity for development as frame of reference

This dissertation appreciates the diversity of 'capacity' related definitions and proposes to select the most suitable definition for each case. For instance, if the programme is to target the wider policy environment, its definition of 'capacity' needs to take into account other aspects than what a targeted project focusing on bringing tangible results at the local government level must. The diversity is necessarily there, but the definition must be made before proceeding with the content and detail, case-by-case.

This sub-chapter takes the word 'development' as the point of entry. Similarly to 'capacity', the word 'development' has conceptually had various meanings over time. According to Pieterse (2004), its present sense dates from the post-war era of modern development thinking, the core meaning of development being economic growth, as in growth theory and Big Push theory. Economic growth was combined with political modernization with nation-building and social modernization such as fostering entrepreneurship and 'achievement orientation' when development thinking broadened to incorporate modernization. Also in dependency theory, the core meaning of development was economic growth. Alternative development thinking focused on social and community development in the mid-1980s. Amartya Sen's work on capacities and entitlements guided the alternative development thinking to consider development as capacitation (pp. 5–7). In addition to having different meanings of development over time, there are different dimensions or layers to 'development' at any one time, implicitly or explicitly. The historical and political context matters. The author further notes that there has been a significant methodological change toward interdisciplinarity. While traditionally sectoral theories dominated development studies, in practice the significant themes in development policy are intersectoral. These relate to such as cooperation, social diversity, gender, and environment, and changes in development cooperation and structural reform (pp. 12–13).

All these are relevant themes in this interdisciplinary and intersectoral dissertation. The following Table 2.2 captures Pieterse's summary on general trends in development theory over time, again adding useful points of entry for this synthesis.

Table 2.2 General trends in development theory over time

FROM	**TO**
Macro-structures	Actor-orientation, agency, institutions
Structuralism	Constructivism
Determinism	Interpretative turn, contingency
Generalizing, homogenizing	Differentiating
Singular	Plural
Eurocentrism	Polycentrism, multipolarity

Source: Pieterse, 2004, p. 13

The approach in this dissertation is constructivist and actor-oriented. It pays attention to agency and institutions, is plural rather than singular, and differentiating rather than generalizing. The approach in this dissertation appreciates polycentrism and multi-polarity that also give the users some authority to make decisions and enforce rules.

The frame of reference in this dissertation is based on often-cited three analytical levels on which capacity development objectives may need to be pursued: 1) individual, 2) organizational, and 3) enabling environment (OECD, 2006, p. 13). The roots of Figure 2.2 are in the diagram presented by Alaerts, Hartvelt and Patorni (1999) through three basic interlinked elements: 1) creation of an enabling environment with appropriate policy and legal frameworks; 2) institutional development, including community participation; and 3) human resources development and the strengthening of managerial systems. The frame of reference is considered "systemic" in recognition that there are interactions between the levels.

An enabling environment influences both institutional development and human resource development by creating incentives for both organizations and individuals within. An enabling environment can create incentives which foster productivity, innovativeness, and capacity development, instead of fostering passivity, decline, or even closure. This is the broader context within which the development process takes place and which can either constrain or enable prospects for success (Blagescu & Young, 2006, p. 5). An important aspect of an enabling environment is good governance, in this case *good local water governance*, which is another key operative concept added into the frame of reference (Figure 2.2).

Action environment is added to set the economic, political, and social milieu in which the activities take place. These conditions influence political stability and legitimacy of government, relevant dimensions for fragile countries, and their capacity change. Hilderbrand and Grindle (1997) note how this context had been frequently overlooked in the design of capacity-building interventions; their case studies indicated that the action environment was indeed a critical dimension in constraining or facilitating the ability of governments to perform development tasks (p. 39). For the purposes of this study, also natural environment is added. This influences both the water resources management as well as the livelihoods opportunities that the rural populations depend on. Here *economic factors* refer to the private sector, development, and labour market; *political factors* refer to leadership, mobilization of civil society, stability, legitimacy, and political institutions; and *social factors* to overall human resources development, social conflict, class structures, and organization of civil society (Hilderbrand & Grindle, 1997, p. 36). The *natural factors* refer to geo-hydrological conditions, including water resources and land use pattern that affects the availability and quality of water.

The individual level – the human capacity – refers to individuals with skills to: analyse development needs; design and implement strategies, policies, and programmes; deliver services; and monitor results. Individual skills or abilities contribute to the realization of development objectives. Human resources development entails education, training, learning-by-doing, and various kind of skills development activities, but also recruitment and personnel

management issues. Human resources development is here considered as only one dimension of capacity development, albeit an important one. Institutional issues are here linked into the dimensions of good governance. Institutions refer to the formal “rules of the game” and informal norms that provide the framework of goals and incentives within which organizations and people operate (North, 1990). Organizational capacity is about groups of individuals bound by a common purpose, with clear objectives and the internal structures, processes, systems, staffing, and other resources to achieve them (Blagescu & Young, 2006, p. 4). An organization needs to be resourced with clear rules of the game for using these resources. This is where policy and legal frameworks mediate, and this is where both formal and informal institutions come in.

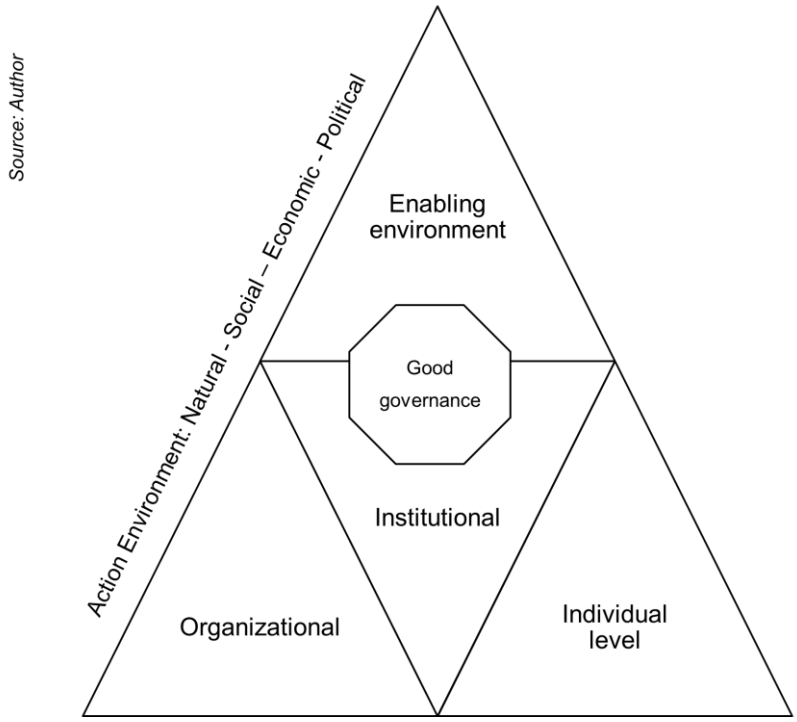


Figure 2.2 Frame of reference

2.3 Capacity for good governance

Capacity for good governance, good local governance, and more specifically, good local water governance, are leading themes in this dissertation. The assumption in this study is that the water sector problems are essentially governance problems in many countries, as identified in urban context by Seppälä (2004), among others. Conceptually they all have changed rapidly over the past decades with the swift global changes often referred to as “globalization”. Cheema and Rondinelli (2007), in their outline of the evolution of the governance concept, describe how until the early 1980s government and the state were generally used interchangeably, and governance was considered almost as a synonym for government and its act of steering society. By the early 1980s, globalization at many levels was shifting the debates from the proper

allocation of responsibilities within government to the appropriate roles of government, the private sector, and civil society. Hence, the concept of governance expanded to include both government and other societal institutions, including the private sector and civil associations (pp. 1–2).

Good governance means that processes and institutions produce results that meet the needs of society while making the best use of resources at their disposal. The concept of good governance is now widely described in terms of being transparent, representative, accountable, and participatory (Cheema & Rondinelli, 2007). Several authors have described in further detail how the concept has evolved over the past decade; see, e.g., Cheema and Rondinelli (2007) and Tråpp (2007). Good governance has an intriguing future dimension as it should be responsive both to the present and future needs of society. It calls for institutions and processes to serve all stakeholders within a reasonable timeframe. When the governance cannot respond to the present needs, it has very little chance of responding to future needs either. However, in this study, one of the assumptions is that if the principles of good governance, as outlined below, are institutionalized in local formal and informal institutions and society in general in a meaningful, tangible way, they do have local relevance and can contribute to sustainability. Local informal institutions may well represent more stable institutions where the other governance layers are compromised by political instability.

For rural community-managed water systems and services the concept of local governance is central. It can be defined as the formulation and execution of collective action at the local level. It encompasses the direct and indirect roles of both formal institutions and related organizations, such as local governments, and informal institutions, including community groups, local norms, and ways of pursuing collective action for various types of interaction, collective decision-making, and delivery of local public services (Shah & Shah, 2006). Communities and their representatives operate within the local governance structure, whether this is formally acknowledged or not. Ideally, this governance structure should form part of the institutional arrangements which provide a structure within which the members of a society, collectively or individually, cooperate or compete (Saleth & Dinar, 2004). Yet, in many fragile countries such as Nepal, these formal local governance systems are not fully in place or functional.

A closely related concept to this is decentralization. With the broader perspective on governance, new concepts of decentralization also emerged. While in the 1970s and 1980s decentralization focused on deconcentrating hierarchical government structures and bureaucracies, by the mid-1980s it also contained political power sharing, democratization, market liberalization, and expanding the scope for private sector involvement in decision-making. In the 1990s the concept of governance became more inclusive, and similarly the concept of decentralization was seen as a way of opening governance to wider public participation through civil society organizations (Cheema & Rondinelli, 2007). Shah and Shah (2006) identified five perspectives on models of local government: 1) traditional fiscal federalism, 2) new public management, 3) public choice, 4) new institutional economics, and 5) the network forms of local governance (p. 5).

Governance and decentralization are not about something static and steady but rather a continuous process with a number of actors. This also has its downside: decentralization and involvement of a number of civil society and private sector actors with new local structures, organizations, and procedures mean in practice that the local governments are expected to perform increasingly more complex tasks. Cheema and Rondinelli (2007) note how national government officials can use the weak performance of local governments as a justification to keep decision-making centralized. Thus, it is critical to be able to identify those factors that facilitate or prevent local government performance, or indeed, performance of any critical actors at the local level where the tangible action is meant to be.

Global Water partnership defined water governance as "*the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society*" (Rogers & Hall, 2003, p.16). Key general good governance issues which can be applied to good water governance relate to protection of public health and safety, environmental protection, accountability, transparency, user participation, gender and equal opportunities, balancing equity, efficiency, effectiveness in performance, financial sustainability, and transparency. Water governance must also be perceived as a subset of a country's general governance system of how various actors relate to each other (Rogers & Hall, 2003). Tråpp (2007) argues that governance and politics are increasingly both part of water crises and part of the solution, and that framing water challenges as governance challenges allows for a broadening of the water agenda.

2.4 Capacity for institutional development

The concepts of decentralization, governance, good governance, local governance, and water governance are all linked to institutional development and institutional capacity. Institutional capacity development refers to the processes that aim to establish or increase the capacities of (formal) institutions to exercise their legally-defined functions. Institutional development is not a separate activity or a project as such, but rather an endogenous, complex, and dynamic process of development or transformation. These, in turn, require a sense of ownership, and a willingness to change and to improve from within. Institutional development cannot be sustainable if done from outside. The primary stakeholders have to make the change themselves and thus, be committed to make the effort from the beginning.

Successful institutional development calls for broad-based participation which in case of the local governments entails all the community development actors within the administrative boundaries of the local government. However, there is a risk of shallow results in a complex environment as a result from comprehensiveness and wide participation. There may simply be too many issues and interests involved to make progress with any of the issues. Even if the activity is clearly focused on water and environmental sanitation, there will be a large number of stakeholders and interests involved. The challenge remains: how to address multiple issues

simultaneously, in an integrated manner, without missing the momentum for real change and tangible improvements? There are no quick fixes since strengthening institutional capacity takes time.

Institutions in this study are considered as more than organizations. Using the definitions given by North (1990), formal institutions consist of laws, regulations, and government structures, while informal institutions shape the unwritten codes of behaviour. Understanding informal institutions is of utmost importance for those concerned for sustainable development in a multi-ethnic, culturally diverse rural societies. Organizations, in turn, can be more formal and guided by written codes of practice. As defined by North (1990), organizations consist of groups of individuals bound together by a common purpose to achieve objectives. In other words, organizations are players in a game where institutions are the rules of the game. In this study, the Water Users and Sanitation Committees (WUSCs) and the lowest tiers of local government institutions represent formal organizations; i.e., those who create the enabling (or disabling!) environment and the broader governance structure. There are also a number of local informal institutions which have direct impact on such organizations as WUSCs who are meant to translate the policies into local action, or indeed, inaction. Informal institutions are especially relevant in the local context where they can have particularly strong influence with rather immediate, tangible results.

Shah and Shah (2006), among others, consider the new institutional economics helpful in clarifying local government roles and responsibilities on a broader framework of local governance. The frame of reference also gives an opportunity to acknowledge how the situation can get complicated by weak or extant countervailing institutions, path dependency, and the interdependency of various actions (pp. 18–19). This framework is useful in examining local government involvement in a partnership of multiple organizations. The authors introduce the network forms of local governance within which the local government has an opportunity to play a catalytic role in facilitating the roles of various types of networks in improving social outcomes for local residents. The authors call for a new local public management paradigm which demands the local government to separate policy advice from programme implementation. In this paradigm, the local government takes the role of purchaser of public services but not necessarily as a provider of them (p. 20). This is in line with the service delivery thinking concerning water supply, whereby the local government does have a role as a service authority, but not necessarily as the service provider or producer.

Water services are a multi-level system as described by Katko and Hukka (2015), ranging from on-site to cooperatives, municipal utilities, and various types of supra-municipal arrangements. The authors are concerned that even with this evident multi-polarity, the debates concentrate just on one level, ignoring the others and their inter-relationships. The authors call for a distinction in between service provision and production, which until now has gone undetected by almost all parties (p. 222). This echoes with the new rural water service paradigms and the notions of professionalization of rural water services. This suggestion is supported by literature concerned with the existing incentives and accountability framework faced by existing levels of

government: these are not seen as conducive to a focus on service delivery consistent with citizen preferences (Shah & Shah, 2006, p. 21). This is particularly relevant in a country such as Nepal where, in the absence of elected local bodies, the services are delivered by centrally appointed bureaucrats.

Each local government and community has its specific characteristics, and traditions and cultural practices are diverse; informal institutions can be equally varied. Casson, Della Giusta, and Kambhampati (2008) discuss the importance of informal institutions in the development process. The authors highlight how a development-orientated institutional perspective also needs to emphasize more explicitly the role of informal institutions in shaping formal ones. Their interpretation of North's theory of institutional change explains that formal institutions are a crystallization of informal ones, and that both co-evolve through the operation of organizations, both informal and formal social groups, from households and villages to networks, firms, parties, and governments (p. 137).

Casson et al. (2008) further note that issues of equity, economic rules and regulations, caste, religion, social capital, and elite groups affect the dynamics of institutions, and acknowledge that informal institutions do shape the formal ones. The authors draw attention to social capital and elite groups that are highly relevant notes for rural water sector and community-managed water systems. Here they define social capital as *"trust, norms of reciprocity, sanctions and networks which allow co-operation. Social capital decreases the transaction costs of organising activities*" (p. 139). Yet, while social capital can help to resolve problems, access to social capital may depend on a person's power and location. In this regard, the authors consider that sustainability may be compromised by such inequality (p.139). Adhikari and Goldey (2010) studied 129 community-based organizations in Southern Nepal, and concluded that upward enforcement of rules is impractical, enabling elite capture of resources and impunity due to the caste- and class-based hierarchical social organization and power-based vertical relations in the society in general (p. 192). Also Cleaver (2005 and 2012) acknowledges the challenges linked to social capital and related notions of participation.

The tension between formal and informal institutions can force institutional changes, both intentional and unintentional (North, 1990). The role of informal institutions gets even more important in a post-conflict situation where formal institutions are poorly defined or not functional at all. This is particularly relevant for the focus country of this study, Nepal. This is not entirely a negative matter; change can also be positive and constructive, and new synergies may emerge. Pahl-Wostl et al. (2008) considered strong interdependence and synergies between formal and informal institutions as an emergent feature of more collaborative governance styles. The authors saw it particularly important for understanding institutional change and transitions towards more adaptive water management regimes (Pahl-Wostl, 2002; 2007a; Pahl-Wostl et al., 2005, in Pahl-Wostl et al., 2008).

2.5 Capacity for participation and community-driven development

Capacity for participation and community-driven development touches all elements of the frame of reference (Figure 2.1). At individual level it is about human resources development, at WUSC level it is about institutional and organizatorial capacity, and as having an opportunity to participate and move towards community-driven development, it falls within the enabling environment domain. All this is also strongly about action environment.

Water sector has traditionally focused on physical facilities with some interest for the natural environment. Since the community management concept became more widely applied, projects started to pay more attention to the other factors as well, including the institutional, human, social, and financial aspects. Since the Water Decade 1980–1990, participation and community management have been mainstreamed in rural water sector in many countries. At that time, participation and community management – and generally the idea of managing water at the lowest appropriate level – were considered as key to successful project implementation and sustainability. This was articulated already in 1992 by the Dublin Principle No. 2 which stated that "*Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels*" and that the decisions should be taken "*at the lowest appropriate level, with full public consultation and involvement of users in the planning and implementation of water projects*" (Dublin Statement on Water and Sustainable Development, 1992). According to Bakalian and Wakenam (2009), the scope has broadened even further since the mid-1990s, and a number of stakeholders have incorporated one or more components of the demand-driven, community management model (p. 4).

Participation and inclusiveness are important aspects of good local water governance. Today, participation is mainstreamed in some form or another in most of the rural water and sanitation projects and programmes either directly or through legitimate intermediate institutions or representatives, such as local governments, user groups, and community-based organizations. Numerous studies have discussed its merits and challenges (e.g., Marks et al., 2014; Bakalian & Wakenam Eds., 2009; Cornwall, 2003; Johnson et al., 2001; Seppälä, 2002; Doe & Khan, 2004; Parker & Skyttä, 2000; Prokopy et al., 2008). There are many ways to do this and still call it participation in local decision-making. Gomez and Nakat (2002) identified three types of participation, and considered interactive participation as the most advanced form of community participation. As community members are encouraged to use their own knowledge and abilities, the project benefits from local skills and resources. This has to do with responsiveness, another characteristic of good governance, which relates to institutions and processes capable of serving "all", and being able to learn and review community-specific needs, priorities, and options (Rogers & Hall, 2003). In this context, participation can be defined as a consultative empowerment process within which communities are established as effective decision-making entities (Harvey & Reed, 2007).

Participation can also be superficial and passive, and not give equal opportunities. It may favour those more knowledgeable about manipulating the process or those who participate over those who do not. Participation is also often discredited as a slow process, even if it is well known to instil a greater sense of ownership of the results and stronger commitment to future sustainability. In early 2000s, according to Doe and Khan (2004), participation and ownership are known to contribute to the sustainability of water services although the linkage between the two was poorly understood. Later on in 2014, Marks, Komives, and Davis (2014) claim that while participatory planning and sustainability of rural water infrastructure is well documented, less attention has been paid to identifying the particular forms of community participation that matter most. The authors list examples of participation: contributing cash and labour toward the capital cost of the water system; attending planning meetings and trainings related to the project; making key decisions regarding technology choice, service pricing, and management of the infrastructure; financing 100 percent of ongoing operation and maintenance (O&M) costs; and forming a water committee charged with overseeing the project or parts of it, usually assumed to take over the O&M functions. Yet, there is still less understanding on which aspects of these are related to sustainability (p. 277).

Public participation also has legal dimensions. The Berlin Rules on Water Resources as adopted by the International Law Association summarized international law customarily applied in modern times to freshwater resources. Its Article 18 "*Public Participation and Access to Information*" stated that "*in the management of waters, States shall assure that persons subject to the State's jurisdiction and likely to be affected by water management decisions are able to participate, directly or indirectly, in processes by which those decisions are made and have a reasonable opportunity to express their views on programs, plans, projects, or activities relating to waters*" (International Law Association, 2004, p. 24).

In Ghana, a study about the functionality of hand pumps found that project outcomes were better within communities where a greater share of households reported participating in management-related decisions, and worse in communities where more households participated in technical decisions (Marks et al., 2014, p. 285). Various studies made in individual African countries indicate operational failure rates of 30–60 percent. Harvey and Reed (2007) emphasize how there is a strong need to distinguish between "community participation" and "community management", participation being a prerequisite for sustainability but community management not.

This aspect is further discussed by Harvey and Reed (2007) who further question community management, pointing out how the concept was adopted by most organizations in project-based approaches to shift the responsibility "with a clear conscience" to beneficiaries for on-going operation and maintenance after "the project" had completed constructing the facilities. Hence, sustainability of the facilities and services was left with the communities, often without further post-construction support. Harvey and Reed (2007) further note how the concept of community management was indeed developed predominantly in the West where there has been a tendency to idealize communities in low-income countries. Harvey (2008) in his study of poverty

reduction strategy papers and rural water in sub-Saharan Africa commented that "*Community management is based on the well-intentioned principle of empowering communities to take ownership of, and responsibility for, their own water supplies. This is a worthy ideal but the way in which it has been adopted in most countries abrogates responsibility for sustainable service delivery away from Governments and implementing agencies"* (p. 126). The author reminds us that because access to safe water is a universal right, it is unacceptable and unethical that communities are left alone to manage and sustain their water supplies (Harvey, 2008, p.126).

Community-driven development (CDD) emerged as a response to top-down supply-driven approaches. It is an approach to local development in which control of decision-making and resources for local infrastructure and service delivery are wholly or partly transferred to community groups (de Regt, Majumdar & Singh, 2013, p. 1). CDD can also be defined as the *process* of giving control of development decisions and resources to community groups. Communities can be geographical entities, such as rural villages, or groups with common interests, such as water user associations. In CDD, these groups typically work in partnership with support organizations, service providers, local governments, the private sector, or non-governmental organizations (NGOs). The community group should be the one to develop and implement projects that meet their immediate priorities. The authors suggested four cross-cutting design principles for CDD in fragile countries: 1) always be responsive; 2) think long-term; 3) keep things simple, i.e., do not add many layers of themes and activities; and 4) always think scale, both vertically and horizontally (de Regt et al., 2013, pp. 37–38).

Narayan (2002) divides CDD into four practice areas, all relevant notions to this dissertation (pp. 209–210):

1. Enabling environment: development of policy and institutional reforms oriented toward increased control of decisions and resources by community groups and/or by participatory elected local governments.
2. Participatory elected local governments: elected local governments make decisions on planning, implementation, operation, and maintenance in partnership with community groups.
3. Community control and management of investment funds: community groups make decisions on planning, implementation, operation, and maintenance, and manage investment funds.
4. Community control without direct management of investment funds: community groups make decisions on planning, implementation, operation, and maintenance, without directly managing investment funds.

In this dissertation, the Step-by-Step fits into the practice area 3 above. WUMP as a planning tools fits well for both practice areas 2 and 3, even if in Nepal there has not been an elected local government for over a decade at the time of writing this dissertation.

There is plentiful literature on the community-based and community-driven development, its successes and failures, and practical approaches into its practical implementation and follow-up. This is closely linked to another area of vast literature, namely that which relates to sustainability of CDD, gender equality and social inclusion (GESI), and social capital. Furthermore, participation alone is not the solution. Cleaver (2005) suggests that "*rather than spending more effort reiterating oversimplified mantras about the beneficial effects of participation and association on the generation of social capital, we need to pay far more attention to the effects of the lack of material and physical assets of the poor, and to the socio-structural constraints that impede their exercise of agency*" (Cleaver, 2005, p. 904). This is where a water project or programme can have a lot to offer, assuming that there are also investment funds available to address the lack of material and physical assets.

2.6 Capacity, empowerment, gender equality, and social inclusion

The United Nations' Universal Declaration of Human Rights put equality between men and women on a worldwide agenda in 1948 by stating that everyone is entitled to all the human rights and freedoms set forth in the document, regardless of gender. Gender equality was thus seen as essential for all development to ensure that both women and men have equal conditions for realizing their full human rights and potential to contribute for the common good (Khosla, van Wijk, Verhagen & James, 2004). The World Development Report 2012 leading message was that gender equality is a core development objective in its own right. The report acknowledged that greater gender equality can enhance productivity, improve development outcomes for the next generation, and make institutions more representative (World Bank, 2012). In this dissertation, one of the peer-reviewed articles focused fully on gender issues, with GESI featuring in other peer-reviewed articles and in a number of conference papers.

Gender refers to a system of roles and responsibilities between women and men. It is a socially constructed concept, not a biological one. Gender mainstreaming is about being deliberate in giving visibility and support to women's contributions. The United Nations Conference on Environment and Development (1992) Agenda 21 included gender issues, and in 1995 the Fourth World Conference on Women, held at Beijing, agreed that it was essential to design, implement, and monitor – with the full participation of women – effective, efficient, and mutually reinforcing gender-sensitive policies and programmes, including development policies and programmes at all levels, to foster the empowerment and advancement of women (website accessed 30.5.2015). Gender equality and women's empowerment was also the Goal Three of the Millennium Development Goals. The international community and many national governments have endorsed several plans of action for the full, equal, and beneficial integration of women in all development activities. Practically all development programmes now apply a gender policy. The same applies to participation which is one of the key factors that create a sense of ownership, which in turn is crucial for sustainability.

Water and sanitation are truly gender issues. Women experience the lack of water and sanitation facilities differently than men, and as caretakers of the children, the elderly, and the sick, women experience the burden of non-existent facilities more heavily than men. Similar to poverty, problems with water supply and sanitation hit women differently to men, and the remedies are equally varied. The Dublin Statement Principle No. 3 stated that women play a central part in the provision, management and safeguarding of water. Women were seen as providers and users of water, and guardians of the living environment. The statement called to address women's specific needs and to equip and empower women to participate at all levels in water resources programmes, including decision-making and implementation (Dublin Statement on Water and Sustainable Development, 1992).

The tacit knowledge relating to water, sanitation, health, and associated practices are likely to vary depending on gender. Women's knowledge and daily experience with water, sanitation and hygiene is should not be overlooked when planning and implementing water and environmental sanitation schemes. There is increasing evidence that an integrated and gender-sensitive approach to water sector development and management leads to greater efficiency, effectiveness, and equality (Khosla et al., 2004). This includes statistical evidence that a gender- and poverty-sensitive approach is significantly correlated with better sustained and used services (Gross, van Wijk, & Mukherjee, 2001). Regmi and Fawcett (1999) discussed the ways of integrating gender into drinking water projects in Nepal, recommending inclusion of both women and men in the project activities, gender training and awareness-raising for all, and promotion of women's employment in water projects (Regmi, & Fawcett, 1999, p. 64). All these echo well with Article III in this dissertation (Rautanen, & Baaniya, 2008), that highlighted the importance of integrated gender policy that both mainstreams the principles and targets specific groups. Article III also discussed the trained women's employment opportunities after the training.

Empowerment is critical for ensuring sustainability of community-managed water services. Empowerment in its broader sense becomes the key pillar of resilience in a world of uncertainties and unpredictable situations. Pahl-Wostl et al. (2008) note how uncertainties and, e.g., impacts of globalization and climate change and changing socio-economic conditions provide new challenges that cannot be tackled within the established technology-driven command-and-control management paradigm. This prevailing paradigm is based on the firm belief that risks can be quantified and optimal strategies chosen, and that there can be controllable and predictable technical infrastructure based on fixed regulations. Pahl-Wostl et al. (2008) call attention to the new paradigm which is based on the notion of "living with water" where the limits of control and the importance of uncertainties are clearly acknowledged.

Empowerment is an important dimension or even a goal in its own right in local capacity development. Empowerment is at the core of the rights-based approach, and embedded into the approaches to GESI. Alsop, Bertelsen, and Holland (2006) define empowerment as a group's or individuals' capacity to make effective choices and then transform these choices into desired actions and outcomes. Agency, in turn, was defined as "*an actor's or group's ability to*

make purposeful choices" (pp. 10–11). The authors note that agency and capacity to do the right choices does not necessarily mean that they are used effectively to transform the decision into something tangible, and that by establishing the rules of the game for the exercise of agency, institutional contexts determine the effectiveness of agency (Alsop et al., 2006).

2.7 Capacity for water management and services

This dissertation takes IWRM as the leading approach to water management and thereby, water services. There are many definitions and approaches to define "IWRM", see Box 2.2. Moriarty, Butterworth, and Batchelor (2004) add that IWRM is a process. The role of capacity-building is again acknowledged as the authors claim that "*any improvement in coordination or planning of water resource development represents a step in the process, and in many cases local level agreement and capacity building on better sharing and use will have greater impact than new national laws or international level treaties*" (p. 7). With its process-nature, IWRM is essentially a futures-oriented approach to getting from some existing state to some envisaged and preferred future state, by achieving commonly agreed principles or best practice in managing water through the involvement of all relevant stakeholders. IWRM can be viewed as a tool for cross-sectoral integration that brings together water for people, water for food, water for nature, and water for industry and other uses (Moriarty, Butterworth, & Batchelor, 2004, p. 9).

Box 2.2 Definitions of IWRM

Definitions of IWRM

IWRM is a process which promotes the co-ordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromizing the sustainability of vital ecosystems (GWP, 2000, p.22).

IWRM is a process of assignment of functions to water systems, the setting of norms, enforcement (policing) and management. It includes gathering information, analysis of physical and socioeconomic processes, weighing of interests and decision-making related to availability, development and use of water resources (van Hofwegen and Jaspers, 1999).

IWRM involves the coordinated planning and management of land, water and other environmental resources for their equitable, efficient and sustainable use (Calder, 1999).

IWRM expresses the idea that water resources should be managed in a holistic way, coordinating and integrating all aspects and functions of water extraction, water control and water-related service delivery so as to bring sustainable and equitable benefit to all those dependent on the resource (European Community, 1998).

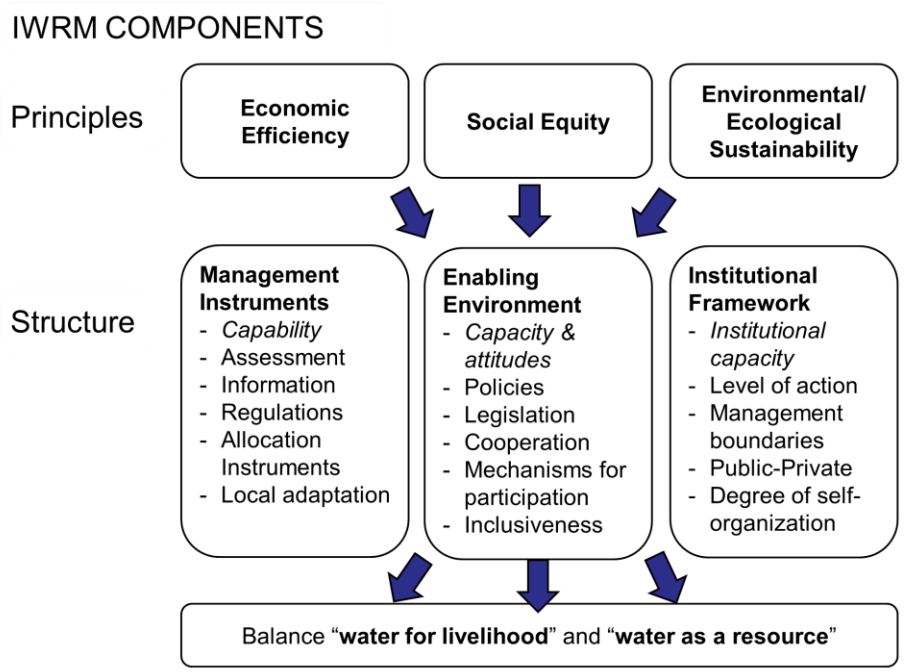
Source: Moriarty, Butterworth & Batchelor, 2004, p. 6

IWRM means reconciling basic human needs, ensuring access and equity, with economic development and the imperative of ecological integrity, while respecting transboundary commitments (van der Zaag, 2005, p. 868)

IWRM concept has been heavily debated over the past decade and across the scientific disciplines. There are claims that IWRM is an elusive, vague, and fuzzy concept, and while some authors take it as an inspiring concept that encourages to think outside the box (e.g. Van der Zaag, 2005), some criticize it for being too elastic and amorphous (Biswas, 2004, Molle, 2008, *in* Butterworth et al., 2010, p. 69). Butterworth et al. (2010) presented a number of solutions and ways forward for the usual IWRM criticisms and problems. The authors appreciate that the IWRM paradigm makes conceptual space for real and significant improvements in water management at all levels, from households to international river basins, and as such the approach has its merits. They call for lighter approaches to implementation and focusing more on services people use (p. 75). Two articles in this dissertation take the lighter approach into IWRM. The scale, boundaries, and temporal variability count in IWRM. Implementing an IWRM process as described by Hassing et al. (2013) is based on the GWP publications over the years, and is a question of getting three pillars right (pp. 3–4):

Moving towards an enabling environment of appropriate policies, strategies, and legislation for sustainable water resources development and management
Putting in place the institutional framework through which the policies, strategies, and legislation can be implemented
Setting up the management instruments required by these institutions to do their job

Figure 2.3 presents the IWRM components that have been modified from the original to highlight the places where capacity and capability issues come in. Overall, the pillars are well aligned with this dissertation frame of reference.



Modified by the author from: Global Water Partnership, 2000 & Hassing et al., 2013

Figure 2.3 Three pillars of IWRM

IWRM is by definition about multiple uses of water. IWRM and multiple use water services (MUS) are both linked to integrated planning processes within the wider rural development context, as well as rural service delivery options. MUS is about water service delivery while IWRM is focused on resource management. MUS is the core item in two of the peer-reviewed articles, and the concept that drives this synthesis. The MUS approach is proposed as an alternative to water services provision (Moriarty et al., 2004; van Koppen, Moriarty, & Boelee, 2006). The point of departure is that water *will* be used for multiple-uses, not only for drinking, whether or not the water system was designed for this. Conceptual framework for MUS as presented by Van Koppen, Smits, Moriarty, Penning de Vries, Mikhail, and Boelee (2009) guided Articles II and IV in this dissertation. The multi-layered framework operates at four levels: household, community, intermediate, and national. Van Koppen et al. (2006) introduced a typology of MUS of elaborate global learnings (pp. 6–8):

- *Single-use planning but de facto multiple use:* schemes that were originally planned and designed for a single use. These "domestic", "irrigation", "livestock" or "fish pond" schemes are invariably transformed into de facto multiple-use schemes by the users after construction is finalized (p. 6);
- *Domestic-plus and productive-plus*: A response to de facto multiple uses of single-use planned schemes that aims to better contribute to people's well-being and to enhance scheme sustainability; anticipates of and caters for "additional" uses by designing infrastructural add-ons, while maintaining the sector's single-use as the starting point. In these "domestic-plus" and "productive-plus" technical designs, the range of water needs is much better recognized, but the predominance of the sector-based priority water use does not fully disappear (p. 7); and
- *Multiple-use approaches*: full-fledged multiple-use water services approach. These are often less hindered by sector boundaries or sector-based government policies, and have a strong mandate to tackle poverty and incentive to meet clients' needs (p. 8).

The Articles II and IV study de facto multiple use. In practice the combinations of micro-hydro power and irrigation were fit for the "productive plus" category, but these are not usually designed as MUS but rather, as hydro power applications. Irrigation and other uses of water flowing through the system were added de facto benefits. Smits, van Koppen, Moriarty, and Butterworth (2010) conclude that operational application of MUS can largely build upon technologies and approaches commonly used in the sector, regardless of presenting MUS as a new approach to water services provision. MUS has a service delivery objective that goes beyond sub-sectoral mandates to one of reducing rural poverty through improved access to water for a multitude of livelihoods (p. 118). Van Koppen et al. (2006) emphasized the need for a thorough understanding of the multiple roles of water in people's livelihoods. The authors introduced five principles important for needs-based planning and design processes that are at the heart of MUS: 1) a thorough understanding of water-related livelihoods; 2) efficient, equitable, and sustainable use of water resources; 3) appropriate technologies; 4) inclusive institutions; and 5) adequate financing (p. 21). In this regard, the authors identified the following five

principles to guide the efforts in creating an enabling environment for MUS at the intermediate level where priorities and planning take place: 1) coordination amongst sectors and actors; 2) long-term support to communities; 3) adaptive management; 4) adequate financing; and 5) participatory strategic management (p. 26).

Van Houweling et al. (2012) studied the role of productive water use in women's livelihoods in rural Senegal based on 1860 household surveys and 15 women's focus groups conducted in four regions of Senegal. These women used small-scale piped water systems described as "domestic plus systems" that are gender-equitable and potentially a women-friendly invention. The authors described the use of existing domestic water systems for MUS as "domestic plus water systems". They found that the domestic plus MUS provided women with time savings and greater quantities of water leading to more productive use of water activities. These were complementing the women's small commercial activities. The authors found that one half of women's incomes were linked to productive use activities and, consequently, women earned a higher percentage of their income from the piped system than men. They also found that the range of benefits that productive use offers for women and the poorest households is limited due to affordability constraints, poor water system designs, and limited access to productive assets. Recommendations in this regard include micro-credit programmes, policies to strengthen women's land rights, extension services, programmes aimed at improving market access, and subsidized productive inputs, such as seeds and fertilizers. The authors further recommended that rural water supply interventions adopt a broader mandate to address the different levels of constraints faced by men and women within the domestic plus model (p. 675). These findings echo well with the findings in Articles II and IV.

The MUS approach emphasizes the service delivery. Over the 1980s, the rural water supply sector has been moving from supply-driven centralized government programming to more demand-driven approaches, based on the principles of community-based management and participation. In more recent years, there has been a call to build on community management with more structured systems of post-construction support and the increasing involvement of local private operators (Lockwood & Smits, 2011, p. 1). There has been a call for shifting the emphasis in rural water supply in developing countries "*away from a de-facto focus on the provision of hardware for first-time access towards the proper use of installed hardware as the basis for universal access to rural water services*" (Moriarty et al., 2013, p. 326). Here the hardware refers to water systems as technical engineering infrastructure systems. Software, in comparison in this context, would imply the human, social, and cultural aspects of water-related services.

Lockwood and Smits (2011) introduce a taxonomy of four models at the level of the service provider: community-based management, direct public sector provision, private sector operators, and self-supply. Based on an extensive six-year study in 13 country cases, the authors conclude that there has been a trend away from the voluntary arrangements of community-based management, moving towards professionalization. The authors term this as "community management plus". The authors appreciate that while some of the founding

principles of community-based management, such as community cohesion, common participation, and informal accountability to a water committee are crucial, they remain insufficient (pp. 1–3). Another useful point of view for this dissertation is making a difference between the physical system (the infrastructure) and the service which these systems deliver. According to Lockwood and Smits (2011), "*service refers to the provision of a public benefit through a continuous and permanent flow of activities and resources" (pp. 18–19).* The authors introduce Service Delivery Approach as a conceptual approach to the provision of rural water supply services. It pays attention to the entire life-cycle of a service, consisting of both the hardware (engineering or construction elements) and software aspects (pp. 18–19).

Butterworth (2010) presents Service Delivery Approach as a conceptual ideal of how water services should be provided. It calls for the shift in focus *from* the means of service delivery (the water supply systems or infrastructure), *towards* the actual service accessed by users, where access to a water service is described in terms of a user's ability to reliably and affordably access a given quantity of water, of an acceptable quality, at a given distance from her or his home. According to this thinking, water *service* consists therefore of the hard and soft (physical and other infrastructure) systems required to make this access possible. According to Butterworth (2010), service delivery models provide agreed frameworks for delivering service, and are developed within the parameters of a country's existing policy and legal frameworks. These define the relevant norms and standards for rural water supply; roles, rights, and responsibilities, as well as financing mechanisms (pp. 2–3).

The study by Lockwood and Smits (2011) identified ten building blocks for sustainable service delivery. All of these are directly or indirectly linked to learning or capacity of the various stakeholders, including WUSCs, local governments, and private sector, as well as those working with regulation and overall sector development (Lockwood & Smits, 2011). The role of local governments as the service authority in service delivery (the institution responsible for guaranteeing service provision) means that they should be able to fulfil a number of functions: planning, financing, implementation, monitoring, and support of rural water service providers. This is highly challenging, especially where decentralization is incomplete and the roles and responsibilities do not match with the available resources, whether human or financial. Boulenouar (2015) concludes that in this context "*capacity support is a key element of delivering sustainable services at scale"* (p. 7).

2.8 Capacity for sustainability

Over the past nearly two decades, a number of authors have claimed that the major problem facing rural water supply is not its initial capital costs but sustainability (Ostrom, Schroeder, & Wynne, 1993; Sharma, 1998, and Dixit, 2000 *in* Bhandari, Grant & Pokhrel, 2005; Bhandari & Grant, 2007; Harvey & Reed, 2007). Ostrom, Schroeder, and Wynne (1993) noted two decades ago that whilst design and construction of infrastructure facilities can be completed in fairly short

periods of time, long-term vision is needed to organize and finance operation and maintenance. Sustainable rural water supply and sanitation facilities are not technically difficult or very time-consuming to construct. However, sustainability is a complex challenge as it depends on a number of interlinked factors, including type of technology, local traditions and related cultural and social well-being and equality, formal and informal institutions and organizations, financial and institutional viability, social and economic development, natural and political environment, and other factors unique to each community. Related to these are the common water sector problems in developing countries, including inadequate cost-recovery, outdated institutional arrangements, and fragmented and poorly coordinated water administration (Katko, 1991; Seppälä, 2002; Seppälä, 2004; Rios Osorio et al., 2005; Prokopy et al., 2008; Harvey, 2008). Gomez and Nakat (2002) reviewed some experiences and, as others, concluded that sustainability was hampered by inadequate involvement and commitment of the beneficiaries, inappropriate technology, lack of sense of ownership and responsibility, and projects' disregard of women, the poor, and marginalized groups. Harvey (2008) calls for a holistic approach to water service sustainability, and acknowledges that from the institutional framework down to technology choice, all are heavily influenced by government policies (p. 117).

Ostrom et al. (1993) called attention to long-term vision needed to organize and finance operation and maintenance. In 2000, Parker and Skyttä evaluated rural water projects funded by the World Bank, and found that many unexpected social factors are related to effective cost recovery, including such as participation in multiple community activities by user group members, participation in system design, participation in system construction, recognition of improved beneficiary health, and satisfactory participation in the water group by women; these are all related to above-average cost recovery (p. 39). These authors also note that there is an increased sense of ownership where beneficiaries make a regular and significant financial contribution to their scheme. In Nepal, a study surveyed 205 households for user satisfaction on water supply, and found the following leading problems: insufficient collection of money for operation and maintenance; difficulty in retaining maintenance workers who often leave villages to search for higher-paying jobs; and frequent damage by natural disasters, such as landslides (Bhandari & Grant, 2007).

There are also positive findings. The World Bank study collected information from households, village water committees, focus groups of village residents, system operators, and key informants in 400 rural communities in Bolivia, Ghana, and Peru, and found the great majority of the village water systems performing well. The findings supported the fact that first of all, these communities had been involved in pre-construction planning and had contributed to capital costs, and that the consumer satisfaction was high. Yet, few programmes had planned for systematic provision of post-construction support, assuming that community management was feasible from a technical perspective. Consequently, the villages used post-construction support from wherever they could get it, whether at their own request ("solicited post-construction support") or by others arrived at their own initiative ("supply driven post-construction support") (Bakalian & Wakenam, Eds., 2009). This study found that regardless of

the encouraging overall findings, there was still room for improvement: the households were still using unprotected water sources, and the finances of many village water committees were in poor shape, among other problems. The observers argued that it is unrealistic to leave rural communities to their own devices after a water project is completed, and some post-construction support was needed, including, e.g., follow-up training and technical assistance from the engineers.

Prokopy et al. (2008) in their study in Peru concluded that post-construction support prepares communities for self-management by increasing the community's self-reliance and the households' confidence in system sustainability. This suggests that projects can be made more efficient by building post-construction support into system design, as systems will operate more continuously, break down for shorter times, and can be fixed without bringing in outsiders (p. 304). In their study of 129 Community Based Organizations (CBOs), Adhikari and Goldey (2010) concluded that evidence shows that the transition period is the most vulnerable phase for the groups' management. For this dissertation, this notion is highly relevant for the Water Users Committees when they transfer from planning and implementation into post-construction/post-implementation phase where there is no more external presence to induce practices. This is the testing time for any type of capacity built. Adhikari and Goldey (2010) recommend particular vigilance in rules-keeping and equitable resource utilization – especially during the transition period – and that those involved in community mobilization need to be aware of both sides of social capital, also the downside (p. 192).

According to Bakalian and Wakenam (2009), some of the main factors affecting sustainability can be considered as "internal" to a community, and therefore at least partly within its sphere of influence. These include such as preventive maintenance of facilities; tariff collection and cost recovery to cover routine operation and maintenance of water supply infrastructure; adequate capacity (technical, financial, administrative, etc.) within the community to manage a system, or to engage with an external party to operate and manage the system on its behalf; and the continued involvement of community women, along with men, in all aspects of system management and maintenance (p. 21).

Similarly, Bakalian and Wakenam (2009) identified factors that are seen to be largely "external" to the community include access to, or availability of, spare parts, tools, and equipment to carry out repairs; the availability of some form of external follow-up support, not only to help empower community management structures to maintain the infrastructure they are responsible for, but also training for households to promote hygiene and behavioural change; the presence and strength of private companies and entrepreneurs providing goods and services and skilled technicians to carry out complex repairs; the existence of a supportive policy environment, legal frameworks underpinning the legitimacy of water committees, and clearly defined roles for operation and maintenance; and a system source that continues to produce water of sufficient quantity and quality to satisfy users (p. 10). The authors further listed five main groups of factors that affect post-project sustainability: technical, financial, community and social, institutional, and environmental factors (p. 9). More factors pre- and post-project are identified in Table 2.3

below. This was modified by the author of this dissertation, based on the experiences in Nepal, Tanzania, and Guyana. The dynamics of how the 'internal' capacities relate to 'external' capacities do matter.

Table 2.3 Factors influencing sustainability of rural water schemes

Pre-project issues	**Post-project issues**
Community participation	Community ownership; sense of ownership; definition of roles and responsibilities for system management; both for service authorities and service providers
Scheme financing, contributions; developing transparent and accountable practices	Tariff collection for both regular O&M; financing for capital maintenance expenditure and reinvestment/extension/service level improvements; public audits and public hearings are continued to maintain transparency and accountability of the user committees to the users
Demand-responsive approaches; Serving-the-unserved; inclusion	User satisfaction; customers willing to pay for the expected services; reliable services meet the demand; inclusive services ensuring water for all as per the right to water
Empowerment and capacity strengthening	Capacity of water user committees and its individual members; rights holders can call for their rights from the duty-bearers; duty bearers have capacity and willingness to respond
Appropriate technical design, construction quality, location of the structures, related environmental considerations and works; GESI	Linkages to government and private sector service providers and other local government/district level processes
GESI on Participation and benefits	GESI on capacity enhancement
Training (for planning and implementation)	Continued learning-by-doing, refreshers, peer-networks (e.g., among pump operators, village maintenance workers, new water users committee members)

Source: Modified by Author from Hodgkin & WASH Project staff 1994; Sara & Katz, 1997; Sugden, 2003, original in Bakalian & Wakenam, Eds. 2009, p. 9.

3 METHODOLOGICAL FRAMEWORK

3.1 Constructivist research paradigm

This chapter introduces the methods applied in this dissertation. The research interest is to create a new paradigm for how to address the need for dynamic capacity change in the futures context in the rural water and sanitation sector policies, programmes, and projects that operate at present time. There is no one single theory to test but rather, the study explores various past and present realities, utilizing futures-thinking to project from the pasts into the futures.

According to Mertens (2015), *"a paradigm is a way of looking at the world. It is composed of specific philosophical assumptions that guide and direct thinking and related action*" (p. 8). Schutt (2004) defines scientific paradigm as "*a set of beliefs that guide scientific work in an area, including unquestioned presuppositions, accepted theories, and exemplary research findings*" (p. 71). The research paradigm in this dissertation is *constructivist* and in line with problem-based research paradigm. The key problem is that regardless of decades of effort in improving rural water supply and sanitation, the access is still low, with sustainability and re-investment being constantly questioned. The constructivist paradigm has its roots in the philosophy of Edmund Husserl's phenomenology and Wilhelm Dilthey's and other German philosophers' hermeneutics. Hermeneutics is about interpretation; more specifically, about a way of interpreting the meaning of something from a certain standpoint or situation. Martin Heidegger, known in the fields of existential phenomenology and philosophical hermeneutics, argued that all meaning, including the meanings of research findings, is fundamentally interpretive. Therefore, all knowledge, in this sense, is developed within a pre-existing social milieu, ever interpreting and reinterpreting itself.

The basic assumptions guiding the constructivist paradigm are that knowledge is socially constructed by people active in the research process, and that researchers should attempt to understand the complex world of lived experience from the point of view of those who live it. The constructivist paradigm emphasizes that research is a product of the values of researchers,

it cannot be independent of them. The answers to the paradigm-defining questions for the constructivist approach are as follows (Mertens, 2015, pp. 11, 16–17):

- *Axiology (nature of ethical behaviour):* Balanced representation of views; raise participants' awareness; community rapport
- *Ontology (nature of reality):* Multiple, socially constructed realities. Multiple mental constructions can be apprehended, some of which may be in conflict with each other, and perceptions of reality may change throughout the process of the study.
- *Epistemology (nature of knowledge; relation between knower and would-be known):* Interactive link between researcher and participants; values are made explicit; created findings; the concept of objectivity is replaced by confirmability.
- *Methodology (approach to systematic inquiry):* primarily qualitative; hermeneutical; dialectical; contextual factors are described. Qualitative methods such as interviews, observations, and document reviews; multiple data collection strategies. The research questions cannot be definitively established before the study begins; rather, they will evolve and change as the study progresses.

The constructivist paradigm is the best fit for the subject of this dissertation since it is ultimately about people, capacity, and socially constructed knowledge. Constructivist inquiry uses an interactive research process. The researcher first identifies the different interest groups in the chosen setting, deliberately aiming at a group that will represent widely variable viewpoints. The researcher learns what each group thinks, and gradually develops a shared perspective on the problem being studied. In this dissertation, the constructivist paradigm applies also into the learning theory and related philosophy of education. The learning theories are relevant for the leading topic of this dissertation: capacity and its change. Pedagogic approaches that promote active learning, learning by doing, are often associated with constructivism.

3.2 Research design, process and methods

In the spirit of constructivist research paradigm, the overall research design is best described as flexible design combining both quantitative and qualitative approaches and multiple data collection techniques. Validity of the research is established by triangulation of data, observers, methodologies, and theory itself. This should be adequate to counter the threats to validity. Data is triangulated by using more than one method for data collection and by having several different cases all with their own set of data. Observations are triangulated by using more than one observer. Methodological triangulation is done through the flexible design combining both qualitative and quantitative approaches. Theory triangulation takes place through using more than one theory and a number of perspectives. All peer-reviewed articles and the literature reviewed contributed to the theoretical framework, and the overall approach to results synthesis and analysis in this dissertation.

Figure 3.1 provides an overview to the research process, articles and case studies over time, indicating also sources of funding where relevant. The Capacity Development in Water and Environmental Services (CADWES) research team at the Tampere University of Technology together with the sector experts home and abroad have driven the overall research process over the years. The doctoral studies was started with the "Governance of water and environmental services in long term perspectives" (GOWLOP) project, funded by the Academy of Finland, in 2005. The studies at the Tampere Vocational Teacher Training Institute in 2006 added pedagogic understanding.

Four out of six peer reviewed articles were prepared when working with the following: Rural Water Supply and Sanitation Support Programme (RWSSSP III, 2002–2004), Rural Village Water Resources Management Project (RVWRMP I and II, 2008–2013), and Rural Water Supply and Sanitation Project in Western Nepal (RWSSP-WN II, 2013–2015). Similarly, data related to case studies was collected when working as capacity development consultant in Bangladesh (2006), as a research scientist for the ex-post retrospective evaluation of Health through Water and Sanitation project (HESAWA) in Tanzania (2005-2006), and as a Water and Environmental Sanitation Officer with UNICEF Guyana (2000–2002). Table 3.1 describes the study topic, objectives, method and data sources with key words with regard to each peer-reviewed article, and the three case studies; these will be further elaborated in the forthcoming Chapter 4 Results.

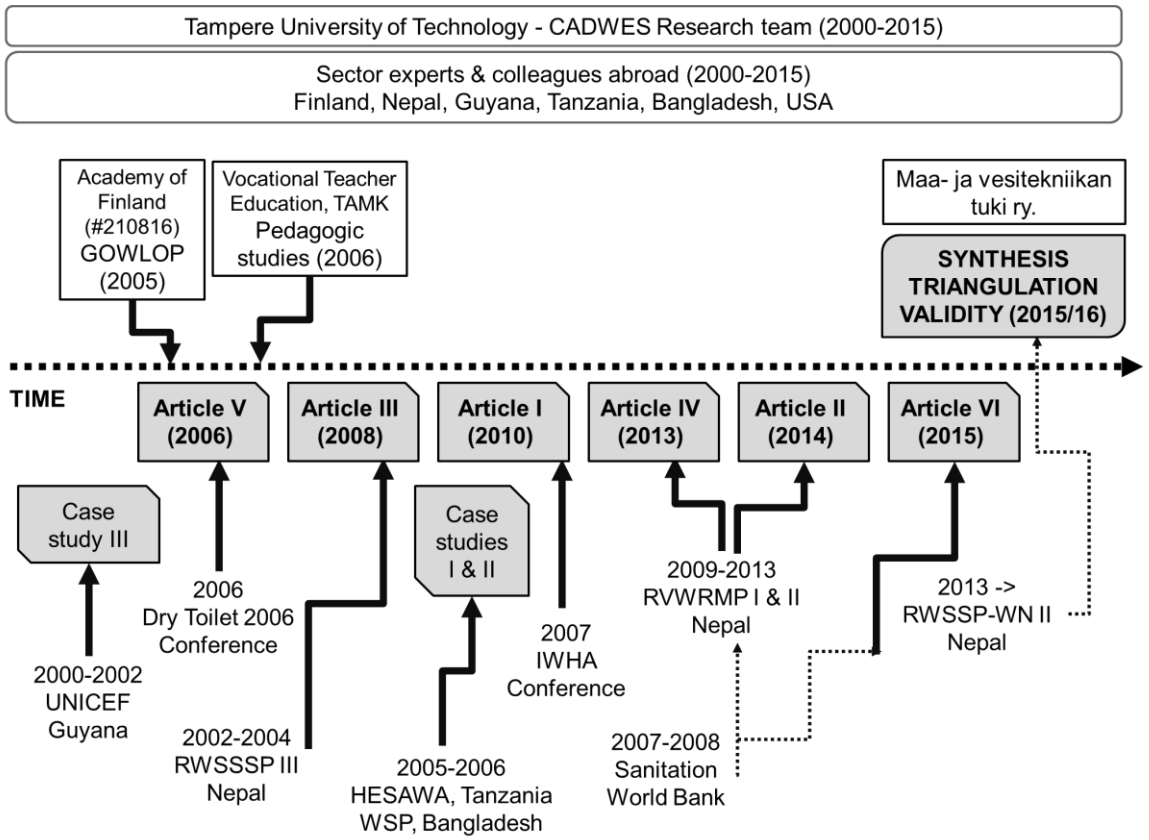


Figure 3.1 Research process and articles over time

Table 3.1 Summary of article and case study specific objectives, methodologies and data sources

Ref	Study topic/ description	Objectives	Method	Data sources
Article I	Drivers of change: health, sanitation, and water in historical perspective	Identify drivers of change and how they link into capacity development; long-term systemic change processes.	Literature review	Secondary data (27 scientific articles)
Article II	Capacity for MUS	Identify drivers and barriers to change in the context of community managed MUS, institutional capacity, participatory approaches, and empowerment.	Action research, interviews, field data	Primary data from project sources, field and monitoring reports
Article III	Capacity development for empowerment of women, gender and WASH	Analyse the interface in between human resource development (training) and enabling environment; GESI drivers and barriers; future options.	Action research, interviews, survey	Video, interviews, survey (N-97), workshop (N-95)
Article IV	Community management, social inclusion, and sustainability	Describe an approach to human resource development, its interface with institutional development and enabling environment; GESI drivers and barriers.	Action research, case study	Primary data from project sources, monitoring and field reports
Article V	Drivers of change: sanitation	Analyse drivers of change and their link to capacity development for sanitation.	Literature review	Secondary data (19 scientific articles)
Article VI	Behaviour change related to sanitation and hygiene	To identify and address sanitation and hygiene-related behaviour change drivers, triggers, and barriers.	Action research, field data	Primary data, consultancy report, interviews, observations
Case 1	Bangladesh: Local governments capacity for rural water services	Identify capacity-related constructs, options, and barriers relating to local governments, civil society, private sector.	Formative research, interviews	Field reports, interviews, literature, consultancy report for synthesis
Case 2	Tanzania: Capacity for sustainable services in retrospective context	Identify capacity-related key constructs from the ex-post (Retrospective) evaluation of rural water project.	Summative evaluation, surveys	Evaluation Report, Household surveys (N-722)
Case 3	Guyana: school context, using knowledge, attitudes, beliefs, and practices-survey for baseline and futures-thinking	Application of WASH-related knowledge, attitudes, practices, and beliefs (KAPB); example of a training-of-trainers, importance of schools.	Action research, KAPB	KAPB surveys (N-1,300), 11 workshops and related reports

3.3 Approaches to flexible design research

3.3.1 Case studies

This dissertation consists of a number of case studies, both in the peer-reviewed articles and as supporting case studies as presented in this dissertation. All these feed into the synthesis and further theoretical construction. Case study is an empirical inquiry that investigates a phenomenon within its real-life context. It is based on an in-depth investigation of a single individual, group, or event to explore causation and to find underlying principles. Case study is a well-established strategy where the focus is on the description and interpretation of a particular case. This particular 'case' can refer to a particular social or cultural structure or group, or be defined by other boundaries or setting. It typically involves participant observation, but also other methods can be used. The concept of population is crucial to indicate from which sample the conclusions are drawn. The initial definition of the research question is important in creating theory from the case studies. Focus is needed to avoid diluting the findings by the sheer volume of available data. Multiple-data collection methods are used, providing opportunity to triangulate the findings as well. Data analysis typically overlaps with data collection, and as such, case study is directly linked to the action research approach in this study (Järvinen, 2004, pp. 73–79).

Case studies have sometimes been criticized for having a bias toward verification, understood as a tendency to confirm the researcher's preconceived notions. In this dissertation, this is a valid concern given the author's long-term engagement with the cases and related action research element. Yet, as narrated by Flyvbjerg (2006), "*The case study contains no greater bias toward verification of the researcher's preconceived notions than other methods of inquiry. On the contrary, experience indicates that the case study contains a greater bias toward falsification of preconceived notions than toward verification"* (pp. 234–237).

3.3.2 Action research and interventionist approach

Action research is applied research that treats knowledge as a form of power and abolishes the line between research and social action (Mikkelsen, 2005, p. 132). Its common characteristics are that those being studied participate in the research process; research incorporates ordinary or popular knowledge; and that research seeks to raise consciousness or increase awareness, among others. The purpose of action research is to solve problems in a programme, organization, or community, rather than producing knowledge as the end result (basic research), aiming to understand the nature of issues (applied research), determining effectiveness of certain types of actions (summative evaluation), or improving the intervention (formative research) (Patton, 1990, 160–161 *in* Mikkelsen, 2005, pp. 132–133). Waterman et al. (2001) give the following often-cited definition that also guides this dissertation: "*Action research is a period of inquiry, which describes, interprets and explains social situations while executing a change intervention aimed at improvement and involvement. It is problem focused, context-specific and future-oriented"* (p. 11). The author further points out that action research is a group

activity, and has an explicit critical value basis, building on a partnership between action researchers and participants, all of whom are involved in the change process. Waterman et al. (2001) consider the participatory process as "*educative and empowering, involving a dynamic approach in which problem identification, planning, action and evaluation are interlinked. Methodology is flexible in the sense that knowledge may be advanced through reflection and research, with both qualitative and quantitative research methods may be employed to collect data*" (p. 11). The authors point out that action research can result in different types of knowledge, including practical and propositional. In this regard, also "*theory may be generated and refined, and its general application explored through the cycles of the action research process*" (p. 11). Robson introduces the steps (Bassey, 1998, pp. 94–95, *in* Robson, 2002, p. 218):

- Define the inquiry; describe the situation
- Collect evaluative data and analyse it
- Review the data, look for contradictions and tackle it by introducing change
- Monitor the change; analyse evaluative data about the change
- Review the change and decide what to do next -> going back to the inquiry

Action research, also referred to as "participatory action research", is often defined as a cyclic process of change as shown (O'Leary, 2004): Observe (research and data collection) -> Reflect (critical reflexivity -> Plan (strategic action plan) -> Act (implementation) -> Observe … … -> new cycle (Figure 3.2).

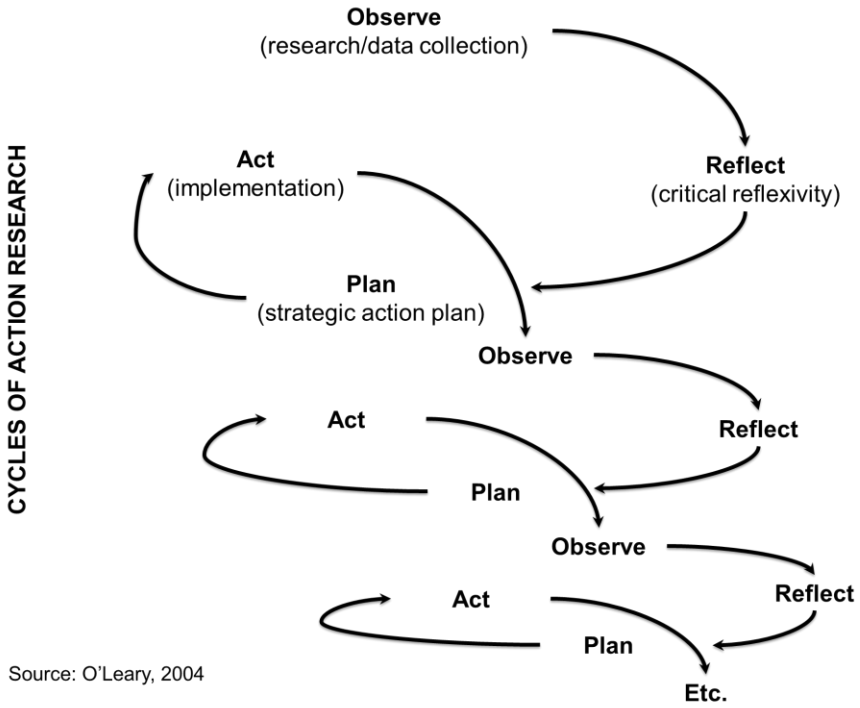


Figure 3.2 Cycles of action research

In this dissertation, action research was applied in articles II, III, IV, and VI, and in case studies made in Nepal and Guyana. For the Case Guyana, Knowledge, Attitudes, Beliefs and Practices (KABP) Survey was used for defining the inquiry, describing the situation, and collecting evaluative data. The outcome was then reviewed and analysed as part of action process. This approach has its roots in human health and management sciences; in the WASH sector, it has been used by such development agencies as UNICEF and OXFAM for baseline purposes. The tool can be used to collect quantitative data on the perceptions of the local communities related to WASH, the predetermined questions, or statements capturing the respondents' knowledge, attitudes, beliefs and practices, as the name of the tool (KAPB) suggests.

The findings of the KAPB survey then fed into a qualitative step for identifying contradictions and defining the course of action for change. The outcome from KAPB surveys were triangulated by the interaction workshops at each location, mainly with the school teachers as the case study focused on school WASH as part of the Guyana Amazon Programme. KAPB survey in this case is linked to formative research, but as a baseline could be also used for summative evaluation later on (see the next chapter). The insights from years of working with action research for water sector development in Nepal have also been used in the results and discussion chapters, and hence, the action research approach has a pivotal role for the entire outcome of this dissertation.

3.3.3 Formative research and summative evaluation

Formative research aims to suggest how to improve interventions, whether it is a policy, programme, project, organization, or product. It focuses on strengths and weaknesses of the target of study to further suggest how to improve it. Formative research is about performance, and closely linked to action research (Mikkelsen, 2005, p. 133). Formative research or the term formative evaluation is also defined as "*process evaluation that is used to shape and refine programme operations*" (Schutt, 2004, p. 320).

Summative evaluation aims to determine effectiveness of human interventions and action (programmes, policies, personnel, products). It focuses on goals of the intervention. Its desired results include judgements and generalizations about the effective types of intervention and the conditions under which those efforts are effective. Summative evaluation is about effectiveness (Mikkelsen, 2005, p. 133). Summative evaluation characterizes Articles II, III, IV, and VI related to Nepal.

The distinction of formative and summative evaluation research is primarily one of the purposes, and the distinction is not absolute. Robson notes that, for instance, summative evaluation could have a formative effect on future developments (Robson, 2002, pp. 206–208). In this dissertation, for instance, the Case Guyana had formative research characteristics as the exercise was done to develop an appropriate WASH programme for remote schools; in other words, to improve the intervention that had been already outlined and started at the start of the survey. The same survey could serve as baseline for future summative evaluation research, and also for an impact evaluation study.

3.3.4 Interviews

Interviews as a research method have a number of applications. All interview methods used in this dissertation were in-person interviews, whether by the author herself or local enumerators/facilitators. The following definitions of three main types of interviews, all of which were used in this dissertation, were modified from Robson (2002, p. 270):

- Fully structured interviews have predetermined questions with fixed wording and coding, usually in a pre-set order. The questions are made to all respondents in a same order with the same words. Open response questions can be used. The difference to survey method is the role of the interviewer. In this dissertation, the Case Guyana and Article II on gender issues utilized fully structured survey interview.
- Semi-structured interviews have predetermined questions but these can be modified during the interview, the wording or the order of questions can be different, and the questions may be left out during the interview. In this dissertation, Articles II, III, and VI used this method.
- Unstructured interviews are interviews done over a general area of interest and concern, letting the conversation flow and develop openly.

Interviews were taken with both groups and individuals. For instance, in Article III and Case Guyana, both structured in-person interviews as well as facilitator-led group interviews were utilized. The survey interviews were used for quantitative analysis and the group interactions for qualitative analysis. All the group discussions aimed to develop specific topics further, towards actionable items.

3.4 Approaches to Futures Research

Future thinking has always been a part of human history, even if the concept of future may have had many dimensions. The future is always uncertain and unpredictable. Rather than a future, the present holds keys to a number of futures. Future can never be accurately known, future is always about surprises, choices, and changes. Change can be extremely rapid, and changes interact and influence each other. A trend can express how the changes have happened in the past, but it can rarely be extrapolated into the unknown future. Characteristics of futures studies include such as participation, complexity, normativity, scientificity, dynamicity, and transdisciplinarity (Masini 1993, p. 17).

Incompleteness and uncertainty mean risk and challenge, further elements of futures-thinking. Yet, because present behaviour partly influences the future, positive, optimistic images of futures can help overcome present problems and reach desirable future states in the long run. The future of an individual, organization, or in this case, community and its poorest people, depends on its internal strengths and weaknesses. People are always at the core of any change or difference. The aim of futures research is to help the various stakeholders take the future and

in doing that, assist in understanding the alternatives and possibilities that lay ahead. Managing, planning, and in the process, creating the future, are the expected outcomes of the futures-thinking.

The purpose of the futures studies, is according to Bell (1997), "*to discover or invent, examine and evaluate, and propose possible, probable and preferable future*" (Bell, 1997, p. 73). The futures field is an integrative science of reasoning, choosing, and acting. It is looking to know what causes change, the dynamic processes underlying technological developments, as well as social, political, and cultural orders. In futures studies basic assumptions are holism, belief in the reality of present possibilities for the future, and of course, time itself. Bell brings up six topics that refer to existential phenomena that aid in delineating alternative descriptions and assessments of the future, and that can be scientifically studied (Bell, 1997, pp. 174–175):

- Present images of future and expectations for the future;
- Beliefs about the most likely futures;
- The goals, values, and attitudes, hopes and fears, the preferences used to evaluate alternative images of future;
- Present intentions of people to act;
- Obligations and commitments to others;
- Knowledge of the past.

The futures research related results of this dissertation will consist of descriptions of the processes, drivers and barriers of change and development as well as of looking at the conditions, actions, and the related mechanisms needed in aiming at the ideal future. Within the broader management system, water systems can be further defined as a socio-technical and physical management systems, including organizations which consist of activities of individuals, groups, and physical systems to produce output to fulfil needs. Grigg (1996) further defines socio-technical system as a combination of a technical system (water resources system) with its socio-political environment (pp. 114–115). As socio-technical systems, water management systems have in their core values, beliefs, and interests of various stakeholders. Values and value judgments have a central role to play in futures-thinking. Choices, interpretations, understandings of what is desirable and what is undesirable, even the choice of what to study, are all based on values. Values are of a fundamental importance in futures studies and hence, cannot be ignored or taken as given nor for granted. Even if it is not always possible to be aware of everything and recognize all the values that are present, a futurist should be alert and sensitive to the issue (Bell, 1997). The core value for the author of this dissertation is described in the Human Rights Council resolution 24/L.31 that recognizes that the human right to safe drinking water and sanitation. As such, ‘a do nothing’ approach was not an option but rather, all field work was searching for positive ways of doing better.

The *past (historic forces*) are derived from Article I. There are also drivers and barriers representing the long-term perspectives in the supporting case studies. As acknowledged by Kaivo-oja, Katko, and Seppälä (2004), both history research and futures research are interested

in the time-line phenomena. The authors suggest that futures research and history research could jointly form a decision-making framework, which seeks to integrate both historical and future perspectives into today's decision-making processes. These authors take this into the context of decision-making on water services reform, suggesting that futures research is innovative in that it seeks to address the nearly universal failure of (institutions and) decision-makers to retain and use institutional and organizational memory, while at the same time providing for the evaluation of alternative long-term scenarios to achieve the targets set for the future. This dual perspective ensures that the diversities of the past and pluralities of the future are taken into account in decision-making (Kaivo-oja et al., 2004, p. 540).

In conclusion, the research design, process, and methods were constructed utilizing the scientific literature as reviewed in this chapter, reflecting the context against the articles and case studies produced at different times over several years. The main methodological framework builds in futures-thinking to make a synthesis for the outcome from the individual peer reviewed articles and case studies, searching for emergent new dimensions and connections. The article specific methodological issues are further discussed in the following chapter.

4 RESULTS OF THE RESEARCH

4.1 Overview to results

Chapter 4 outlines the main findings and recommendations of the six peer-reviewed articles as they relate to the capacity change. These are supported by three case studies and various supporting publications; in all these cases except one, the main author is the author of this dissertation. Figure 4.1 adds the time axis into the frame of reference, and the ultimate outcome, “services”, into the integrative framework as an additional dimension. The figure shows the tentative location of each article and case study in this dissertation, and guides the synthesis from here. The following Table 4.1 gives some recent human development related indicators for each country, adding Finland as a comparison. The countries are not introduced in further detail in the following chapters.

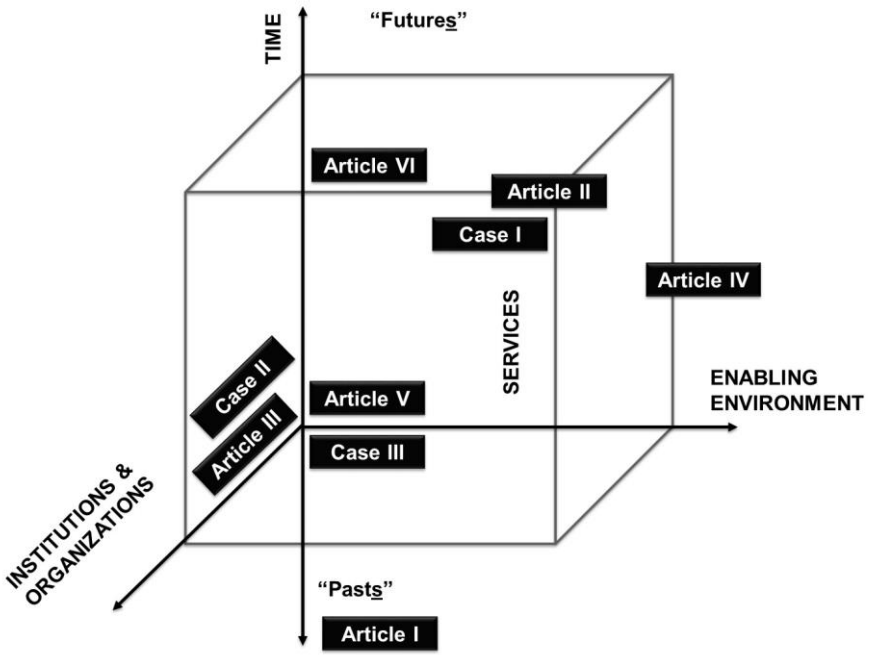


Figure 4.1 Integrative framework for analysing dynamic capacity change in time

Table 4.1 Comparative data from country cases

Human development indicators	Guyana	Bangladesh	Nepal	Tanzania	Finland	Reference
HDI Rank (out of 187)	121	142	145	159	24	1
HDI (value)	0.638	0.558	0.540	0.488	0.879	1
Life expectancy at birth (years)	66.3	70.7	68.4	61.5	80.5	1
Mean years of schooling (years)	8.5	5.1	3.2	5.1	10.3	1
Expected years of schooling (years)	10.7	10	12.4	9.2	17	1
Gross national income (GNI) per capita (2011 PPP USD)	6,341	2,713	2,194	1,702	37,366	1
Population (million)	0.8	156.6	27.8	49.3	5.4	2
% rural	71.5	70.6	82.3	72.4	16.1	2
Deaths of children under age 5 due to unsafe water, unimproved sanitation or poor hygiene per 100,000 children under age	132	334	337	322	0	3
% Child malnutrition - Stunting (moderate or severe) (% under age 5)	18.2	41.3	40.5	42.0	0.00%	4
Population in severe poverty (%)	1.2	21	15.7	32.1	n.a.	5
% live with less than USD 1.25 per day	n.a.	43.3	24.8	67.9	n.a.	5
% below national poverty line	n.a.	31.5	25.2	28.2	n.a.	5
GDP (2011 PPP$ billions)	4.8	365.7	58.5	76.8	206.3	6
GDP per capita USD (2011 PPP$)	6,054	2,364	2,131	1,654	38,104	6

Source: UNDP, 2014. Reference: (1) Table 1; (2) Table 15; (3) Table 14; (4) Table 7; (5) Table 6; (6) Table 10.

Article I deals with sanitation, health, and water in global historical context. Article I is based on qualitative review of 27 scientific papers presented in the International Water History Association (IWHA) Conference in 2007. The authors' research interest was to investigate how understanding of the key concepts and the links between health, water, and sanitation have changed over time. The authors first screened 132 conference papers for those that included health and sanitation perspectives, and then searched for key drivers that prompted changes within the selected 27 papers. The leading research question was whether sanitation and related public health issues evolved from medical sciences, or whether other drivers could be evident, such as politics, economics, or the drive for modern standards of living and convenience? This article is supported by Rautanen (2007a), Rautanen (2007b), and Rautanen (2007c), and conference paper by Juuti, Mäki, and Rautanen (2005).

Article II explored sustainability of community-based water services in the context of MUS paradigm. The purpose of this study was to analyse the experiences of the Rural Village Water Resources Management Project (RVWRMP) in Nepal in applying decentralized, participatory, and empowerment approaches in water services for multiple uses. The analysis and structure

of this study followed the conceptual framework presented in van Koppen et al. (2009). The study was based on action research, and constituted of both quantitative and qualitative data compiled by two of the authors working with the project (Rautanen and Wagle). The overall research and reporting process provided the project an opportunity to reflect on its approach to MUS in a structured way to further improve the practices. It also gave visibility for the work done in these remote locations. It covered the household, community, and intermediate levels. This article is supported by two conference papers: Rautanen (2012a) and Rautanen & White (2013).

Article III takes a cross-cutting theme as a point of entry into exploring rural water services and capacity development, namely that of GESI. Article III itself focuses to gender, the analysis here broadening the scope to social inclusion and transformation. This was prepared at the end of Rural Water Supply and Sanitation Support programme Phase III (RWSSSP III) as part of the post-construction related activities. Article III (Rautanen & Baaniya, 2008) is supported by three conference papers that focused on GESI in Nepal, see Rautanen and Baaniya (2004), Rautanen and Baaniya (2005), and White and Rautanen (2013).

Article IV takes IWRM as the point of entry into discussing good local water governance and MUS for food security, livelihoods, and well-being. Similarly to Article II, Article IV was based on the authors' work with RVWRMP and the need to share and debate the practices with (global) water sector professionals to further improve the present approaches and to give visibility for the work done in remote areas of mid and far western Nepal. Article IV stems from a conference presentation (Rautanen, 2012a) that was later developed into a full peer reviewed article (Rautanen & White, 2013).

Article V searched drivers focusing on one important technical element within the water sector, namely sanitation and more specifically, dry sanitation. It was based on 19 scientific papers concerning dry sanitation and the dialogues held during the international sanitation conference. This article is supported by several sanitation-related conference papers, all focusing on sanitation in Nepal: Rautanen (2003), Rautanen (2006a), Rautanen (2009), Rautanen (2012b), and Rautanen (2015).

Article VI focused on behaviour change in the context of sanitation and hygiene. It was based on the field work done in the Rural Water Supply and Sanitation Project in Western Nepal Phase II (RWSSP-WN II), Nepal, in 2015. This links through the frame of reference into Rautanen (2009) and Rautanen (2015).

The Case Bangladesh is based on an assignment made by the author of this dissertation when working as a short term consultant for the Water and Sanitation Program (WSP) in Bangladesh in 2006. The task was to design a focused and appropriate capacity-development programme to enable local government institutions to strategically plan, support implementation and management of, and monitor the delivery of affordable, sustainable, and reliable drinking water to communities. The methodology was based on both literature review and field work carried out in April–June 2006. Interviews were conducted with the local governments concerning their

mandate, roles, capacity, and challenges in undertaking the task in villages where piped water pilots were already in progress, as well as various project staff and stakeholders as present during the field visits. The first field visit was made to Feni District, the second field visit was made to Narsingpur and Fatehpur villages which were located in the most arsenic affected areas of Bangladesh, and the third visit to Manikganj District (Rautanen, 2006b and Rautanen, 2006c).

The Case Tanzania builds on field research done in 2006 when the author worked as the research scientist for the Ex-post (Retrospective) Evaluation of the Health through Sanitation and Water (HESAWA) Programme (1985–2002) in the three Lake Zone Regions in Tanzania (Rautanen, Seppälä & Skyttä, 2006). This is supported by a conference presentation (Rautanen, 2006d) that compared the approaches to strengthening local capacity in Nepal and Tanzania. The evaluation study focused on the sustainability and impacts three years after Swedish International Development Agency closed its long-running rural water programme. Among others, HESAWA's operational goals included capacity-building and strengthening at all levels. As the research scientist in the evaluation team, the author of this dissertation led the field research team. Primary field data was collected through users' surveys in 36 villages in six districts in three regions bordering Lake Victoria. The number of household surveys was 722. The survey data was supplemented by the qualitative material obtained from various interviews and workshops with key informants at the district, regional, and central levels in Tanzania, and with key informants in Sweden and other countries. Secondary data was collected through review of a number of documents, studies, and other reference material relevant to HESAWA in various contexts.

Case Guyana focuses on the use of the Knowledge-Attitude-Practices-Beliefs (KAPB) survey in establishing a baseline for a capacity-development programme. The material was compiled in the water and environmental sanitation sub-project of the UNICEF Guyana Amazon Programme in 2000–2002. The main objective of this sub-project was capacity development in the Hinterland Regions to assist communities to plan, improve, and maintain existing and future water supplies and environmental sanitation systems. The sub-project consisted of the following elements that had their own set of objectives, in line with the principles of action research: 1) training of the trainers, the trainees being the University of Guyana students from various faculties who originated from the Hinterland Regions; 2) training of the selected hinterland communities, teachers, and students, as well as community health workers – the KABP survey was indeed prepared with reference to water, sanitation, and health for four different target groups: teachers, students, households, and community health workers; and 3) production of the Water Supply and Environmental Sanitation Promotion Kit ("WUN Kit"), using local Amerindian Wapishana language. '*Wun*' is a Wapishana language word for water. For the complete study reports, see Rautanen (2000) and Rautanen (2001).

4.2 Key learnings and recommendations (Result I)

This chapter seeks answers to these questions: what has triggered positive lasting change in the past, and what kind of challenges and barriers to change are evident?

Rautanen et al. (2010) (Article I) took a long-term perspective into sanitation, hygiene and health. It considered history of sanitation and hygiene as the history of epidemiology, medicine, and public health, as well as the history of industrialization, urbanization, and related urban misery. It was concluded that the earliest sanitation driver appears to have been the need to remove human excreta and other wastes from densely populated urban areas. It is as ancient as urban environments and city states themselves where urban drainage systems were considered to serve the dual purposes of waste and storm water conveyance. The need to protect urban environments from flooding continued to be the main driver until the industrial revolution (c.1750–1850). Similarly ancient are hygiene-related drivers associated with spiritual aspects, wellbeing, and also beauty: healing rituals, public baths, and saunas. Scientific knowledge as a driver is very recent as until the 1840s knowledge about water and sanitation was based on sense perceptions and observations, and subjective experience (Article I).

The conference paper by Rautanen (2007a), connected to Article I, outlined the history of water-related development in Nepal. The geographical realities meant that local decision-making was a must, while at the same time the interest of the various rulers was in human settlements located along the trade routes or religious sites with pilgrim routes. Similar cases are likely to exist across the continents: there is always the large rural population who have been and still are left to manage their local issues and services on their own. One of the reoccurring themes was decentralization. It re-appears in policies over the decades, with varying interpretations and equally diverse local applications. Informal institutions represent the resilience where the formal institutions fail, also in local water governance (Rautanen, 2007a). The case is elaborated in more detail in two related book chapters Rautanen (2007b) and Rautanen (2007c). All these were produced in the Academy of Finland funded “Governance of water and environmental services in long term perspectives” (GOWLOP) project. See also Rautanen (2007a), Rautanen (2007b), Rautanen (2007d), Juuti, Mäki, and Rautanen (2005), and Mäki, Nyangeri Nyanchanga, Rautanen, and Vuorinen (2007).

Path dependencies from pasts to futures are obvious, as the past decisions and the past understanding do influence the present state. The past drivers are still evident at present time, albeit their content has increased in complexity: what constitutes as ‘wastewater’, for instance, has not always been the same as it is now. Aiming for ‘modern’ and ‘convenience’ are still valid drivers, but highly cultural and locality-specific constructs. Non-linear developments over time are evident, considering that at different localities there are different dynamics. Article I suggested that this has much to do with political-economy and political-ecology, i.e. that the priorities are often guided by political interests and power rather than ideals, public wellbeing, or scientific evidence. Article I recommended more detailed research into antecedent

circumstances and contemporary factors contributing to problems and alternative courses of action: how and by whom were the alternative scenarios discussed – if at all? This adds the call for considering the past into the otherwise futures-oriented frame of reference.

The spatial differences are evident even when applying conceptually the same system. MUS is an example of a locality-specific application that operates across several mandates and sectoral policies. Its strongest drivers become evident at local level where the tangible benefits can be felt. Yet, its main barriers are more likely to exist at other levels where such as budgeting across sectoral budgets can be challenging. Rautanen, van Koppen, and Wagle (2014) (Article II) acknowledged that while one water scheme may be relevant for energy sector only, another water scheme may be relevant for irrigation, energy, and water supply sectors at the same time. Linking the ecological sanitation into MUS concept adds increasingly relevant sectoral issues that relate to environment, health, agriculture, and water, including those related to public health and food safety. National scaling up of MUS calls for simultaneous action across sectors, and equal broad vision across all of them. Working through decentralized systems and local government structures is needed as this is where the tangible results are evident and where the dynamic application takes place. Even a large-scale MUS must be grounded in its own locality. As long as funds are not too strictly earmarked and broad technical capacity is available, no national coordination is necessary (Article II). In this regard, strengthening local capacity and available local human resources counts as described in Article III (Rautanen & Baaniya, 2008). This is further discussed in the following chapter with regard to human resources development, and how to integrate it meaningfully with the other dimensions of the frame of reference.

Rautanen and White (2013) (Article IV) noted that the good local water governance has many faces that relate to the protection of public health and safety, environmental protection, accountability, transparency, user participation, equal opportunities, balancing equity, efficiency and effectiveness in performance, financial sustainability, and transparency. All these are themes for the capacity-development programmes. Using MUS as an over-reaching approach further broadened the scope and vision, encouraging to move across the sectors and standard designs, bringing together green and blue water at the level where it makes a difference; i.e., where the tangible changes in livelihoods and poverty can be observed. Article II and IV both called for attention to be paid into legal and regulatory framework that makes it possible to work across the sectors and sectoral policies.

All the Articles have acknowledged that diversity is inevitable and needed: what works in one locality does not necessarily work in another. This was further discussed by Rautanen and Wagle (2009) with reference to post-implementation phase sustainability of the decentralized rural water systems. This conference paper noted that strategic direction and local priorities vary, and these are constrained by limited resources. Also here the importance of time was highlighted: since everything changes in time, also the management practice itself has to be able to adapt and change. Future water and sanitation sector should pay increasing attention to the overall system dynamics, recognizing that simultaneous changes in a complex system can never be fully predicted nor their consequences mitigated by preliminary actions. The authors'

vision for RVWRMP's post-construction phase was an effective combination of the activities related to water safety plan, environmental conservation and watershed management to ensure water security and safety, operation and maintenance plan based on the WUCs regulation to ensure physical, financial and institutional sustainability, and continued hygiene and sanitation promotion. It suggested to continue working with the Community Organizations in institutional development and income generation, as well as in scaling up livelihoods activities for food security and income. Through securing water for more than purely domestic use but also for productive uses, a water project can address rural livelihoods without losing its focus on water and spreading too thin across a number of related sectors (Rautanen & Wagle, 2009).

Four articles and related conference papers introduced two important tools for community and local government level good governance, both requiring in-built capacity development. Box 4.1 describes these as defined by Rautanen (2012a). The author of this dissertation has been and still is contributing directly to making these tools and approaches better. The related research in terms of both peer reviewed articles and conference presentations show how these contributions have been documented, presented, and debated with the global audiences. Table 4.2 summarizes approaches and working tools, related benefits and drivers, and barriers and challenges, as identified in Articles II and IV.

Box 4.1 Definitions of WUMP and Step-by-Step

Water Use Master Plans translate the principles of the Integrated Water Resources Management (IWRM) into practice at local level. Local institutions have the key role to play in both preparation and implementation. WUMPs are prepared to identify available potential water resources, present structures and existing plans, and to establish a five-year vision. The WUMP serves VDCs in prioritizing, planning, and budgeting. VDC-level Water Resources Management Committees with their representatives from each sub-committee ensure inclusion and holistic integrated planning. Over the past year they have also adapted the role of VDC WASH Committee as defined in the Nepal National Sanitation Master Plan. This integrates also sanitation and hygiene into the overall water resources planning context. The individual schemes identified in WUMPs are then included into regular local government work plans and budgets. Increasing access to information is inherently built into WUMP which is all about making information available for local decision-making.

A Step-By-Step Approach guides multiple stakeholders through the planning, implementation and post-construction support phases. It translates the multi-layered complex principles of good local water governance and IWRM into doable, real steps backed up by capacity-building. The very first phase is WUMP preparation. As the individual scheme is taken up for implementation, a Water Users Committee is established and registered. The District Development Committees approve the annual plans and individual schemes, and release the investment funds to Water Users Committees through District Water Resources Development Funds. The Step-by-Step approach facilitates the information management at the scheme level through Community Mapping, public hearings and public audits, bringing the principles of good governance into action. Both Step-by-Step and WUMP process are supported by the Gender Equality and Social Inclusion Strategy (GESI).

Source: Rautanen, 2012a, pp. 105–106)

Table 4.2 Summary of approaches and working tools

Tool	Description	Drivers and benefits	Barriers and challenges
Water Use Master Plan	Decentralized local government wide integrated, participatory and inclusive planning tool; operationalizes the principles of HRBA & GESI, good local (water) governance, IWRM; opportunities for MUS and ecological sanitation in addition to water supply, sanitation, irrigation, hydro-energy and various agricultural and watershed related activities.	Local demand; holistic and inclusive; responsive to different needs across sectors; long-term vision with immediate action. Creates consensus across a local government-wide planning units on priorities; conflict-prevention/mitigation.	Skilled facilitators with open mind to IWRM, MUS and other livelihoods links needed. Unrealistic expectations. More water *use* than water *resource* management. Lack of long-term vision and capacity to relate into longer-term changes limits the scope and application into immediate needs.
Step-by-Step	Operationalizes the principles of good local water governance, HRBA & GESI at an individual scheme level. Can be applied into any type of infrastructure schemes. Constructivist capacity development Step-by-Step. Transparency and accountability; good local water governance at the individual scheme level.	Meaningful participation for meaningful plans and results that last. Learning by doing for WUSC; capacity for planning, implementation and later O&M increases. Transparency increases willingness to contribute.	Takes time also from WUSCs; lack of capacity may limit meaningful participation (illiteracy); calls for field presence and external support in capacity change; skills of field staff itself may be a barrier.
MUS	Local do-able steps translating IWRM into local applications that are responsive to a range of needs. Number of combinations give room for local adaptation. Opens up new opportunities especially in water scarce environments.	Multiple benefits for a range of livelihoods applications. Food security. New livelihoods opportunities that may not have existed before. Cost-efficiency.	Concept still new. New mind-sets needed; technical thinking still in silos. Higher cost not perceived as cost-effective.
GESI & HRBA Strategy and Action Plan	GESI policy that is accompanied with action plan. It includes results and impacts oriented monitoring to ensure that the policy and principles get translated into tangible activities and change. Operationalizes GESI principles. Constructivist capacity development that adds transformation in terms of action items.	Social, economic personal motivators; voice to voiceless; empower women as both water users and managers; inclusion of marginalized communities; “services for all”-thinking.	Limiting attention to numbers (quantity) rather than quality such as meaningful participation, access to assets, sustainability of achieved practices, opportunities to use the skills and practice.

4.3 Findings within three dimensions (Result II)

4.3.1 Individual level: human resources development

This chapter seeks answers to the question: what is learned at individual level with regard to human resources development?

Human resources development appears in all articles, cases, and other supporting publications as referenced in this dissertation. An example of practical constructivist approach of doing human resources development is the Step-by-Step approach (see Box 4.1 earlier). It is not a one-off disconnected individual activity, but rather, a series of activities that all constitute learning-by-doing and on-the-job kind of learning, building on previous experience (Articles II, III, and IV). The leading principle of the Step-by-Step approach was that specific activities, including capacity development and physical work, needed to be satisfactorily completed and monitored before moving to the next step. This approach identified tasks to be completed and training to be done before proceeding from one step to another. Each step involved structured monitoring on the basis of which the budget was released in instalments to be remitted to the WUSC's account. The approach aimed at both fully functional physical structures as well as active, capable WUSCs that had guided opportunities for learning-by-doing being backed up by specific training events and site supervision. Since the WUSC members will be changing, capacity development including learning-by-doing cannot be a one-off time-bound activity. WUSC itself needs to adopt a continuous learning culture within itself, both for orienting and training new members and for improving the practices and services as the priorities and needs amongst the users change. (Articles II, III, and IV). The Step-by-Step approach aims to avoid the pitfalls as discussed earlier in Chapter 2.5 regarding the weaknesses of community management paradigm and less than optimal participation.

Article III concluded that human resources development can be used to address inequalities and empowering women. In this case it was done through providing women with vocational skills. This opened up a number of livelihoods opportunities, also beyond the water sector. The recommendations from the field included adding such topics as women's rights, for example, into technical trainings. Equity is an aspect of good governance, and refers to all men and women having the opportunity to improve or maintain their well-being. Equal participation by women and men was not a prerequisite in the earlier Phases I and II of the project being studied (RWSSSP). In Phase III, the Integrated Gender Policy had visible results, speaking for the importance of having focused policies and affirmative targeted action for specific sensitive issues, such as gender and ethnic/caste equality, and social inclusion (Article III).

Both the GESI and HRBA strategy and action plan, WUMP and Step-By-Step aimed at empowerment of the communities, both in terms of individuals and in terms of institutions therein. Participation and equal opportunities for the poor and marginalized ethnic/caste groups is not

something that will come about automatically. Article III called for specific attention into this dimension, especially if the focus is shifted from project-type approaches with close field presence into programmatic, sector-wide approaches that rely on existing structures. Article III further recommended that gender and poverty-related indicators should be integrated into the baselines and monitoring systems, but sheer figures alone may miss the qualitative real changes: many WUSCs have women as members while in practice these women may not even know they are members! Ten years later it is a normal practice across water projects and programmes to have gender indicators, now including also those related to social inclusion.

Water sector has developed a number of gender-analytical frameworks and related gender tool kits, which are effectively integrated into the usual participatory planning tools and monitoring and evaluation practices. The plans should pay explicit attention to who benefits and who does not benefit from the proposed actions. Furthermore, in formulating a capacity-development plans and programmes, and when articulating the substance of related activities, there should be close coordination between relevant local authorities and development programmes, including the education and health sector actors (Article III). Article III concluded that "*capacity-building should be futures-oriented at all levels and responsive to changes. At the community level, capacity building should continue after the actual scheme implementation is completed. This is especially true for WUSCs and technical personnel who only find out during the practical work whether the skills provided are adequate. Follow-up monitoring should find out areas where further training and upgrading of skills are needed to enable local institutions and the programme to respond. There is a lot of human potential and indigenous and tacit knowledge in the field that should be given an opportunity to flourish. WUSC Networks could serve as umbrella institutions for releasing this potential*" (Rautanen & Baaniya, 2008).

The Step-by-Step approach to community management can guide multiple stakeholders through the planning, implementation, and post-construction support phases. It translates the multi-layered, complex principles of good local water governance and IWRM into doable steps and actions backed up by skills development and learning-by-doing. The very first step is WUMP preparation. The Step-by-Step approach for micro-hydropower schemes is aligned with the funding partners. The Step-by-Step approach for sanitation is aligned with the National Sanitation and Hygiene Master Plan (Article IV). All these were essentially constructivist approaches.

With regard to human resources development for sustainable and desirable sanitation, skilled people who are aware of the existing options and ready to develop them further are needed (Article V). Article V also suggested that dry sanitation technology should be developed to the same level of convenience as the water closet systems now provide. Sustainability and tailor-made products need community involvement and listening to the real users, but also an enabling environment from the local planners and decision-makers. It is a must that the recommended options are safe from the public health point of view (Article V). Similarly, sanitation and hygiene related behaviour change triggering requires understanding of the target population, their needs and priorities, before attempting to trigger change (Article VI). All these are relevant notions from

the constructivist point of view: there is always a past on which to tailor strategies, approaches, and activities.

Human resource development was one of the corner stones of HESAWA. The capacity-building and training activities in the Phase III included initial and preparatory promotion meetings for villagers as well as village and ward authorities, promotion meetings for parents of primary school children, promotion workshops on HESAWA concept and gender awareness for village leaders, and environmental sanitation promotion for village leaders and actors (Rautanen et al., 2006). Training activities targeting Water Users Groups (WUGs) were extensive, with 5,517 WUGs trained out of the total number of 5,761 (96%). Many training activities focused more on awareness and promotion than actual technical or implementation-related issues. Yet, there was also a significant amount of technical training for various village resource persons and financial management training for WUG Management Committees and staff. Training for village resource persons covered technicians, pump attendants, village health workers, traditional birth attendants, and village animators. Village animators and traditional birth attendants were equally used to mobilize people to participate in HESAWA activities. This had often stimulated other development activities in these villages. The study recommended that future capacity-building activities should aim at institutionalizing good practices and continuity in the skills development rather than aiming at an impressive number of training courses and participants. The programme's supporting capacity-building should pay attention to qualitative changes and sustainability, and emphasize pro-poor and gender-sensitive approaches (Rautanen et al., 2006).

Human resource development was the leading theme in the Case Guyana (Rautanen, 2000, and Rautanen, 2001). The findings indicated that there was a lot of interest in the communities in water, environmental sanitation, and health, but that there were also several beliefs that were not necessarily correct, even if under specific circumstances they could be. For instance, if the rainwater catchment system is kept clean from the gutters to the storage tank, it is likely to be also safe for drinking. But when the systems are not completely maintained, as was manifested by water test carried out at the hospital, the water can be seriously contaminated by bacteria of faecal origin. The respondents, including the health workers themselves, were usually only aware of diarrhoea and not about other water-related illnesses. Oral Rehydration Salt as the treatment of diarrhoea was well known even if there still were a lot of questions about how one can get diarrhoea and how to prevent it. This information was needed in such a format that makes it available where it is needed and in a language that is understandable. It was also recommended that the children should receive a more active role in the overall development of the community as they were already giving a strong input into daily life by cleaning up the yards, burning the rubbish, and carrying water, to mention but a few of their daily tasks. Their ideas could be very valuable as well as innovative. The self-supply and capacity to change from within is highlighted in the scattered rural villages, such as are found in Guyana hinterlands.

The Case Bangladesh, focusing on the local government level, acknowledged that its members themselves can have very diverse educational and professional backgrounds and interests.

Educational level can range from barely literate to a university degree, and professional experience from farmer or housewife to teacher or influential businessman. The support groups can be equally diverse, from informal groups of professionals such as teachers or health workers to more formal groups, such as those established under the local government structure as sub-committees. These committees should also have other members than elected members, usually professionals. From an individual person's point of view, high social capital due to involvement in the various groups and local government had potential of being an added benefit in the capacity-development. Active individuals are well connected internally and externally, and can show strong leadership. The potential within social capital of at least some of the individuals, if not all, would add another layer of sustainability to the capacity-development programme. Numerous people get training from a range of NGOs and international NGOs alike, but may not get opportunities to use these skills if and when the individual programme has phased out. Local government human resources database could provide further opportunities to use the skills. These aspects were discussed in both Rautanen (2006b) and Rautanen (2006c).

In conclusion, the approach to human resources development benefits from constructivist approach: it has to stay sensitive to multiple realities and the past experience and knowledge of the individuals therein. While the past matters, there needs to be a continuum to the future as well: training as such does not result in better water services or improved sanitation if the trained people do not get a chance to apply these skills. This vision should be clear: where exactly the training is aiming at, how and whom will it benefit over short and long term? Such as the Step-by-Step approach give a meaningful path to follow, and such principles as GESI ensure that all have equal opportunities to benefit regardless of gender or social group.

4.3.2 Organizatorial and institutional level

What are the lessons that relate to organizations and institutional development? What are some of the findings relating to these dimensions of capacity development?

Article II noted that RVWRMP provided intensive support for participatory planning and implementation – and institution-building to that end – embedded in local government. These two tools that aimed at building resilient WUSCs with a sense of ownership were: WUMPs covering the lowest tier of local governance structures (Village Development Committees) and the scheme-specific Step-by-Step approach to guide individual scheme-planning and implementation. These approaches considered communities as the core group of stakeholders, and therefore their values, perceptions, needs, and traditional knowledge and related ways of 'living with water' were taken into account as much as possible. This was expected to build a sense of ownership for the constructed infrastructure and appreciation of the services delivered, and assumed to lead to more sustainable future than without the sense of ownership (Article II). Sustainable future was further discussed in detail with regard to RVWRMP's approach to post-intervention period.

Rautanen and Wagle (2009) identified the following process elements for sustainable rural water management, relevant for organizatorial and institutional levels, all calling for attention to capacity:

- Character of planning, implementation and post-construction phases;
- Success and nature of institution and capacity-building efforts, both within WUSC itself but also within the community (Community Organizations; livelihoods groups; local private sector; institutional linkages from community to district level);
- Diversity, multiplicity, and adaptability of supporting functions and activities; accounting for diversity and dynamism; systematic application of the principles of good water governance;
- Systematic operationalization of GESI strategies for equitable access to services and other benefits. Especially critical in post-conflict context where the root causes of the conflict directly related to social exclusion of large parts of the population, based on class, caste, gender, ethnicity, religion, language and geographical isolation;
- Understanding and use of local knowledge, skills, initiative, resources and constraints; attention to indigenous technologies and practices; research and development in this regard; and
- Recognizing the influence of external conditions, including such as the political instability in post-conflict era and the natural environment (landslides, water scarcity, topography, etc.).

Article III focused into women being trained in technical works, to training of trainers, and also to the role of local NGOs and CBOs in capacity-development programmes. Dynamic capacity-development activities focusing on CBOs should build on their previous experience and educational level as well as the community-specific situation. The links between the local government institutions, present and future development projects and programmes, and local CBOs need to be established and formalized as these trained CBOs do represent potential for providing sustainable human resources for their locality. Continued development and motivation of the trainers need attention. Article III concluded that the local level institutional development matters for women. The women interviewed pointed out that women have to work harder to gain respect, to show that they can. Many women were providing their work for free or with less pay than their male colleagues. WUSCs and other institutions that can provide job opportunities – such as NGOs working in the sector – need to be encouraged to pay attention to trained and skilled human resources. This could be in-built into both formal and informal code of practice but it needs to be explicitly addressed as otherwise the traditional thinking will lead. Similarly, the role of local governments in terms of having records of skilled and trained persons should be considered as part of capacity-development programmes (Article III). Rautanen and Baaniya (2004) and Rautanen and Baaniya (2005) provided more details on interviews and issues raised by both the women technicians themselves, and those who facilitated the interviews. This calls for adding an additional GESI lens into the capacity related debates and to its various dimensions.

In Case Tanzania institutional development included but was not limited to human resources and organizational development. It also involved change in and transformation of social systems. In general, institutional development was seen to embrace three levels: individual actors, organizations, and social systems, and to consist of a broad range of activities at each of these levels. The National Water Policy 2002 introduced an entirely new approach to implementing water supply, sanitation, and water resources management: the traditional centralized approach was changed into decentralized approach, already practiced in HESAWA. In the new approach "*User groups are not only responsible for operating, maintaining and sustaining the infrastructure; they are also responsible for planning and managing it*" (Ministry of Water, 2006, p. 3). In this context, the National Water Sector Development Plan recognized that the capacity gaps at district and regional levels created a major challenge to sustainable water supply nationally (Ministry of Water, 2006, p. 4).

At the village government level, the Village HESAWA Committees were established in 92% of the villages. The village government representatives and some district level personnel appreciated this as one of the key positive features of HESAWA, which also enhanced capacity at the local level. Village HESAWA Committees were basically answerable to the Village Governments and were considered crucial for sustenance of the programme results in the communities during HESAWA. After HESAWA, 64% still existed at the time of the study, some 44% were considered still active. Occasionally Village HESAWA Committees were mixed up with the Water User Groups (WUGs) and in some areas people still associate HESAWA with the Village Government. The institutional performance and sustainability of the Village Governments varied and depended largely on the overall leadership. Accordingly, in those cases where the Village Government Chair had been a strong individual with good (political) leadership qualities, the Village Government's performance had been successful.

WUGs were formed beginning in the mid-1997 and further consolidation took place in the last phase in between 1998–2002. WUGs were created in response to the challenges encountered in the previous phases, and considered by many key informants as a turning point. WUGs transferred ownership and management of water facilities from the Village Government to the users themselves. This was intended to empower the local community to take a proactive role in operating, maintaining, and safeguarding the water installations. More importantly, WUGs were the corner stone for sustainability of the Programme. The mode of WUGs formation provided room for participation of water users in a specific neighbourhood, a level even lower than a village. The formation of WUGs coincided with the adoption of the "Rural Water Policy" (1997) which emphasized community management and ownership of water supply schemes. By the end of the programme, a total of about 5,700 WUGs with estimated committee members of about 66,000 had been formed and trained. The WUG committee members were trained for three days on how to manage water facilities including hygiene, education, and skills on pump repair, as well as provided with necessary tools. In addition, the village and ward leadership was given training on participatory monitoring, management skills, vision, and leadership. (Rautanen et al., 2006).

With regard to institutional development in Case Bangladesh, community-based initiatives emerged as one of the means of delivering safe water. Since 1995, demand for better service levels for safe drinking water has emerged as a response to the detection of arsenic in shallow ground water and increasingly densely populated rural settlements. Many people were and still are used to having a hand pump close to the house and are reluctant to give up this convenient water source in the face of arsenic contamination. Desire to improve service levels through piped water supply called for a more complex institutional arrangements as that required private tubewells. At the same time piped water systems required different type of capacity development, financial resources, and technical know-how to enable sustainable services, safe drinking water, scaling up, and replication. The small-scale providers and NGOs were demonstrating greater capacity in delivering water and sanitation services than the local governments. An increase in Micro Finance Institutions in rural areas opened opportunities for private providers to deliver point source water supply to the consumers on direct payment. Generally, the small-scale providers continue to be vibrant in rural Bangladesh. In 2006 it was widely acknowledged that the current institutional arrangements for water supply and sanitation services were poorly equipped and coordinated to face the new challenges. The supply-driven approach was openly criticized for being inefficient, unresponsive, centralized, bureaucratic, and not accountable to local users (Rautanen, 2006b).

In Bangladesh, the Sector Development Plan Fiscal Year 2011–25 called the local government institutions *"to take the lead role in coordinating local service delivery activities*" (Government of Bangladesh, 2011, p. 41). Yet, capacity for the local government institutions to do this remained a challenge. At the local level, the union water and sanitation committees were generally found weak. The NGO Forum for Drinking Water Supply and Sanitation used 16 performance indicators to assess the capacity of the local governments participating in their programs. The assessment showed that 50 percent were capable of leading implementation of water and sanitation activities satisfactorily, while 35 percent were partly capable, and the remaining 15 percent were less capable (Government of Bangladesh, 2011, p. 152).

Programming for a context-relevant, appropriate capacity-development programme needed to be aware of the various institutional options for the rural water and sanitation service delivery. For instance, with regard to sanitation as a decentralized option, Article V calls for innovative approaches into how to involve the private sector to ensure the necessary technical services: it should not be expected that individual house owners are willing to maintain the systems themselves or have an interest in gardening, among others.

4.3.3 Enabling environment

What is learned with regard to the enabling environment, and what seems to be missing?

The projects being studied were constantly developing their approaches, monitoring practices, and capacity-development components to make it relevant and appropriate in a very diverse environment where all local governments had their own dynamics, socio-economic and cultural

realities, and their own face of poverty. They acknowledged that there were no 'one-size-fits-all' solutions but that it is possible to develop tools and approaches that allow local application. The planning, prioritization, and institution-building appeared to be robust even in the highly politicized context with no elected councillors in place. Rules, regulations, and policies related to local development were in place and supportive even across the sectors. In the MUS paradigm, this scope is further broadened through a range of livelihoods applications to further address food security and climate adaptation strategies. Capacity-development aspect cut through every plan and related action, many issues venturing into something new; e.g., home garden related practices or micro-hydropower were something entirely new in most locations.

Articles II and IV studied a project that had gone beyond theory and piloting to broad-scale implementation in a difficult socio-cultural and geographical environment in the poorest districts of Nepal. The study explored the first-hand experiences, tools, and lessons learned to contribute to further policy debate. It used community-based MUS as the leading theme. MUS is a participatory approach that pays attention to the multiple domestic and productive uses of water. The technical options included combinations of water supply, conventional and non-conventional irrigation, water mills, and micro-hydropower. Sanitation and hygiene were always included as goals of their own right, not as competing for priority with anything else.

In RVWRMP, MUS was the point of entry in scheme identification and as an approach for planning with communities. This was whether or not the staff actually used the word 'MUS'. Basic livelihood activities benefit all working areas and focus on home gardens to improve nutrition and generate small incomes. Advanced-level livelihood activities build on sub-sector analysis of viable products and services that also consider aspects such as access to markets – many of the RVWRMP working areas are far away from accessible roads. This integrated perspective opens up smart combinations of water sources and integration of existing infrastructure into new designs, among others. In practical terms this means, for example, that standard designs used at intermediate level should allow for local applications, such as additional reservoir tanks and irrigation structures in what is traditionally considered as gravity-flow piped drinking water systems (Article IV).

Another highly policy-relevant item was the GESI strategy to ensure active, free, meaningful, and equitable participation. Article III and supporting GESI related conference papers (White & Rautanen, 2013; White & Rautanen, 2015) discussed how the GESI policies can be both mainstreamed and made targeted across the Step-by-Step approach, WUMP, and related monitoring practices. It prioritizes women, disadvantaged ethnic and caste groups, indigenous people, the ultra-poor, and other groups that are often excluded from services, decision-making processes, and related benefits. White and Rautanen (2015) underlined how the projects contribute to achieving universal access to water and sanitation for all, empowering rights-holders to claim their rights and enabling duty-bearers to meet their obligations. They build the capacities of local government level duty bearers and raise awareness at all levels regarding rights to water and sanitation.

The projects use two main strategies (White & Rautanen, 2015, pp. 19–20):

- *Mainstreaming* HRBA and GESI principles by integrating these at all levels into policies, planning, implementation, monitoring and evaluation. For example GESI and HRBA aspects are taken into account when preparing local government level five year master plans, and when planning individual schemes; all training events have integrated HRBA and GESI aspects within the existing curricula; monitoring at all levels and related reporting have HRBA and GESI indicators, reminding all involved of these principles. Both normative and cross-cutting criteria are considered.
- *Undertaking targeted actions* to supplement the above where mainstreaming alone would not suffice. Gender-specific interventions will sometimes need to target women exclusively, men and women together or only men, to enable all groups to participate in and benefit equally. Disadvantaged groups will need specific attention. An example is adding a confidence building workshop prior to the main local government level planning workshop to encourage the disadvantaged groups and women to participate and to get their voice heard.

To conclude, enabling environment is a must for catalyzing change. Enabling environment is of utmost importance for capacity development which by definition is about change. Enabling environment is close to what Otoo, Agapitova, and Behrens (2009) earlier discussed about capacity *for* development in terms of making resources available for change. As related earlier in Chapter 2.1, increasing the capacity *for* development, by extension, is a process of socio-political, policy-related, and organizational change; and learning is seen as a strategic instrument of economic and social change. If the enabling environment is not in place, the capacity development effort will have sub-optimal results as the full potential cannot be realized. With specific, more sensitive themes, such as HRBA and GESI principles, or certain aspects of good governance, it will not suffice that the policies are in place if these are not also monitored and enforced accordingly. Cross-sectoral approaches such as MUS still suffer from the lack of enabling environment that allows operating across sectors.

4.3.4 Sanitation and hygiene matters

Sanitation and hygiene are priorities of their own right. They are closely linked to access to water given that the lack of water can undermine the best efforts. Sanitation and hygiene are about dignity, convenience, public health, clean water and healthy environment, security, and general well-being of the citizens. All these are issues and concerns for local governance, and call for various types of capacity. At the time of completing this synthesis, the Nepal National Sanitation and Hygiene Master Plan has placed the local governments into a leading role to make the universal sanitation overage come true. This in turn, calls for more diversity in both approaches to behaviour change and in terms of technological solutions.

Gerwel-Jensen, Rautanen, and White (2015) (Article VI) described how behaviour change is achieved via ‘trigger-based’ approach applied at both community and individual levels. Here the

challenge has been the sheer number and diversity of people to be reached: how many 'triggerers' need to be trained and effectively mobilized to trigger one million people? Triggering activities are supplemented by behaviour change communication (BCC) via other channels, including street drama, rallies, and radio broadcasts. At this stage still, any sanitation option is valid, the target being in open defecation behaviour. BCC is most efficient when it is focused on limited number of behaviours, preferably only one behaviour at the time. Adaptive change management approach considers the behaviour change at individual and collective levels, encouraging these individual units to design integrated systems based on their own understanding of what is desirable and possible. The question remains to what extent the already complex world of sanitation and hygiene gets even more complex if a specific technology choice is added, such as ecological sanitation or even more specifically, dry sanitation? If this is further linked into MUS and service delivery thinking, does the core message get diluted? (Rautanen, 2015, and Rautanen, 2012).

With regard to non-conventional sanitation, Rautanen and Viskari (2006) (Article V) suggested that at the policy level it is politically difficult to commit to unconventional options if there is no reliable, first-hand experience from their real-life performance: therefore, experiences have to be effectively shared. Rautanen (2003) acknowledged that the key problem related to sanitation is more than a question of policies and resources, health awareness or education. It is more than a socio-economic or a cultural question alone. Toilet culture is about culture, and cultures do not evolve over night. There are changes that can take place within a very short period of time, but to get something new rooted into a culture takes time, for so does to change long-accustomed roles and practices. Sanitation is also a governance issue, whether dry or not dry, as summarized by Rautanen (2006a). There are additional critical questions relating to sustainability, scaling up, cultural acceptability, affordability, and safety. It is obvious that we still need more practical experience under various climatic and socio-cultural settings, together with related reliable and vigorous, impartial monitoring and data related to costs (Rautanen, 2009).

Article I suggested that sanitation policies should also address social objectives within the framework of particular social, economic, political, technical, and environmental constraints, and be integrated across sectoral thinking. All these link into capacity development in several ways, both in terms of having human resources and both informal and formal institutions, and in terms of having the kind of enabling environment that make the different options possible. Figure 4.2 was modified from Article V, adding the productive uses, linking irrigation and organic fertilizers into MUS. Capacity change needs to apply to several layers of this figure, both from technical and social points of view: the technical options need to be culturally sensitive and responsive to what people want and accept.

Article V recommended to continue systematic research *at scale*: even if a number of pilot research and demonstration projects had been carried out, more real-life and long-term research at scale was needed. In this context, strong advocacy and educational component was recommended to inspire (political) confidence to commit to dry sanitation. Sound technical design, good workmanship, and durable materials are important as poorly constructed options

are not sustainable and may prove to undermine sanitation improvements in general, whether dry or not. Article VI, in turn, made several recommendations on how to target behaviour change communications campaigns in a more meaningful and effective way, both before the actual behaviour change triggering and after it. All these have implications for capacity development both horizontally and vertically.

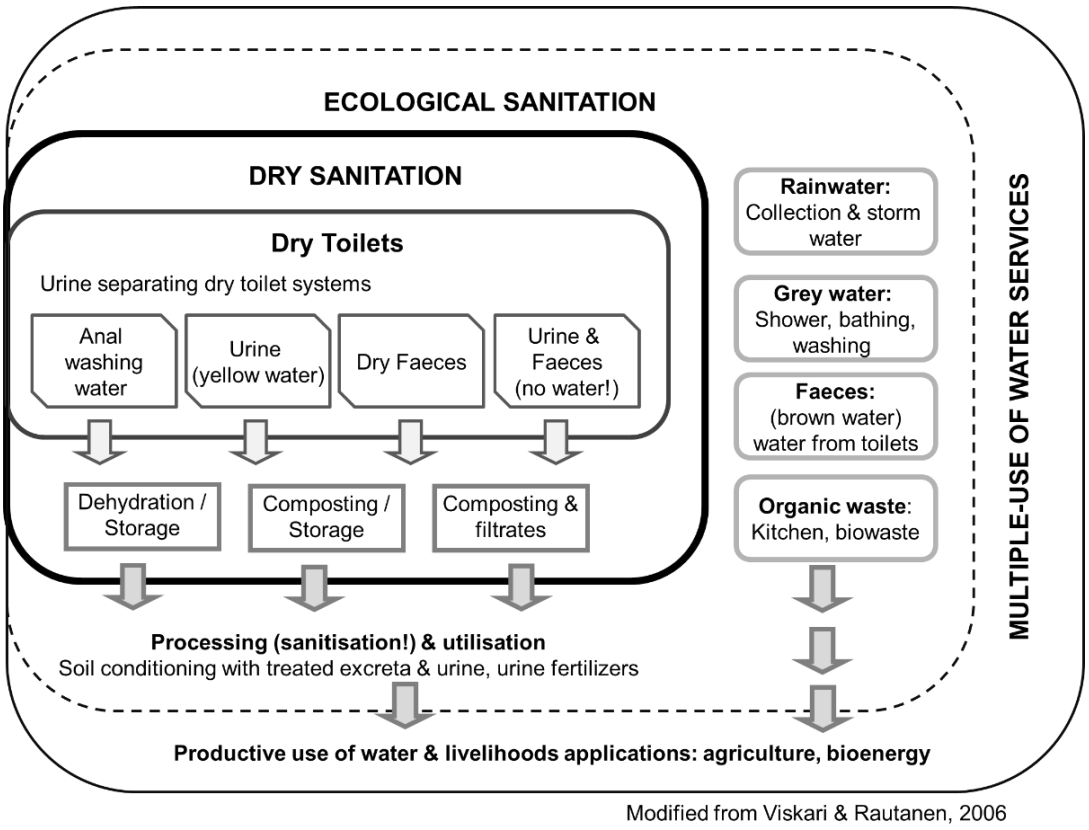


Figure 4.2 Bringing ecological sanitation and MUS together

5 DISCUSSION AND REVIEW

5.1 Searching for a dynamic frame of reference

Utilizing the findings from the Chapter 4 (Result areas I and II), and looking back into the Chapter 2 (Literature review), this chapter discusses how the present frame of reference can be improved by adding futures-thinking to make it more dynamic and responsive to change that may not always be predictable. What kind of frame of reference could work at policy, programme, and project levels? These were the research questions for Result III. This chapter also triangulates the findings and provides insights into the validity and reliability of the results, and gives the assessment and self-evaluation. It concludes by making suggestions for the dissemination and further use of the results. Figure 5.1 adds details into the frame of reference and the various dimensions discussed in this chapter.

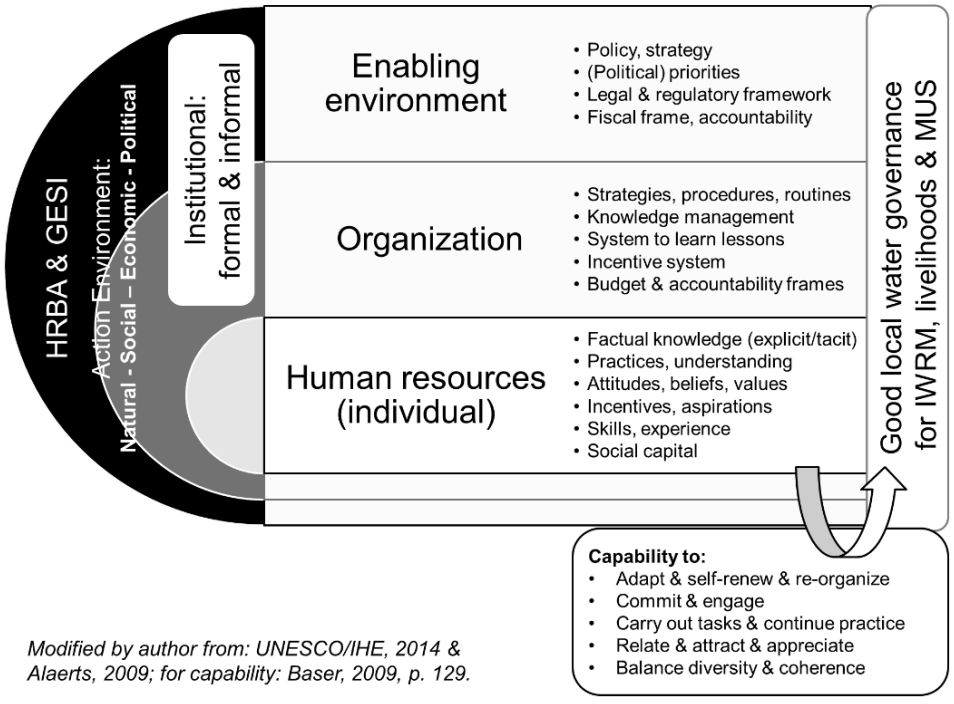


Figure 5.1 Detailed frame of reference

In 2006 the author of this dissertation compared the approaches in between two conceptually very similar bi-lateral rural water and sanitation projects in Tanzania and Nepal. That conference paper concluded that capacity was not static and it could not be described by a linear change: it was about incremental changes and even side-steps. Local governments' capacity to manage more efficiently the present and assume new responsibilities in the future was built on the previous experiences and capacities. The underlying question was whether the local governments were truly utilizing all their opportunities and resources that they could have been, as efficiently as they could have done? What were and are now the incentives for doing so now? When or under what kind of conditions it can be said that "a local government body has capacity to perform a given responsibility" and that this is on a sustainable basis? How can we know when this capacity is institutionalized into the local government structure, and when it is merely dependent on individuals? The study suggested that the future vision of "a capacitated local government institution" should be equally clear as the shared understanding concerning its capacity now. The same applies to good water governance: the vision must be a shared one with real and measurable road map (Rautanen, 2006a).

Over time the practices are likely to get their own interpretation and adaptation from the original model, and this plurality in local governance needs to be appreciated. For instance, policies and related laws and regulations may state that WUSCs should periodically re-elect their members. Yet in practice, the resigned, deceased, or otherwise missing members continue to be missing until something, usually major damage such as a landslide that needs immediate attention, triggers the committee back into action. The mechanisms of new WUSC members getting selected and oriented is less understood but as long as new members are selected and get oriented, this is not a problem. The problem is if a WUSC cannot deliver, i.e., fails its service provider role. The call for adding *a time dimension* into the present is already evident at this time.

Given that everything changes in time and that the change is not linear, the revised frame of reference becomes a three-dimensional matrix. The question is how the different systemic layers change in time, interact with each other *now* and *over time*: the nature or quality of the interaction may also change over time. Projects and programmes providing capacity-related interventions need to pay increasing attention to results and impacts, and how these change in time. Post-intervention support and monitoring are needed to ensure that the target group has benefited and institutionalized good practices. Chapter 2.8 Capacity for Sustainability discussed some global findings in this regard. One key driver that appears in all articles relates to motivation and incentives: motivation of the local governments, water user groups, their (technical) support persons and organizations, and individuals therein. This study recognized that these are community-specific, even within one country or region. Small, tangible, and sustainable steps are needed in each to show the direction, but in such a manner that consequent change and adaptation remain possible. Capacity of the local actors both at the community and the local government level are critical, and hence, the good governance with its multiple dimensions is added. Pearson (2011) adds individual-level variables including motivation, existing capacity levels, and specific job-training needs, and organization-level

variables including internal reform policies, restructuring, and senior management commitment (p.30).

Time is a factor, and the fact that the timelines of different processes do not meet each other has to be considered. For instance, the design period of a rural water supply scheme in Nepal is typically 15–20 years. Within that time period, many issues will change, from individual WUSC members to water source availability to land use to policy environment to political economy at large: certain support functions may cease to exist, another ones open up. Figure 5.2 captures the change in time showing the two approaches and tools as discussed in Articles II and IV. Here WUSCs as the service provider move and change in time. At a certain point, there are more WUSC members who did not benefit from the initial learning-by-doing (Step-by-Step), the transition from one group dynamic into next one being one of the critical junctures.

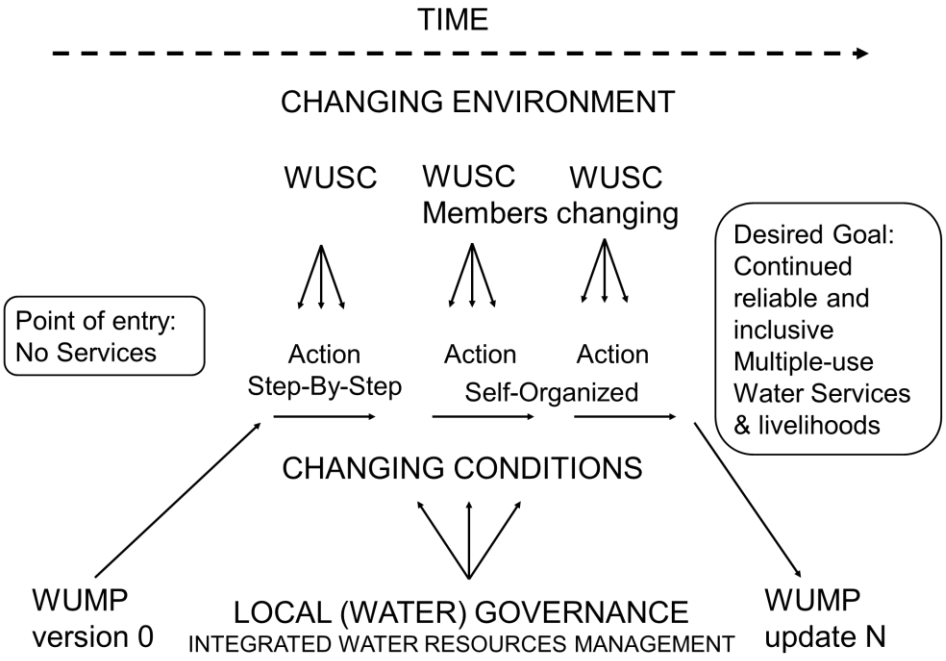


Figure 5.2 Approaches and tools

At intermediate-level, post-construction support for the capacity development of new WUSC members is lacking in the study cases. These type of post-construction support services are not institutionalized at the local government level at this time. While local governments in many countries do have the service delivery authority, this is not recognized as such, and the centralized line agencies continue to be regarded as both the service delivery authority and the producer. Figure 5.3 adds the time dimensions into the initial frame of reference, drawing attention to the fact that the changes at various dimensions do not happen simultaneously at the same point in time, and that the various layers do overlap, feeding each other.

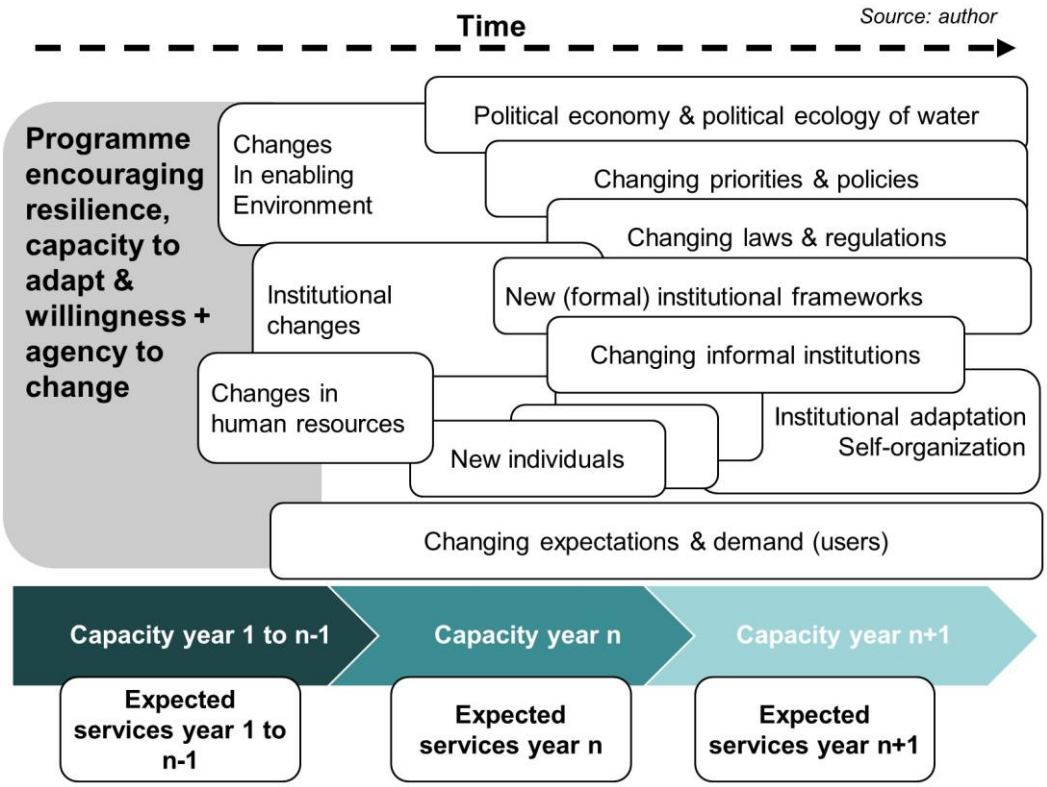


Figure 5.3 Changes in time

Complexity is a given when multiple factors, actors, and perspectives on a situation exist, and the situation itself is unstable. The sustainability of a water scheme and its WUC requires identifying the significant factors or variables that can be addressed by existing resources: the pillars of resilience, the strong points which help a WUC to carry on regardless of external shocks and unpredictable changes. This is where complexity and system dynamics have to be recognized and the relative strengths of a WUC in a given location identified. Strengthening the resilience of a community becomes the key, rather than attempting to construct technical facilities alone or establish structured WUCs that “last forever.” They will not (Rautanen, 2007b, p. 56).

Schools have an important role to play as drivers for change, both for initiating and maintaining it. Schools and other educational institutes are an obvious factor in any capacity-development programme that deals with human resource development. As concluded by the Case Guyana, health workers and teachers were often among those key persons who had a strong personal influence on the present and future state of the community. Especially teachers were seen as role models, not only for the children but also within the wider community. Teachers noted that parents and other adults could be sensitized on these issues through Parent-Teacher Associations. The importance of school water supply and sanitation is widely agreed, but in practice across the developing world these facilities continue to be sub-standard or non-functional. In Case Guyana none of the schools had a reliable water supply, also lacking safe and hygienic child-friendly sanitation facilities.

With regard to cross-cutting themes, Article III recommended that gender-sensitive capacity-development activities should be made an intrinsic part of any effort in the water sector with relevant monitoring procedures and follow-up. To highlight continuity of these principles, attention should be paid into the post-construction phase. The Article also suggested to sharpen gender-sensitive approaches by truly encouraging women to come forward, for instance by providing tailor-made courses for illiterate women or special group events organized close to the cluster of households. A series of short events could give an opportunity to women who often have children and other family members to look after, and may not have the time or social approval to leave the house for long periods of time to attend training elsewhere. It also suggested to pay attention to the enabling environment after the interventions are completed to ensure that there will be opportunities to utilize the newly acquired skills in addition to learning them. All these have a characteristic of a positive trigger of change.

Articles II and IV were about MUS. In this study, the community-managed MUS approach took the notion that people will use water for productive uses and livelihoods anyway, whether or not their water system was designed or even had the capacity to do this, with the risk of compromising the basic water supply needs of other users and possibly leading to conflicts. MUS is more than a technical design or technical option. At the community scale, MUS considers all uses, users, sites of use, and water resources and infrastructure holistically through a participatory approach. MUS is essentially an integrated perspective that pays attention to smart combinations of water sources, existing infrastructure, and also to livelihoods potential, among others. MUS is embedded into IWRM thinking, operationalizing the principles through multiple local applications. MUS is also about service delivery at the local level (Smits et al., 2010). This is one of the service delivery models whereby by definition the system is potentially about a number of services: water supply, irrigation, and energy, and through these, agriculture, small cottage industries, and other rural livelihoods. This results in having a number of service authorities as well, adding more dimensions into governance context. Here those involved need to appreciate the cross-sectoral creative interplay, and to ensure that this is functionally enabled from the enabling environment point of view. Too narrowly defined mandates, policies, and budgets do not encourage this.

This study suggested to add ecological sanitation into the MUS paradigm based on the conclusions made in Article V. Water sector includes by definition environmental considerations and more specifically, sanitation. Environmental issues, such as sanitation, drainage, solid waste management, and wastewater disposal, with land use related dimensions, are all directly linked to water: its quantity, quality, and availability. IWRM and MUS cannot ignore these aspects, especially where there is an increasing population density with an increasing standard of living, and planned or unplanned land use changes are evident. It is important to assess the situation case by case when starting any capacity programmes. In some locations, for instance, vector control may be of utmost importance, and could be easily linked into other themes. In this dissertation, ecological sanitation was included into the MUS concept, linking the productive uses of water and productive uses of sanitation. This is closely linked to the need to identify incentives for sanitation improvements at various levels, from the national policy level to local

action level, and also to consider sanitation as a service. Attitudes and beliefs guide behaviour, also in the context of an enabling environment. This is a capacity-development issue: if the rules and regulations do not allow to construct dry systems, it will simply not be done, however convenient it would be otherwise (Articles V and VI).

5.2 Emerging shape

The futures-thinking acknowledges that there is always the past, or rather, pasts, and that there will always be the future, or rather, futures. Each water scheme, its WUSC, the related local government and other institutions, all have their history both as institutions or organizations, but also in terms of individuals involved. Similarly, the factors operating the enabling environment-sphere do have the past policies and politics that they build upon, and there is no one fixed interpretation of these either. Similarly, in the future there will be numerous options and opportunities, decisions to do or not to do – also this is a decision and alternative pathway. The 'capacity cube' (Figure 5.4) represents the 'presents' that move across its different dimensions and in time: even the present is not one state or reality, it is not fixed.

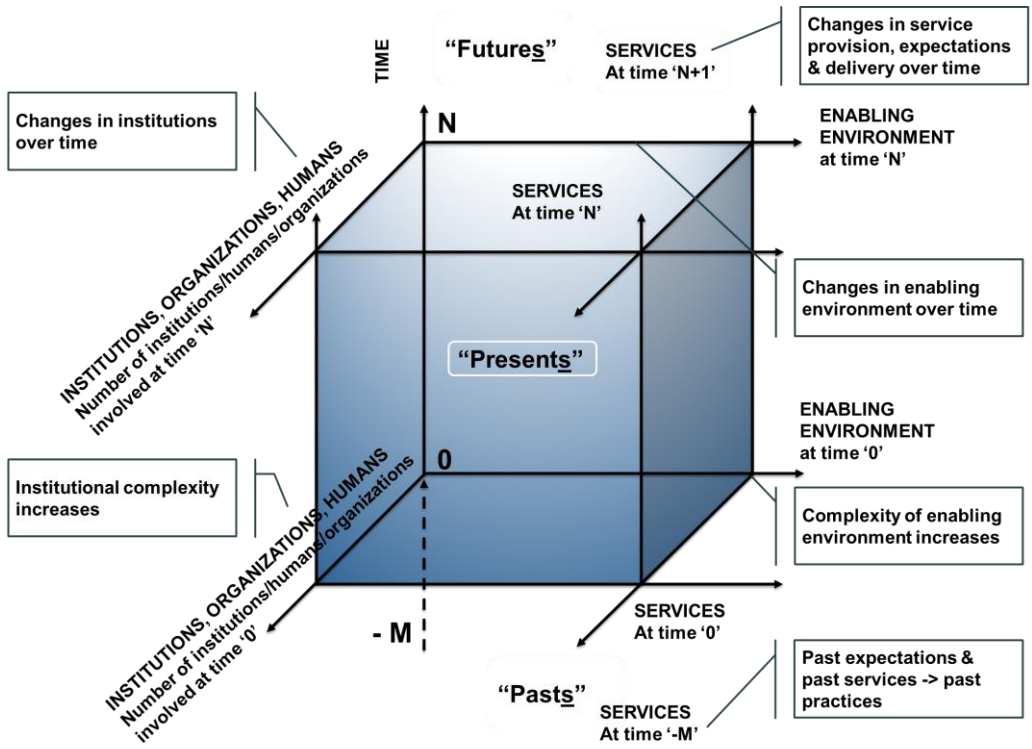


Figure 5.4 Frame of a capacity cube

Here the time span from 0 to 'N' represents the time within which the intervention, project, or programme operates. Time 'N+1' points into the future, and '-M' into the past that may have an entirely different time span. The 'capacity cube' has four axes: 1) time, 2) enabling environment, 3) institutions including both organizations and individuals therein (human resources), the fourth dimension and result being services that move in time. Capacity is an integral element of each

axis, shaping the services and pathway in time. Capacity-related questions need to be asked with regard to each axis. As discussed in the Chapter 2.1 earlier, in many capacity-related definitions its process nature is evident. All these are in constant flux, the axes merely assisting in framing the boundaries of the intervention. Complexity increases when moving along the axes, whether this takes place in present time horizontally or across the time vertically. The closer to '0' the point of interest is, the less complex it is, and the more one-dimensional and narrower the aspect is.

Framing the cube allows the project or programme planners to establish the external frames of reference to give shape for the time dimension. The 'cube' (Figure 5.4) visually draws attention to the outer limits and realities, the dynamics within the layers and their combinations, and the scope that lies within. Each project or programme, or each scheme and its WUSC, would take a different shape, and move through their own unique path. Yet, all this should take place within the given resources, policies, institutions, laws and regulations, and other factors that create the system boundaries. The question is, where and what are these boundaries? What is the harm if the case moves outside these boundaries? How many unknown or unpredictable layers are there? What kind of visible or invisible incentives or disincentives are there that affect the chosen path and eventually the entire shape? Are there powerful incentives keeping the shape within a narrow scope? These are relevant questions especially when moving across different sectors where one sector may be the bottleneck, the one with more narrowly defined policies and budgets, for instance. The laws and regulations may indeed create so strong boundaries that crossing these could be downright criminal! IWRM and MUS applications are likely to face this dilemma.

The 'cube' serves as a futures-oriented frame of reference. As discussed earlier in the Chapter 3 Methodology, Bell (1997) outlined six topics that refer to existential phenomena that aid in delineating alternative descriptions and assessments of the future (pp. 174–175). The cube provides frames within which to reflect each of these: present images of future and expectations for the future; beliefs about the most likely futures; the goals, values, and attitudes, hopes and fears, the preferences; present intentions of people to act, their motivation and other drivers; obligations and commitments to others; and knowledge of the past. These can be approached from individual, and also from organizational/institutional perspectives.

Setting everything in time allows the planners to reflect how changes in some processes will affect the others. Working through 'cube' should bring clarity to avoid fuzzy initial setups that do not hold when moving in time. Capacity development programme flows within this setup, aiming to provide relevant capacity given the overall setup. Even identifying the items for the 'enabling environment' layer can be an eye-opening exercise: in this sphere there are the formal policies, laws, and regulations, including the impact of the past policies and the expected impact of the future policies; political economy of development both at the national and global level, and such informal enabling environment related factors as local power relations and social capital. All these have potential of being positive drivers, truly something enabling that could be actively utilized as such, or of being downright barriers. Uncertainty with these needs to be considered

if the link is considered to be critical. The questions to ask for instance with regard to enabling environment (Figure 5.5) include such as what were the past policies that shaped the present? What are the present policies that will shape the intervention period? Are these likely to stay the same over the intervention period? Are they likely to be the same at the end of the intervention period? What is likely to change in the future? How are these affecting the way the services are provide at different times, or how people expect that these services are provided? (Article I).

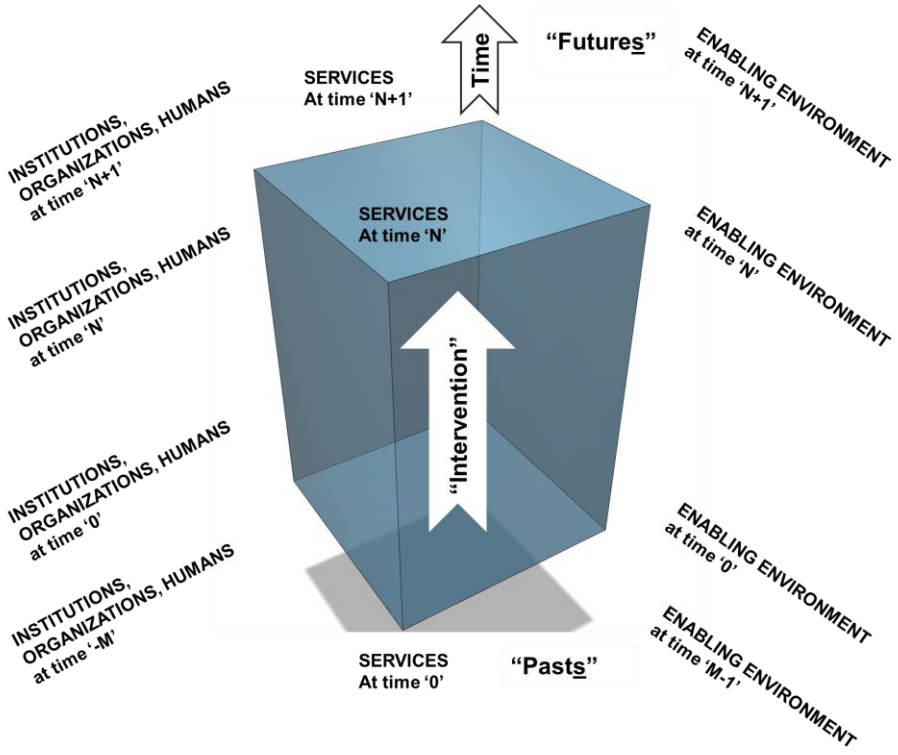


Figure 5.5 Change in time – the entry point

Identifying the interplay in between the axes in the '4D' space is another eye-opening exercise for the planners and policy makers: what are the critical links, what does not have an effect, what does? What do we know, what we do not? What is something that nobody who should know it wants to talk about? What is the topic that gets ignored given its sensitive nature, or given its political inclination? For instance, in many policies across the sectors, a lot is expected from the local governments. Yet, their mandate and boundaries, and the way they are resourced both in terms of human and financial resources, do not match the expectations. Does this indicate that perhaps the central level does not want to get decentralized after all? At the same time the citizens' expectations do change.

Even if the design life of a water structure is technically up to 20 years, the expectations for the water services will change. Services in the past may not have been what they are at the start of the project or programme at time '0', and while the intervention may aim at providing services at time 'N' at the end of the intervention period, the services at time 'N+1' are likely to be again different. Similarly, the institutions change: moving from narrow sectoral scope towards IWRM

and MUS with ecological sanitation services requires more from the related institutions. It adds more institutions, organizations, and humans, given that the scope is broadened across a number of sectors: water, energy, irrigation, agriculture, and livelihoods at large from home cottage industries to multi-purpose cooperatives.

Adding MUS with ecological sanitation here adds more potential drivers but also barriers into the enabling environment sphere, and calls for more nuanced understanding of the institutions and humans involved. Figure 5.6 adds the layer of possibilities into the 'dynamic capacity cube'. The surface illustrates the various combinations while at the same time staying within the established boundaries. None of the cases ventures outside the agreed outer limits, but rather, self-organize themselves within the agreed frames of reference. Figure 5.7, in turn, has cases that do venture outside the boundaries. The questions to ask include such as under what kind of circumstances this is likely, and under what kind of circumstances this is also acceptable, even desirable? Can we find solutions to wicked problems by crossing these boundaries?

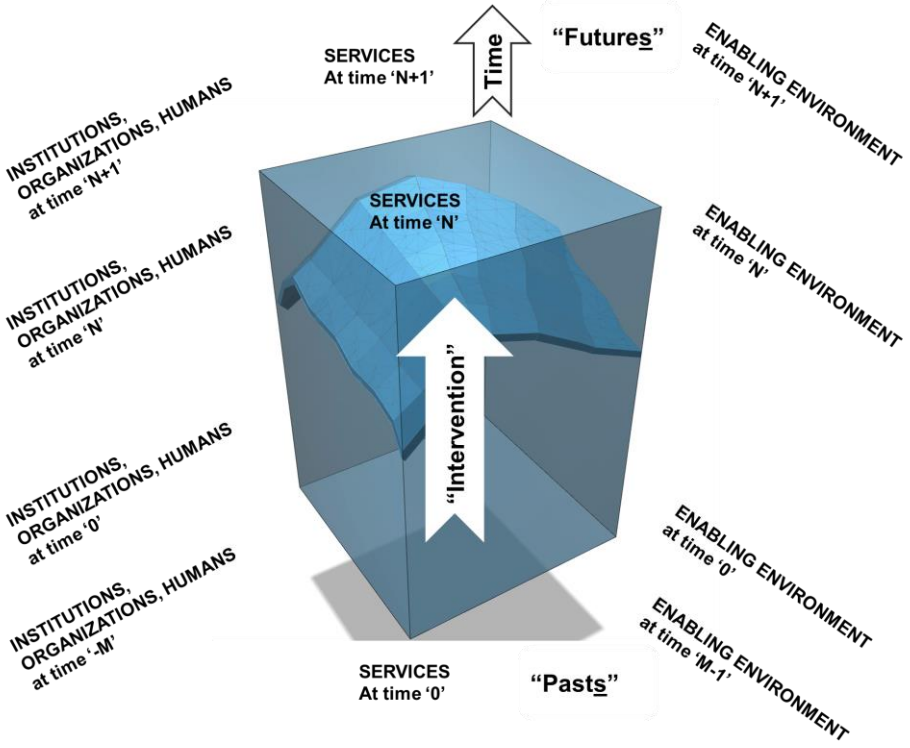


Figure 5.6 Change in time – within limits

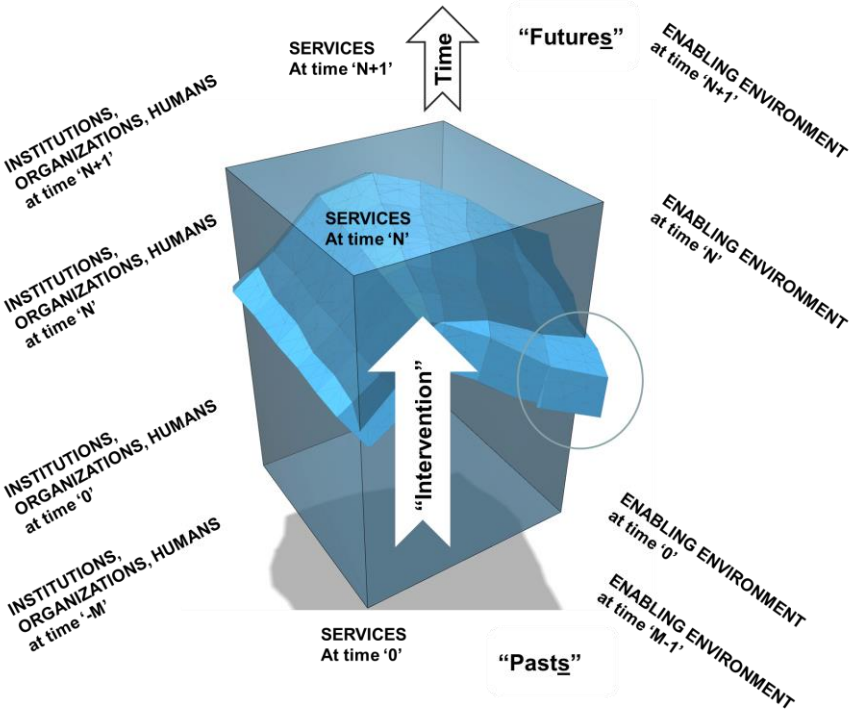


Figure 5.7 Change in time – crossing the limits

The following cases are identified in Figure 5.8 to describe how the planners could use this type of tool to establish a vision and to frame a programme or a project in time, exploring the different capacities and related processes within each dimension. The #1 represents a straightforward institutional setup established at the start of the intervention to cater for a single sector service. It is established as a complex system that entails several institutional and organizational setups; for instance, community groups, local governments, contractors, and other private sector service providers. Yet, it operates within one single sector, and hence the position with regard to an enabling environment is close to '0'. Over the course of intervention more sectors get included into the case, and it starts moving towards more complex enabling environment by the end of the intervention (#2), for instance, by encouraging MUS and livelihoods applications. At the end of the intervention the immediate stakeholders need to decide the direction (#3) that may or may not be within the intervention period.

If the enabling environment does not support the more complex setting, the beneficiaries may venture back into single-sector mandate and more narrow scope of services simply because the supporting environment does not exist. Or as in the case #6, the initially more complex scheme simply decides from the beginning to keep itself as "drinking water supply only" even if over the intervention period it operates in the MUS context. Here the path is different, the options #4 and #5 have been considered from the beginning, and the transition to new post-intervention period may be smoother. At this juncture there can be several scenarios. The end of the time 'N' is the juncture where the transition into 'future' starts. What kind of capacity is needed at these different junctures? Whose capacity is the critical one to make the decision possible?

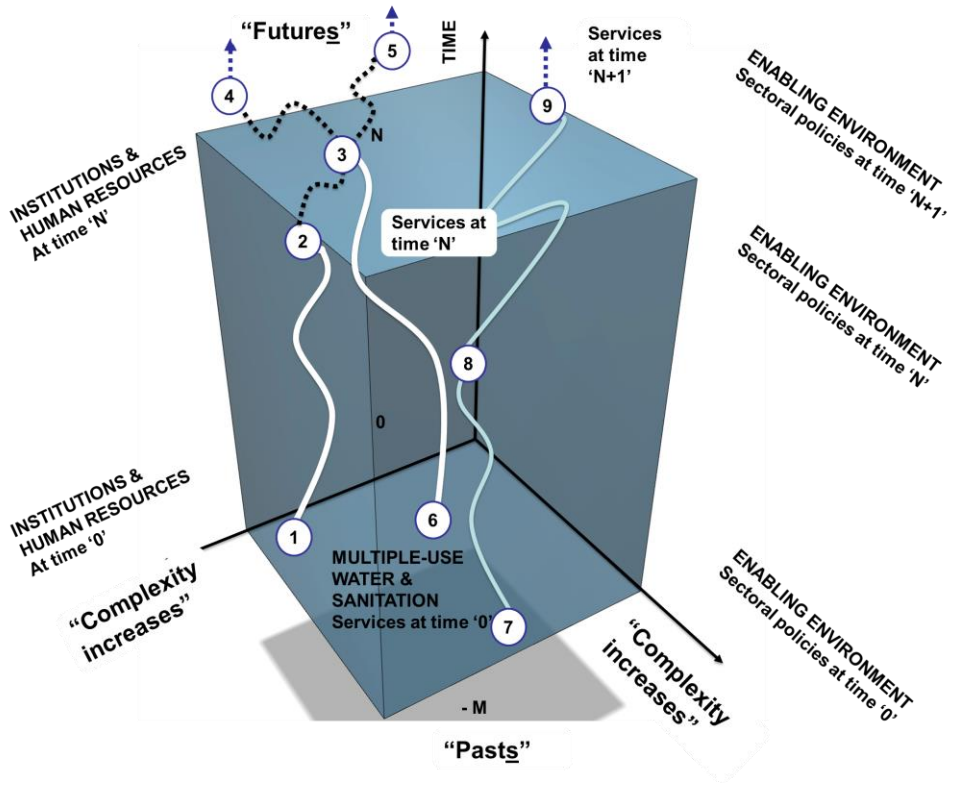


Figure 5.8 Change in time - cases

The other example in Figure 5.8 is the MUS case (#7). The MUS-by-design case includes all possible sectors and operates in an equally complex cross-sectoral and institutional/human environment. Within the intervention period, it narrows its sectoral services (#8) until a new policy item appears in the enabling environment and the scope gets broadened again (#9). The enabling environment axis is here indicated as sectoral action environment. This stems from the external frame of reference which included the "action environment" with its sub-themes: natural, social, economic, and political. These are also livelihoods assets, the natural environment being an aspect of an enabling environment in its own right. These link into political-economy both at the national and global level. For instance, the global political-economy related to development budgets influence individual donors and groups of donors alike, their expectations and fiscal realities, adding another unpredictable layer of opportunities but also threats as far as the expectations for continued support go.

In policy dialogue, this type of visual presentation assists in debating the position of each proposed case. Establishing the case #5, for instance, raises immediate questions about the complexity of both institutional/organizatorial environment and the capacity of humans therein. The enabling sector axis raises the question of whether all the supportive policies are in place and what kind of changes can be expected therein; is this shape possible from the legal and policy point of view? Is the action environment conducive to what is being proposed, what kind of capacity gaps emerge? Does natural environment make it possible to take the proposed path? Instead of listing these issues in a structured tables or formats, those involved can move the

‘cases’ in different spheres of the cube to establish the different combinations and their likely directions over time, both within the intervention period and thereafter.

The planners may face situations where many questions remain open, there is just no predictable answers to the questions. Even this type of finding is useful – to know that something is not known is better than not to know that it was there, or to ignore it without considering alternative pathways. If this unknown point is a potential major bottleneck, the adaptive system can pay attention to other pathways and pillars of resilience that may be useful when the critical point in time is reached. The unanswerable questions can easily relate to such as impacts of climate change (in natural environment) and impacts of political changes (in enabling environment), for instance.

5.3 Triangulation, validity, and reliability of the results

Triangulation was done in between the articles, case studies, and the materials developed and presented in this dissertation. Although the cube has not yet been tested in real-life context, initial discussions with colleagues seem to indicate that it has potential. The outcome was found valid, none of the interviewees contradicted the findings but rather added new nuances that were discussed earlier in this chapter. Findings are in line with the previous studies, not contradicting those reviewed in Chapter 2. The futures approach and blending in the learnings across the sectors and different disciplines allowed to conclude new insights as well. Table 5.1 summarizes the different aspects relating to validity and reliability.

Table 5.1 Assessment on the validity and reliability of the study

	Riege (2003)	This dissertation
Construct validity	Multiple sources of evidence Chain of evidence Have key informants to review draft Confirmability audit – examine the data, findings, interpretations & recommendations	In addition to the main focus country, three cases studies originate from different countries and two articles utilize global data. The chain of evidence is outlined in this dissertation. Data processed through participatory action research, involving numerous sector professionals from several countries.
Internal validity	Do within-case analysis, then cross-case pattern matching Assure internal coherence of findings and that concepts are systematically related; Do explanation building Triangulation (sources, investigators and methods) Researcher's assumptions, worldview, theoretical orientation; Researcher's self-monitoring	Results presented for the research team CADWES. Peer discussions and continued dialogue with sector professionals especially in Nepal. A range of data gathering methods utilized. Researcher's assumptions, worldview, and theoretical orientation are described in this dissertation. Self-monitoring was part of the action research protocol.
External validity	Use replication logic in multiple case studies Define scope and boundaries of reasonable analytical generalization Compare evidence with extant literature Pre-determined questions Thick description (develop case study data base)	Limitations of this study described in Chapter 1 of this study and reflected again in Chapter 3 Methodology. The evidence corresponded with the research paradigm. Different data gathering methods were used. Several cases, methods, approaches, and also diversity in geographical location are sources of triangulation.
Reliability	Give full account of theories and ideas; Assure congruence between research issues and feature of system design Develop and refine case study protocol; use case study protocol Use multiple researchers; use peer review Record observation and actions as concrete as possible Record data, mechanically develop case study database Assure meaningful parallelism of findings across multiple data sources Clarify researcher's theoretical position and biases	Full account given in this dissertation. Multi-disciplinary approach with flexible research design. Case study protocol varied in the cases; no database as such given the diversity of materials. Six articles were peer-reviewed; the case studies were reviewed by the immediate sector stakeholders involved in each case as well as the final beneficiaries. The researcher's biases and position are described in this dissertation.

5.4 Assessment and self-evaluation

This dissertation was inter- and cross-disciplinary, the research topic providing ample options to venture to a range of scientific disciplines from technology to politics, from health sciences to natural sciences, from economics to education. The research and background studies for these are immense across the sectors but not specifically for the rural water and sanitation services that are in line with the human rights based approach.

All these could have been too complex to pin down as a subject of one dissertation only. Yet, it was impossible to cut the evident connections by attempting to limit the scope. This reflects well with the reality of rural development: the more poor and disadvantaged the rural area is, the more there is a need to work across the sectors even if one sector would be kept as “an anchor”. In this study, MUS for productive uses with ecological sanitation and rural livelihoods as an operational interpretation of IWRM principle and as a way of bringing in ecological sanitation, was an example of such policy theme that is by definition multi-disciplinary and cross-sectoral.

The constructivist research paradigm in this dissertation was justified. It was evident that in the futures perspective constructivism works best, given that for such ‘learners’ as rural communities in developing countries and local governments with high staff turn over the approach needs to be active and directly meaningful. In the spirit of constructivist research paradigm, the flexible design combining both quantitative and qualitative approaches and multiple data collection techniques was most appropriate, the research topic itself calling for multiple-perspectives and dynamic approach. Statistical generalizations would not serve the system that is unpredictable and in constant change. Since the research aimed to develop useful futures-oriented frame of reference for policy, programme, and project purposes, it had to be grounded into the real world.

The depth of research varied: while four of the articles focused on individual projects and dealt with primary data sources, two relied on secondary data sources and took a thematic approach. The case studies all stemmed from the author’s work with these cases, adding depth from different perspectives with materials that are not peer-reviewed in the scientific sense, but rather, were “peer-reviewed” from the customers’ and immediate beneficiaries’ points of view. The author considers these sector professionals as relevant peer reviewers as those used by the scientific journals. Replicability of the findings has been shown in the context that was a hybrid in between what is defined as ‘project’ and what is defined as ‘programme’. The applications of some of the tools in the programmatic context should be further studied as these contexts would probably not have the ‘presence’ of the external drivers in a same way as in the study cases.

5.5 Dissemination and utilization of results

The frame of reference, approaches and tools are results of the author's 15 years of action research and involvement in various projects and studies in several countries. They have already been utilized in several ways to improve the present approaches to rural water and sanitation sector development. Given the dynamic nature of the frame of reference developed in this dissertation, there are many options for further study, dissemination, and utilization; these can be country-specific, location-specific, multi-sectoral context specific, or used in the processes leading into new programmes and projects, and in those that are already being implemented. The frame of reference studied and re-constructed with futures approach in this dissertation have a number of policy implications. These could typically appear in rural water and sanitation policies, all with direct link to capacity. The conclusion, recommendations, and recommendations for further research with regard to policy issues are discussed in the following chapter.

The proposed frame of reference is also valid for programmes that are not specifically about water and sanitation: integrated holistic local government-wide action-oriented and inclusive cross-sectoral dynamic planning that does not remain as a plan only but is actively translated into action, can be applied to any sector. The relevant capacities can be built for any specific purpose by using the core idea of 'Step-by-Step'. Appreciating the constructivist paradigm as the point of entry can help any development programme: the stakeholders are after all adults with some skill sets and experiences that can be used. The programmes and projects that build on capacity which very few people have are probably not the right choices.

The proposed frame of reference is applicable as a research and participatory evaluation tool. The ideas and findings drawn from the process can add dynamic dimensions and assist in identifying areas for improvement, risks, opportunities and options. Since the frame of reference pays attention to past and related path dependency questions, it can also be utilized in ex-post retrospective studies. There is always a need to think on how to work at scale, how to proceed towards approaches, practices, and tools that can be used without heavy external intervention. Therefore, it is recommended not to utilize the findings in this study for further *pilot*, but rather, for scaling up and for action. The approaches and tools can be used to bring doable operational substance into many policy-level decisions-in-principle, letting the core stakeholders to systematically explore themselves about what is needed, what are the priorities, what are the capacity needs, and what are the available assets and resources available, be they human, financial, or natural. Enabling environment counts but only if it is meaningfully linked to other dimensions.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Cultivating capacity for change, whether referred to as capacity ‘strengthening’, ‘development’, ‘building’, ‘enhancement’ or simply ‘capacity change’, is an important element of practically every policy reform, development programme, and country strategy aiming to improve well-being and with it also water services and sanitation. This dissertation focused on capacity development in the water and sanitation sector in the rural context. It explored the complex challenges, options, and constraints in securing access to sustainable rural water services and sanitation for all in an era of numerous changes that call for dynamic responsive capacity at different levels. The important notice was the call for shift in thinking from providing physical systems into services as per the service delivery thinking, and more to it, to multiple-use water services delivery that also links to the services needed for ecological sanitation and livelihoods applications. In this study, water challenge and therefore all references made to “water sector” do include sanitation, often in its broader sense as “ecological sanitation” or “environmental sanitation”. Multiple-use of water, ecological sanitation and rural livelihoods added another important dimensions to consider.

The purpose of this dissertation was to recommend how the rural water and sanitation sector specific programmes and projects can inspire capacity for continued learning, adaptation, and innovation in the face of ever-new challenges in a volatile and unpredictable local and global environment, while the system in itself was assumed to be already complex and wicked at present time. The specific objective of this dissertation was to elaborate futures-oriented frame of reference for rural water and sanitation sector-specific dynamic capacity-change and to make recommendations with regard to its application for policy, programme, and project purposes.

This study assumed that the research problem was potentially a wicked problem that is embedded with notions of complexity. The different parts of this study including the literature review confirmed that the adverse external and internal social and environmental situations overwhelmed existing practices and persisted even after the application of best-known practices. In this study, the Step-by-Step approach at the individual water scheme level and local

government-wide integrated and inclusive water resources planning (WUMPs) were introduced as best practices, yet, even then the outcome was unpredictable at individual scheme level. The approach and related tools might have all it takes to have high quality sustainable results, but its real-life application is another matter, especially when moving towards programmatic approaches where reliable timely monitoring and direct supervision may not be as intense and timely as it is in a project. These are all dimensions where dynamic capacity change would benefit the overall system.

The findings did suggest that while rural water supply and sanitation as physical structures can be very simple, its overall operative action environment, governance, and broader institutional systems remain complex. There was a degree of difficulty in defining causal linkages while many studies, including those presented in the literature review, six peer-reviewed articles, and three case studies in this dissertation, were able to identify individual reasons for successes and failures. These individual linkages could not explain all the reasons and causal linkages there are, especially when adding a longer-term time dimension and changing circumstances. For instance, based on field observations over the past seven years in rural Nepal, cases of water scarcity and water conflicts are likely to increase in the study areas from what they were at the time of the study. This is a result of both decreased water sources and increased demand.

Functionality and sustainability remained relevant yet complex challenges. Their boundaries of effects were difficult to define or fix in time with any degree of accuracy even if in the individual cases the reasons appear to be what the researcher would expect. For instance, if operation and maintenance were assumed to be the leading challenge, it could be proved, but this still did not explain all the reasons that potentially were there, such as geo-hydrological and environmental reasons, demographic and land-use changes, or simply changes in political-economy and related priorities at any level. This is where the 'wickedness' emerges: the reasons for poor services are not necessarily what was identified or otherwise evident at the time when the system was planned and implemented.

The integrative, local government-wide application of water resources planning as described in Articles II and IV has implications for sectoral planning, implementation, and post-construction support, service delivery models as well as for capacity and institutional development. It calls for attention at both the local level and the policy level across sectors. Although complex, institutionalizing the principles locally enhances the chances of future sustainability, ensuring the appropriateness of the technical solutions and building the sense of ownership with each step (thus increasing the chance of sustainability). The political economy and political ecology of WUMPs, MUS, and GESI strategies in these futures contexts needs further research.

Similarly, application of cross-cutting themes through practical action represents the best practice that did have the expected result, yet, even under these conditions functionality and long-term services in line with the human rights based approach were hard to reach across all locations. The entry note was that wicked problems will not be solved by the same tools and processes that have created them. Yet, in this case it was hard to define what had created the problem in the first place exactly. The study attempted to find solutions that explore mechanisms

and paths different from those that have perpetuated the problem in the first place. The working tools as presented in this dissertation allow for continued co-steering and dynamic site-specific decision-making. This is where futures-thinking comes in, with appreciation that while there are several potential futures, there has also been a multitude of pasts.

Sustainable development is about ensuring that the future generations have options available, that their choices are not compromised. Sustainability has many connotations and a very flexible time frame. The natural and socio-economic environment are in constant flux. While some changes can be expected, many changes are unexpected. Change is evident, and time together with an increase in knowledge shifts the understanding of what is sustainable and what is not. To ensure sustainability of high service levels and continued equal access to safe water for the poor and the rich alike, the project or programme should aim from the beginning to institutionalize good water governance practices and strategic local government-wide water planning and management. Many capacity-development efforts can be lost by focusing on human resource development alone without considering what makes these efforts sustainable in the long run. Sustainability of physical water supply or sanitation facilities is a different matter than sustainability of certain practice. The design life of a water structure as infrastructure in the study cases was 15–20 years. Individual WUSC members or individual local government staff remain very rarely in their position over the entire design life. At the same time, good practices can be 'for ever' and be used to recover or rebuild the systems. Capacity and good practice focused approaches have potential to outlive individuals and physical structures, but it needs an initial shared vision and focused attention at the start.

The approaches stem from the participatory, constructivist, futures-oriented, and decentralized approaches that appreciate the need for being able to re-organize and to re-invent existing and past practices as the external environment changes. The policy environment should not prescribe one-fit-for all solutions, or generally have items that limit the options in the rural environment where the real options available can be very limited from the onset. In this study, the community management paradigm is still considered as a valid paradigm also when shifting the thinking from infrastructure towards service delivery. This dissertation argued that in the highly decentralized context, other water service delivery models are limited if not completely non-existent. For a remote, cash- and resource-poor community, there are limited options or simply no other options, private or public, to manage local water systems and services, even if the contributions to initial investment costs and overall technical assistance may have been provided from external sources. Self-help options often mean that women continue to carry the water and/or the water is not safe. In this dissertation, four distinct tools for enabling dynamic capacity change emerged: one for local government-wide, futures-oriented, integrated, and inclusive water resources planning (WUMP); one for individual scheme implementation at the water users' committee level (Step-by-Step); one for integrating the multiple-uses of both water and (ecological) sanitation while shifting towards service delivery thinking in MUS; and one that mainstreamed cross-cutting policy items through using capacity development as an instrument (GESI). Out of these, the author of this dissertation has directly contributed into their further development and operational application to make these tools context-specific and locally

relevant, applicable appropriate tools. All these aspects include a range of capacity development at different levels.

This dissertation introduced a three-dimensional 'capacity cube' to guide the case-by-case dialogue. It can be used to draw attention to what has taken place *before* the proposed policy change, programme, or project intervention time period, what is meant to take place and likely to change *during* the intervention, and what is likely to take place *after* the intervention period. The 'cube' has both 'pasts' and 'futures' dimensions, in addition to the 'presents'. It encourages to be aware of the path dependency, both with regard to decisions made in the past and with regard to decisions being made in the present.

Futures-thinking could be more strongly streamlined to anticipate the consequences of chosen paths, and the extent to which the chosen path leads to path dependency later on. It acknowledges that complex systems are filled with uncertainty, and hence it is not useful to try to anticipate these with strict standards but rather leave room for adaptation when the unexpected occurs. With complex systems, no amount of precaution can eliminate all risks. Instead, developing and triggering capacity for resilience counts. This needs vision and skill from those who facilitate the process if this is not coming from those who are making the plan. Vulnerability mapping and reflections of such as probability of disaster (medium-term) and impacts of climate change (long-term) do add more layers of unpredictability with no right answers, but considering these nevertheless will add more nuances and dynamic dimensions into what is being proposed and what are the priorities.

- *Conclusions from the project perspective*: the futures-oriented frame of reference introduced in this study can be directly utilized in a project context where there is a presence of an external technical assistance team. In project context, the local government-wide, integrated, and inclusive planning approach (WUMPs), the Step-by-Step approach to individual schemes, and the way human rights based approach was mainstreamed together with GESI all resulted in strong positive changes. All these used participatory tools that do have a potential for including more strong futures-thinking aspects. The Step-by-Step approach allowed constructivist learning-by-doing for WUSCs and their immediate stakeholders. The results were evident in terms of tangible infrastructure systems and services. The projects studied in this dissertation were all hybrids, moving towards programmatic setup over time, yet, with clear-cut inputs from external actors. This is the kind of environment where the approaches and tools introduced in this study also work best, given the external input. Yet, the question of scaling up and policy relevance without the external input and presence is always important, and guided the triangulation of the findings.
- *Conclusions from the programme perspective*: Understanding multiple, socially constructed realities is closely linked to notions of adaptive capacity and resilience, as well as to institutional bricolage. Resilience in social systems refers to the added capacity of humans to anticipate and plan for the future. This study recommends to apply constructivist approaches into programme and project preparations and related

dialogues in an attempt to truly capture the field realities. For the programme preparation, the challenge is to define a programme that gives room for the diversity and multiple realities. It should create an enabling environment where a multitude of solutions can work. This entails a need to work across the sectors and to promote, e.g., the multiple-use of water services paradigm across the relevant sectoral programmes. Application of such approach as GESI and HRBA, or meaningful utilization of the tools such as Step-by-Step can be described in the programme setups and even included into relevant policies, but the application will not take place without field presence and continued systematic results-based monitoring and evaluation. Field presence can ensure dynamic adaptation to changing environment, and related targeting.

- *Conclusions from the policy perspective:* the policies relating to the position of local governments in rural development need to be clearer across the sectoral policies. While from the human rights perspective local governments are often seen as the key duty-bearers and practically as service providers, in the fragmented institutional setup the actual responsibility lies with another organization or rather, is split amongst several organizations. From the enabling environment and institutional development points of view it is of utmost importance to make the position and related lines of accountability clear, and to ensure that there are sufficient human and financial resources. If service delivery thinking would be more pronounced in the sector dialogues, the related roles and responsibilities would get more structured attention. This would also add a vision that could enable dynamic capacity change and make the supporting capacity-development events more systemic. Piece-meal random training events without any vision for what are all the duties that the local governments should be delivering are not efficient. The relationships between the local government, civil society, private sector, and community-based organizations, such as water users committees, have to be clear at the policy level across all related sectors. Narrow sectoral focus in policy dialogues adds to complexity where uncoordinated changes and additional duties can undermine the service delivery simply because it is ‘too much’. Chosen policy, programme, or project setup and the actions therein must remain sensitive to spatial differences even within a country and its regions, and leave room for continued local adaptation and flexibility over time.
- *Conclusions from the futures perspective:* this study was done over a number of years in between 2002–2015. All studies and related assignments did apply the futures-thinking, even if this was often challenged by immediate needs: in many participatory interactions, the urgent basic needs prevented long-term visioning, the present time being challenging and demanding enough. For instance, the KAPB survey was used to develop the baseline and content for the capacity-development programme; it could have included more strong futures-oriented questions that would have been further developed into actionable project or programme. Using the KAPB survey through participatory interaction was the first step in the capacity-development programme as it gave the respondents an opportunity to reflect their present thinking. The KAPB survey worked well for the programme, but could have benefited from longer-term futures-thinking.

- *Conclusions from the constructivist perspective:* The historical perspective identified key drivers for change. One strong driver related to personal negative experience that triggered the need for structured change (mainly of those who were in the right position to make the change happen), closely linked to the call for “modern and convenience”, whatever was the location and time-specific interpretation of these. This is in line with constructivist approach, assuming that change was a result of development of understanding and increase of knowledge of the relationship and causes of poor sanitation and water with dramatic health impacts. An enabling environment needs to make learning-by-doing and building on the previous individual and institutional experience possible, giving room for self-organization and local applications. This is not possible with too narrow or too general approaches to capacity development without the possibility for actual *doing* or at least having an *opportunity* to apply these new skills and capacity later on. This also gives room for attempting to solve wicked problems with other tools than those that originally created them. For example, rather than approaching the non-payment of water tariffs through sanctions, it could be approached through MUS and related livelihoods development. This is truly a win-win situation whereby the community’s capacity to use MUS for livelihoods development would increase both food security and overall well-being in the community, and with it, capacity and willingness to pay for water.

6.2 Scientific contributions

This doctoral thesis with its six peer reviewed articles and case studies is relevant for the academic audience and practitioners interested in rural water and sanitation sector, and its linkages into capacity, rural development, livelihoods, good governance, and GESI. The research paradigm in this dissertation was *constructivist* that called for the researcher to understand the multiple social constructions of meaning and knowledge. The approach was aligned with problem-based research paradigm, the leading problem being that regardless of decades of effort in improving rural water supply and sanitation, the access is still challenged, with sustainability and re-investment being constantly questioned. Constructivist approach further calls for multiple perspectives which served the study context well. Rural water and sanitation projects and programmes need to identify and relate to the multiple-pasts and multiple-futures, and therefore be able to deal with multiple-perspectives.

Article I provided the historical perspectives into how water and sanitation sector has evolved. It specifically investigated how the understanding of the key concepts and the links between health, water and sanitation had changed over time in a global context, and identified some of the key drivers that prompted the change especially with regard to sanitation and public health. These drivers are valid in the present context. Articles II and IV provided the community and local government perspectives into rural multiple-use water services and sanitation, broadening the scope from community-context into local governance-context. Article III contributed first-

hand evidence into the gender debates in 2004–2008 after which the concept has broadened to entail both gender equality and social inclusion, both of which are closely linked into the rights based approach that was also the entry point of this dissertation. The scientific contribution for this time is still valid as far as the capacity development related findings are considered. Article V and Article VI contributed sanitation, hygiene, and related behaviour change issues into the debate. While there is ten-years in between these two articles, their scientific contributions are still valid. In the synthesis the dry sanitation was scaled up to ecological sanitation and further into multiple-use of water services context. This aspect was new contribution in the synthesis part. All articles dealt with capacity development, indicating a need for dynamic capacity change rather than one-fit-for all solutions.

This research contributes multiple perspectives and a novel approach into how to frame the change in time. We need to acknowledge that the present is shaping the future, and that the present has been shaped by the past. Such multi-sectoral approaches as discussed in Articles II and IV have potential of exploring the 'pasts' and 'futures', not only the 'present', should those involved be willing to use this opportunity. This doctoral thesis further explored both drivers and barriers entering into the 'present' with the 'history', driving the 'present' into the 'future'. In the 'present' new entities are created that may or may not be continued in the 'future'. These may be individual people, the informal and formal institutions that consist of these people, their internal and external practices, dynamics and power relations, and their 'personal history'. Since the capacity issues as discussed in this dissertation focus mainly into adult population, there is always some existing capacity, knowledge, understanding, and practices, a history.

Four peer reviewed articles out of six were done through action research. Articles II, III, IV, and VI added the real-life evidence from the rural communities into academic debates, relating to a range of concepts that have evolved over the past decades. The scientific theoretical findings and recommendations were tested and validated in practice, and applied into real-life context through close interaction with immediate stakeholders. These rural water and sanitation projects were bi-lateral projects funded by the governments of Finland and Nepal. Operating through the government systems in Nepal, the research context was directly embedded into practice at scale, not only at a pilot scale. In this regard, the outcome of this dissertation highlights that dynamic capacity change calls for systems thinking and consideration that the whole is more than the sum of its parts.

The main scientific contribution of this synthesis is a novel and comprehensive framework which increases contextual understanding of the dynamic role of time in capacity development. It discussed different factors and layers, these system elements flowing through the time. The framework takes into account the multiple pasts and multiple futures, and multiple uses of water services and ecological sanitation. This framework encouraged participatory cross-sectoral dialogue in between the different stakeholders to reflect on change, and more to it, change in capacity. With the global changes related to both expected and unexpected, there can be potentially dramatic (emergent) changes that may be irreversible. To be effective in facilitating active participation and dialogue in development of rural water and sanitation related services,

the larger and complex economic, political, social and cultural context, and its change in time, has to be considered. Framing the problem with layers that can be identified provide shape for the fuzzy dilemma where both opportunities and threats, whether in this time or in the future, may be missed out otherwise. The emergent properties count for change agents within the culture; self-organization and local innovation need to be encouraged given the great diversity of rural environments.

6.3 Recommendations and policy implications

Appreciating the complexity and dynamic nature of the rural water sector, the system should not be split into individual fixed components or strictly defined activities, such as specific training courses or narrow mandates that do not consider the broader framework within which they necessarily operate. A menu of options for such as technology choices or institutional setup appear to result in more sustainable outcomes. Time is an important factor, and keeping all the aspects of the system 'moving' appears to generate more positive outcomes than trying to fix them in a linear reality or in silos.

Capacity-related interventions need to have a vision that goes further than just the present state of affairs. Capacity change should not be divided and dealt with as individual actions responding to what is evident at present time, but every action should be reflected against the whole and the changes in time therein. Individual training events alone will not result in the same as the systematic Step-by-Step approach that included training events, learning by doing, and related actual infrastructure development. Similarly, individual planning workshop for a local government-wide integrated water resources planning would not result in the livelihoods benefits as observed in two of the peer-reviewed articles without attached investment and technical backstopping that translated the plans into tangible work.

The concept of 'modernity' is still a significant driver. These types of national drivers set the policy and regulatory frameworks at the country level, guiding resources allocation for programmes of national priority. These have an obvious impact on rural areas. This dissertation noted that the local government level stakeholders, including the various interest groups, need to have a realistic understanding of what the proposed water and sanitation options and service delivery models mean: what can truly be delivered to avoid unrealistic expectations, what are the technical and financial risks involved, what are the maintenance needs, and what are the other critical issues that may or may not appear later on. Water demand and wastewater management, sanitation, productive uses of water, pro-poor water governance, and public health issues are all relevant.

There needs to be clear guidance on roles and responsibilities, and only after it is clear what each institution and organization within the various institutions has to deliver, the components and other arrangements for effective training can be defined. All these are important pointers as to which direction the capacity change efforts with regard to such as the local government

actors should take: given the diversity of actors involved, the approach needs to stay equally dynamic.

Result and impact oriented phased (Step-by-Step) and focussed interventions that foresee the change in capacity in the long-term perspective are likely to lead into meaningful outcomes also from a medium-term perspective. The first recommendation is to build these types of tools into projects and programmes from the on-set, setting the results expectations accordingly. The focus needs to shift from infrastructure (alone) into services and the capacity it takes to deliver these services. While prescribing a specific tool may not appear dynamic at the first place, in practice prescribing the right kind of tool provides more structured yet dynamic environment within which to proceed. The preparatory diagnostics calls for understanding the context through political economy and relative power-relations analysis; even simple terms widely used in the sector, such as 'participatory approaches' or 'community management' are all highly location and time specific, and influenced by external power relations. Even the choice of the type of physical infrastructure is influenced by this.

Programmatic approaches to rural water and sanitation should consider sub-national-level institutional arrangements. The results of this study suggest that a hybrid of community and local government involvement could be considered, with attention to capacity and empowerment issues that need to be built into the design of the programme itself. Programmatic approaches need to stay sensitive to local dynamics in fragile and (post) conflict affected situations, and accept that just prescribing good governance with clear lines of accountability and transparency, and, e.g., GESI and HRBA principles, in a policy paper or programme appraisal, does *not* mean that these get translated into action. Since these are not necessarily in the interests of the powerful elites and those who are benefiting from the present situation, the change is not going to happen without an external trigger. The tools introduced here, such as Step-by-Step or the local government-wide holistic inclusive and integrated water resources planning with tangible investments and immediate benefits, have the potential of triggering the change but they do call more (external) field presence than what is typically associated to be 'programmatic'. Dynamic understanding of processes of change, as well as the interaction of various desired and undesired outcomes, do count.

6.4 Recommendations for further research

This study covered a range of themes and approaches, all which are worth further studies in their own right or as complex integrated systems. Rural water sector is linked to a range of livelihoods opportunities and cross-sectoral issues through the MUS paradigm. Both the MUS context with ecological sanitation and the rural water services delivery paradigm would benefit from real-life research where these emerging paradigms are not only piloted or researched at small scale, but rather, scaled up and connected further to such broader themes as climate change adaptation and disaster risk reduction, ecological sanitation, and community's resilience.

Capacity development is an instrument and a process that has potential in shaping the policies. The further real-life testing of the “capacity cube” for this purpose is recommended. With this, it is also recommended to continue developing tools for applying futures-thinking with constructivist spirit as the starting point to add the time scale into present political economy assessments and stakeholder analysis. These tools can be used for both stakeholder mapping and capacity assessments, but the futures dimension needs to be added. This is particularly relevant in fragile / post-conflict situations where the overall operational environment is fluid.

Suggestions for the further research are listed below:

- *The project perspective*: the project approach is still a valid approach to encourage and trigger capacity change, and worth developing towards a hybrid in between programme and traditional project. This study recommends to further study the merits of different interpretations and operational applications of the ‘projects’ and ‘programmes’, and how capacity development as a policy tool, featured in these. This needs to appreciate the fact that even within one country the spatial differences warrant different approaches. Even if one region within the country may be ready to a fully programmatic approach in terms of having local structures in place and functional, the other region within the same country may not have it, this region being the most disadvantaged and in need of assistance in the first place.
- *The programme perspective*: how to build sector-wide programmes that can be results-based and effectively address the need to encourage dynamic capacity change? The programme approach calls for country-led strategies, but these may not always be in favour of the rural poor or capacitated themselves to deliver capacity-related services in remote rural areas. This is closely linked to political economy of rural development, and again has its spatial differences and dynamics. There is great diversity within the rural areas in all possible ways. The research question is how can one “*single, comprehensive programme and budget framework; a formalised process for donor coordination, and harmonised procedures for reporting, budgeting, financial management and procurement*” address the needs of the complex diverse rural realities, reaching the unreached, those who are not powerful? The rural areas do have their powerful elites, and the more empowered constituencies that are more likely to attract benefits. How can one programme reach out to this multi-dimensional landscape, considering that those in the position to drive the change may not want the change?
- *Relevant for both project and programme perspective,* and as it relates to an enabling environment, also for the policy perspective: It is recommended to study more the role of informal institutions in shaping the rural water service delivery in post-implementation phase and in the context of MUS that addresses also the livelihoods and ecological sanitation needs. The informal institutions may prove out to be the ones that have the capacity that is not latent or irrelevant, but how to address these at scale? This is a relevant question for programmatic approaches.
- *The policy perspective*: how sectoral policy dialogues can address cross-sectoral policy needs, what kind of cross-sectoral policies best create enabling environments for such

as MUS that further integrate environmental and ecological sanitation within the overall livelihoods systems? How can focused policy dialogues best deal with complex systems that at the implementation level in rural communities secure both human rights to water and sanitation, and sustainable rural livelihoods? Operating across multitude of sectors, this study also recommends to research on how the political-ecology and political-economy related tools could be applied into capacity development initiatives.

- *The constructivist perspective:* rural water sector interventions could further benefit from the constructivist learning theory and related pedagogic approaches. This dissertation recommends to study the pedagogy used in the various training programmes and other capacity-development programmes from the constructivist point of view. What kind of pedagogic approaches best encourage the learners in rural communities in those countries where the educational background can be hugely varied, sometimes non-existent? The approach should appreciate the fact that adult learners always do have previous knowledge, skills and experience, even if this is not likely to be academic knowledge and is not due to formal education. In many rural locations globally, most adult learners do have a background with the opposite, the more passive incremental learning that has often been traditionally rather didactic learning through lecture and text.
- *The futures perspective:* this dissertation recommends further study on the use of futures research methodologies as operational tools in development projects and programmes, something that is inbuilt to the way the project or programme operates. For the water sector, futures-thinking is of utmost importance, given that such unpredictable phenomena as climate change mean a range of water-related challenges.

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TERMS AND DEFINITIONS

Actors: Organized collectives such as groups, sub-units of organizations, organizations and formal networks (Baser & Morgan, 2008).

Adaptive capacity: The potential or ability of a system, region or community to adapt to the effects or impacts of a particular set of changes. Enhancement of adaptive capacity represents a practical mean of coping with changes and uncertainties, reducing vulnerabilities (GWP, 2012).

Agents of change: Leaders, groups, coalitions and others that can initiate and drive positive changes toward the achievement of a development goal (World Bank, 2011).

Basic sanitation: an improved sanitation facility that is shared among no more than 5 households or 30 persons, whichever is fewer, if the users know each other (WHO/UNICEF, 2014, p. 33). Note: there are many definitions, and these may vary in between the countries and organizations.

Blue water: Fresh surface and groundwater, in other words, the water in freshwater lakes, rivers and aquifers (Hoekstra et.al, 2011).

Capacity areas: Determine the extent of local ownership of the effort to achieve the stated development goal(s), as well as the efficiency and effectiveness of that effort. Broad, multi-dimensional and inter-connected areas make up institutional capacities. Specific factors in these areas, if improved in the local context, can support needed achievements toward a development goal (World Bank, 2011).

Capacity-building: The actions needed to enhance the ability of individuals, institutions and systems to make and implement decisions and perform functions in an effective, efficient and sustainable manner (GWP, 2012). **Community capacity-building**: A process of enabling those living in poverty to develop skills and competencies, knowledge, structures, and strengths, so as to become more strongly involved in community as well as wider societal life, and to take greater control of their own lives and that of their communities (OECD, 2009).

Capacity constraints: Internal and/or external factors that limit a society's resource availability and challenge capacity development (World Bank, 2011).

Capacity development: A locally driven process of transformational learning by leaders, coalitions and other agents that leads to actions that support changes in institutional capacity areas—ownership, policy, and organizational – to advance development goals. (World Bank, 2011).The process of enhancing, improving and unleashing capacity; it is a form of change which focuses on improvements (Baser & Morgan, 2008). The process by which individuals, groups and organizations, institutions and countries develop, enhance and organize their systems, resources and knowledge (GWP, 2012).

Capacity issues: A shorthand way of referring to both capacity as an outcome and capacity development as a process (Baser & Morgan, 2008).

Capacity: that emergent combination of individual competencies, collective capabilities, assets and relationships that enables a human system to create value. (Baser & Morgan, 2008). The availability of resources and the efficiency and effectiveness with which societies deploy these resources to identify and pursue their development goals on a sustainable basis (World Bank, 2011).

Change process: Process by which capacity development activities bring about results towards a specific development goal (World Bank, 2011).

Change: A capacity-neutral term referring to a shift in the configuration and behavior of a system (Baser & Morgan, 2008).

Collective capability: The skills of a system to carry out a particular function or process. It is what enables an organization to do things and sustain itself. (Baser & Morgan, 2008).

Community development: A defined practice aimed at helping communities express their needs and meet them through organization; the practice has knowledge and skills base and is informed by a clear set of value (OECD, 2009).

Community-based management: The service provision option whereby communities control management of their water supplies. For practical purposes, day-to-day responsibility lies with a representative group of community people, often referred to as a water committee, elected to take up this task. Although this group may involve local caretakers or small entrepreneurs, the committee remains responsible for ensuring a sustainable service, and accountable to the community at large (Lockwood & Smits, 2011).

Competencies: The mindsets, the skills, and motivations of individuals which are an essential part of the broader concept of capacity (Baser & Morgan, 2008).

Complex adaptive systems: Systems that are made up of a diverse set of actors whose multiple interactions produce behaviours in the whole system not found in any of the actors. They generate adaptation by changing, both intentionally and indirectly, in the face of new circumstances in order to sustain themselves. Examples of complex adaptive systems include the stock market, social insect and ant colonies, and any human social group-based endeavour in a cultural and social system such as political parties or communities (Baser & Morgan, 2008).

Context: The political, social and institutional landscape within which actors struggled to make their way (Baser & Morgan, 2008).

Decentralization: The transfer of authority and responsibility for governance and public service delivery from a higher to a lower level of government. There are different forms of decentralization (Lockwood & Smits, 2011).

Development Goal: High-level impact at the top of the results chain in terms of improved social or economic conditions. The goal determines general purpose and direction of capacity development programs, and should be marked by strong consensus among stakeholders (World Bank, 2011).

Emergence: An unplanned and uncontrollable process whereby properties such as capacity emerge out of the complex interactions among all actors in the system and produce characteristics not found in any of the elements of the system; this is a key concept to systems thinking (Baser & Morgan, 2008).

Endogenous: Derived internally, or growing or developing within (Baser & Morgan, 2008).

External interveners: Actors involved in the capacity development of others, including bilateral donors, multilateral agencies and global NGOs, but also many national organizations (Baser & Morgan, 2008).

First-order changes: Changes relating to the formal aspects of a system such as structure and the configuration of tangible assets (Baser & Morgan, 2008).

Food security: Physical and economic access, at all times, to sufficient, safe and nutritious food to meet dietary needs and food preferences for an active and healthy life (GWP, 2012).

Formal structure: The explicitly designed pattern of relationships, authorities, information flows, decision-making, and coordination that shapes how a system such as a ministry or network functions (Baser & Morgan, 2008).

Green water: The precipitation on land that does not run off or recharge the groundwater but is stored in the soil or temporarily stays on top of the soil or vegetation. Eventually, this part of precipitation evaporates or transpires through plants. Green water can be made productive for crop growth (Hoekstra et.al, 2011).

Harmonization: The approach of donors coming together to develop common arrangements, procedures and information sharing mechanisms for their aid flows (Lockwood & Smits, 2011)

Improved sanitation facility: one that hygienically separates human excreta from human contact. They include the following facilities: flush/pour flush to: piped sewer system, septic tank, pit latrine; ventilated improved pit (VIP) latrine; pit latrine with slab; composting toilet (WHO/UNICEF, 2014, p. 40).

Incentives: An extrinsic flow of resources in the form of money or power made available to people provided that they adopt a prescribed set of attitudes or behaviours (this compares to motivation to which we give a broader definition). (Baser & Morgan, 2008).

Institution: Structures, norms and rules of behaviour, both formal and informal that shape social order of a human community (Baser & Morgan, 2008).

Integrated Water Resources Management (IWRM): IWRM is a process which promotes the coordinated development and management of water, land and related resources in order to maximize economic and social welfare in an equitable manner without compromising the sustainability of ecosystems (GWP, 2012).

Intermediate level: The level where the functions of the service authority such as planning, coordination, regulation and oversight, and technical assistance, take place. We use the term the intermediate level (i.e. in between the national and community level) of local government, such as district, commune, governorate or municipality, or whatever the exact administrative name given in a particular country, as a generic term to describe this level (Lockwood & Smits, 2011)

Intermediate outcomes: Also known as learning outcomes. Immediate results of activities observed as changes that occur at the individual level and changes that occur in the interactions among individuals and groups, and thus in the broader organizational or social environment. A standard set of indicators for these outcomes that can be customized to different contexts: raised awareness, enhanced skills, improved consensus/teamwork, fostered coalitions/networks, formulated policy/strategy, and implemented strategy/plan (World Bank, 2011).

International development agency: Multilateral and bilateral organizations as well as multinational civil society organizations which provide support in various forms to developing countries. (Baser & Morgan, 2008).

Land use: Refers to the total of arrangements, activities and inputs, people undertake in a certain land cover type to produce, change or maintain it (GWP, 2012).

Legitimacy: A generalized perception or assumption that the actions of an entity are desirable, proper and appropriate within some socially constructed systems of norms, values, beliefs and definitions (Baser & Morgan, 2008).

Mitigation: Structural and non-structural measures undertaken to limit the adverse impact of natural hazards, environmental degradation and technological hazards (GWP, 2012).

Motivation: The reason or reasons for engaging in a particular behaviour, especially human behaviour (Baser & Morgan, 2008).

Non-Governmental Organization: Voluntary group of individuals or organizations, usually not affiliated with any government that is formed to provide services or to advocate a public policy (GWP, 2012).

Operating space: A protected area within which participants can make decisions, experiment and choose and establish an identity, in short, can learn how to self-organize. Such a space can be physical, organizational, financial, institutional, intellectual, psychological or political (Baser & Morgan, 2008).

Organizational arrangements: Examples include operational efficiency, supportiveness of stakeholders, and financial viability (World Bank, 2011).

Participants: Individuals, either from the donor or the developing country, involved in any activity, from a discussion to a broad development activity (Baser & Morgan, 2008).

Participation: a much (mis-)used term used to describe involvement of "users" or "communities" in policy or service development. Levels of participation may vary from very low, tokenistic involvement with little effective impact through to exercising substantial control over policy or service development (OECD, 2009).

Participatory approach: Securing an adequate and equal opportunity for people to place questions on the agenda and to express their preferences about the final outcome during decision-making to all group members GWP, 2012).

Path dependency: Decisions made in the past are likely to have long-term impacts by binding, limiting or postponing alternative future options (Seppälä, 2004).

Performance: The ways in which organizations or systems apply their capabilities, and the results of that application in terms of the ability to deliver and to function. It is about execution and implementation; the result of the application and use of capacity (Baser & Morgan, 2008).

Policy: Any form of intervention or societal response. This includes not only statements of intent, such as a water policy or forest policy, but also other forms of intervention, such as the use of economic instruments, market creation, subsidies etc. (GWP, 2012).

Policy-related factors: Such as efficiency of administrative rules, laws, regulations, standards, including their clarity, consistency, and incentives for compliance (World Bank, 2011).

Post-construction support: The ongoing support to water service providers, be they community-based or private. It may consist of aspects such as monitoring support, technical assistance, training and re-training, and advisory services (Lockwood & Smits, 2011).

Professionalization (of community-based management): The process of gradual involvement of professional staff in community-based service providers, and application of professional management principles to the service provider. In its simplest form, it may involve the hiring of a paid staff member, such as a plumber or administrator. More advanced forms may involve the hiring of an external operator to carry out some tasks. It also entails the application of principles of professional management, such as performance-based management, with the view of operating the service provision at professional standards (Lockwood & Smits, 2011).

Resilience: The ability of a system to deal with shocks and disruptions without changing its fundamental nature or its ability to create value. (Baser & Morgan, 2008). The capacity of a

system, community or society potentially exposed to hazards to adapt by resisting or changing in order to reach and maintain an acceptable level of functioning and structure (GWP, 2012).

Results: The substantive development outcomes that represent improvements to human welfare, such as gains in health or education (Baser & Morgan, 2008).

Scaling up: Scaling up is a familiar term in the water and sanitation sectors but means different things to different people. We refer to scaling up as the combination of vertical scaling up, or the institutionalization of the functions and approaches that make sustainability possible, and horizontal scaling up, meaning the application of these principles in a broader geographical area (Lockwood & Smits, 2011).

Second-order or deep changes: Changes involving altering mindsets, patterns of behaviour, degree of legitimacy and the relationship between the formal and the 'shadow' system (Baser & Morgan, 2008).

Self-organization: The tendency of any open system to generate new structures and patterns based on its own internal dynamics; actors interact without central direction to create something of value or to make progress in addressing a problem of concern to all (Baser & Morgan, 2008).

Self-supply: The situation, in which individual households (or sometimes even a group of neighbours) invest in gradually improving their own service, and where the O&M is also done by the household themselves (Lockwood & Smits, 2011).

Service authority: Service authorities are the institutions that fulfil functions in relation to water supply, such as planning, coordination, regulation and oversight, and technical assistance, but not the actual service provision itself. Typically these authorities are located at the intermediate level and in most countries are carried out by local government (district, municipalities or communes) (Lockwood & Smits, 2011).

Service Delivery Approach: The conceptual approach taken at sector level to the provision of rural water supply services, which emphasizes the entire life-cycle of a service, consisting of both the hard (engineering or construction elements) and software required to provide a certain service level (Lockwood & Smits, 2011).

Service Delivery Model: The practical application of the principles behind the Service Delivery Approach to a given context, including agreed legal and institutional frameworks for delivering a service, the levels of service, and commonly understood and accepted roles for public, private or community actors (Lockwood & Smits, 2011).

Service levels: The normative set of attributes that describe the water service received. These typically include the quantity, quality, distance and continuity of the supply. These can be grouped into a service ladder (Lockwood & Smits, 2011).

Service provider: The institutions or individuals that deliver water to the users. They are responsible for the day-to-day provision of water, and include tasks such as operation, maintenance and administration of the water system. They may be community organizations, small private operators, public sector utilities or companies, or NGOs and faith-based organizations (Lockwood & Smits, 2011).

Stakeholder ownership: Examples include leadership commitment, stakeholder voice, transparency of information, and accountability (World Bank, 2011).

Structural features: The way societies are organized, the nature of their organizations, and the broad rules they live by (Baser & Morgan, 2008).

Sustainable development: Paths of progress which meet the needs and aspirations of present generation without compromising the ability of future generations to meet their needs. (GWP, 2012). Development which recognizes that meeting contemporary needs should not be at the expense of those of future generations. It also incorporates wider social and economic justice components and the recognition that there is a need for development which balances environmental, economic and social benefits (OECD, 2009).

Sustainable sanitation: The purpose of sustainable sanitation systems is the closing of the water and nutrients cycles (GWP, 2012).

System: An entity that maintains its existence and functions as a whole through the interrelationships of its parts or elements (Baser & Morgan, 2008).

Systems thinking: A way of mentally framing the world, focusing on processes more than structures or outcomes, and with systems functioning on the basis of relationships among people, groups, structures and ideas (Baser & Morgan, 2008).

Tangible systems: Formal structures and systems, plans, logistical systems, the number and deployment of staff, equipment, building and access to definable assets such as funding. Formal or tangible systems might include strategic planning, monitoring and evaluation, financial management, personnel recruitment systems and many others (Baser & Morgan, 2008).

Vulnerability: The degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes (GWP, 2012).

Water governance: The political, administrative, economic and social systems that exist to manage water resources and services and is essential in order to manage water resources sustainably and provide access to water services for domestic or productive purposes (GWP, 2012).

Water right: A water right is the right to use water - not to own it. Good water law recognizes and acknowledges existing uses and rights, including customary uses and aboriginal entitlements (GWP, 2012).

Water security: The availability of an acceptable quantity and quality of water for health, livelihoods, ecosystems and production, coupled with an acceptable level of water-related risks to people, environments and economies (GWP, 2012).

Water service: The provision of access to a flow of water with certain characteristics, as defined in the service levels (Lockwood & Smits, 2011).

ORIGINAL PAPERS

I

SANITATION, WATER AND HEALTH

by

Rautanen, S.-L., Luonsi, A., Nygård, H., Vuorinen, H. & Rajala, R. 2010.

Environment and History 16(2), 173-194.

doi: 10.3197/096734010X12699419057250

Sanitation, Water and Health

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ABSTRACT

This article focuses on sanitation, health and hygiene as themes of the 5th IWHA conference 2007. It investigates how understanding of the key concepts and the links between health, water and sanitation have changed over time. It identifies some of the key drivers that prompted these changes. The history of sanitation and hygiene is the history of epidemiology, medicine and public health, as well as the history of industrialisation, urbanisation and related urban misery. Since the first urban settlements appeared sanitation has also been linked to drainage and flood management. The conference papers and presentations discussed in this theme article provide insights into sanitation, health, water and urban development, including such specific themes as flood and rainwater management. The article initially focuses on early civilisations, then on health, broadening the scope to questions relating to economics and institutions in an attempt to identify a range of other drivers.

KEYWORDS

Health, water, sanitation, history, IWHA

Environment and History **16** (2010): 173–194.
 doi: 10.3197/096734010X12699419057250

1. INTRODUCTION

Water is about staying alive, about the health and biological needs of living beings. It is also about livelihoods, survival and development of human settlements and civilisations, about power and politics, about wealth and poverty, about 'ease' and 'dis-ease'. Humans use water for several distinct needs: drinking, cleaning, and productive practices such as livestock raising, agriculture, hydro energy production and navigation. All these activities have their impacts, or rather layers of impacts, on health, the environment and overall quality of life and wellbeing. Pollution and deteriorating water quality, flooding and water scarcity, as well as other problems relating to the allocation and distribution of existing water resources to various users and uses, are questions of life and death. Adverse impacts on water bodies and aquatic environments as well as their users are often defined as externalities: they are the unintentional and uncompensated side-effects of one person's/company's activities on another. In a globalising world with an increasing population and increasing complexity of human interaction the negative impacts are also global.

Water issues can arouse strong feelings, and issues like privatisation of water supply services can bring people to the barricades. The other side of the coin is less publicised. An estimated 2.6 billion people – roughly 42 per cent of the world's population – still have no access to improved sanitation.* Unfortunately it is not past history that there are approximately 4 billion cases of diarrhoea each year resulting in 2.2 million deaths, mainly due to a lack of clean water and poor sanitary conditions. These deaths represent approximately 15 percent of all child deaths under the age of five in developing countries. Cholera and typhoid fever also continue to devastate human life[1].

This 5th IWHA conference 2007 theme article focuses on sanitation, health and water. It investigates how the understanding of the key concepts and the links between health, water and sanitation have changed over time, in an attempt to identify some of the key drivers that prompted the change. It has been assumed that since the link between drinking water quality and health was established during the industrialisation period, sanitation and hygiene were of secondary interest. For many, the history of sanitation and hygiene is the history of epidemiology, medicine and public health, as well as the history of urban misery. Sanitation can also be linked to urban rainwater management and drainage. The question is: did sanitation and related public health issues evolve from the medical sciences, or can we distinguish other drivers, such as politics, economics, strive for modern standards of living and convenience, or even religion? Why is it still easier to talk about and invest in water services than in sanitation? What

* The WHO and UNICEF Joint Monitoring Programme for Water Supply and Sanitation (JMP) defined improved sanitation as: Connection to a public sewer; Connection to septic system; Pour-flush latrine; Simple pit latrine; Ventilated improved pit latrine

can we learn in the light of the IWHA 2007 Conference from the past efforts and processes of change, successes and failures, for a healthier future?

A total of 132 papers submitted for the IWHA 2007 conference were examined for this article, of which 27 were chosen. The article focuses initially on early civilisations, then on health, broadening the scope to questions relating to economics and institutions in an attempt to identify a range of other drivers. As with the other theme articles, a list of references is attached, including the full papers, abstracts of conference papers, and additional external references.

2. SANITATION AND EARLY CIVILISATIONS

Healing and ritual baths, as well as holy lakes and springs, have been thought to contribute to human health and well-being. Water has also captured the imagination of artists from time immemorial. The disposal of human excreta and drainage, on the other hand, has provided much less inspiration. Yet, as soon as human populations organised themselves into densely built settlements, these practical inconveniences had to be solved. Sewerage was closely linked to drainage and overall management of rainwater and flood protection in ancient urban habitats.

One of the earliest systems of wastewater management was constructed by the Harappan civilisation by the river Indus (3000–1500 B.C.). Mohenjo-daro and Harappa have ruins which show the great care taken to construct sewers. According to Hlavinek,[2] even if houses were connected to the drainage channels, wastewater was not permitted to flow directly to the street sewers: it had to pass through tapered terra-cotta pipes into a small sump for settling and accumulation of solids. The liquid overflowed into the drainage channels in the street when the sump was about three-quarters full. The drainage channels were covered by bricks and cut stones which were probably removed during maintenance and cleaning activities. The channel also included a cunnette which, according to Hlavinek, was probably constructed to convey the smaller flows associated with daily wastewater discharges, while the entire channel would only be used during wet weather events.

Another example is the Minoan civilisation which flourished on the Island of Crete from about 2800 B.C. to 1100 B.C. The ruins reveal an elaborate system of stone drains for sanitary sewage, roof runoff, and general surface drainage. These drains emptied into a main sewer that disposed of the sewage a considerable distance from the origin of the wastes. Furthermore, the ruins of the palace of Knossos reveal a two-conduit system: one conduit collected sewage and the other rainwater (Hlavinek). The motivation behind and financing of these structures is not clear, but one can presume it was convenience and water security, considering that rainwater was clearly collected to be used.

Drainage systems were also constructed during the Etruscan period; the same structures were later improved by the Romans. Hlavinek notes that ‘the engi-

neers of Rome were excellent developers of technology rather than originators'. Eventually, based on earlier experience on a smaller scale and the upgrading of the Etruscan structures, Roman engineers built probably the best known major public sewer in antiquity, the Cloaca Maxima – the Great Drain – to drain the marshy areas which eventually became the Forum (Fig. 1).

FIGURE 1. The Cloaca Maxima in Rome (Photo: T. Katko).

The Cloaca Maxima is a huge covered drain which, by the time of the late Republic, functioned both as the main storm sewer and a means of sewage disposal. The drain had a significant flow of water from the low-lying swamplands and as such, provided also a convenient medium for transporting waste. It drained into and consequently also polluted the River Tiber, which was used for drinking, bathing and swimming. Hlavinek points out that the Romans knew of the need for 'clean' water and the need to dispose of wastewater away from the source of drinking water – at least from the source of their own drinking water. Were the Romans concerned about those who drew their drinking water from the Tiber? It must be noted that what Romans considered 'clean water' would hardly be considered clean today. They shared the common belief of antiquity that good potable water must be running, odourless, colourless (clear) and tasteless (or good tasting). Stagnant, marshy water was to be avoided.[3]

3. DRIVERS FOR IMPROVED SANITATION AND WATER FOR HEALTH

Word origins: The word 'hygiene' derives from *Hygieia* (Ὑγιεία), the Greek goddess of health and the daughter of *Asclepius*, the god of medicine. In Rome Hygieia was associated with the goddess *Salus*.

3.1 Rise of the scientific era and the germ theory of disease

In the light of the examples of the previous section, urban drainage systems were viewed as serving the dual purposes of waste and storm water conveyance. The need to protect urban environments from flooding remained the main driver until the industrial revolution (c.1750–1850). Between the fifteenth and seventeenth centuries, towns in North Italy started cleaning the filth and rubbish from their drains to prevent diseases,[4] but it was only in the nineteenth century that hygiene and sanitation occupied the forefront in the struggle against illness and disease.

In Europe pollution and the need for sanitation were mainly brought to attention by industrialisation; to a lesser extent also by the development of modern agriculture. The Age of Enlightenment introduced the idea that science was an instrument of progress, and the subsequent rise of the 'scientific' era of medicine in the mid-nineteenth century finally also put sanitation and hygiene on the political agenda. This development was strengthened by the emergence of the idea of specific aetiology of diseases (in connection with the discovery of specific germs as a cause of specific diseases) in the late nineteenth century. Beveridge and Pflug,[5] among others, note that the beginnings of the modern organisational framework of water and sewage services in London can be traced back to the 1840s when the health of the city's population was seriously threatened by industrialisation, heavy pollution of the Thames and outbreaks of cholera resulting in demands for reform of the ways in which water was supplied, treated and disposed of within London.[6] Numerous other European towns and the rivers running through them, such as Paris and the Seine, faced similar problems in the mid-1800s. At that time, the Seine was truly a multi-purpose resource, suitable for both drinking and waste disposal as well as navigation. Euzen and Haghe[7] describe the eighteenth century as a key period in the relationship between Parisians and the river, which was such an integral part of their lives, but whose waters were becoming increasingly polluted.

3.2 Public opinion and the true incentives – Chadwick's report

The nineteenth century was a period of unprecedented and rapid population growth in the newly developing industrial towns of Europe. Fisher[8] identified three main drivers behind early public health initiatives in Britain during this period: the concern with public health; seminal events; and changes in governance.

There was a growing concern over the state of working class living conditions and public health in the 1830s. Fisher suggests that this was partly due to the reporting by Royal Commissions, journalists, social commentators and writers such as Dickens, Gaskell and Engels,[9] together with improved statistical evidence that the poor were increasing and dying younger.[10] Public opinion urged authorities to take action, shocked by Chadwick's Poor Law Commissioners' *Report on the Sanitary Conditions of the Labouring Classes* (1842) which made a link between unsanitary conditions and poor health. This was uncommon at the time, although similar claims had also been raised earlier, for instance in the context of prisons, slave ships and army camps. The view was further strengthened by such people such as Florence Nightingale whose remarkable work in nursing sick soldiers during the Crimean War (1854-56) has been extensively chronicled.[11]

The Chadwick report leaves room for debate. Some authors note that by establishing a connection between unsanitary conditions and poor health, it managed to divert attention from the fact that poverty and health are linked in a number of ways. Hamlin,[12] for instance, demonstrated how Chadwick ignored medical reports showing that disease among Britain's working classes resulted from a variety of conditions: destitution; horrible housing; poor water and sewage systems; long working hours in dangerous, toxic workplaces; and little education or training. Porter,[13] in reviewing Hamlin's work, noted how

> sewer construction appealed to middle-class sentiments. Sewers improved the town, and could be built without actually dealing with the dangerous classes. Clean water would bring clean morals. The subjective misery of destitution was replaced by the objective language of dirt, stench, pipes, drains, and dwellings. Often spurious data and projections suggested extraordinarily far-reaching benefits: Sanitary reforms would pay for themselves in lower rates of crime, disease, and political agitation.

3.3 Seminal events and political will

Fisher further identified seminal events which have influenced the political will to improve public health. They are related to experiences with and fear of death and disease such as cholera across all classes. According to Fisher, cholera first arrived in Britain in 1831, with subsequent major outbreaks in 1848, 1853 and 1866. At the time the medical profession strongly believed that it was transmitted via foul air. The view of Dr John Snow that it was far more likely to be transmitted by contaminated water was confirmed in 1854 when 500 deaths occurred in Soho, London, in the space of ten days in what is known as the Broad Street Pump Incident.[14] Snow identified one contaminated well by mapping out the cases. Yet, the prevalent belief in disease transmission through noxious vapours remained powerful till the late nineteenth century.[15] Dr Snow

also demonstrated that water drawn downstream of Thames, into which many sewers flowed, caused a death rate 14 times that of water drawn from upstream. In 1859, the water supply intakes were finally moved upstream of sewerage outlets and an intercepting sewer system was built on the Embankment to improve the flow of water.[16]

In Finland health became a factor in water supply and sanitation discussions when the 1879 Public Health Decree, containing provisions on pollution control, was enacted in response to the growth of industry and built-up areas. The country's wastewater treatment practice was primarily determined by public health engineering concerns. Over the last few decades environmental pollution control in Finland and other developed countries has become almost the sole driver for improved wastewater treatment.[17]

3.4 Cleanliness and hygiene

To Florence Nightingale (1820–1910), sanitation was a symbol of Western civilisation. After the Crimean War and the rebellion in India in 1857, Nightingale declared that 'it would be a noble beginning of the new order of things to use hygiene as a handmaiden of civilisation'. Nightingale was not alone: it has been argued that army medical officers had long been raising their voices in condemnation of sanitary conditions in military cantonments. Nightingale also made the still highly relevant observation that it was cheaper to promote health than to maintain people in sickness.[18]

The IWHA 2007 Conference papers introduced country- and city-specific cases, rather than individuals associated with breakthroughs. For instance, Malinova[19] describes how along with urbanisation and the development of science and technology in the second half of the nineteenth century, the mindsets of city inhabitants also changed. Malinova focuses on St Petersburg and its *dacha* territories in the 1840s to 1910s. New ideas on health spread among the educated layers of St Petersburg society, where the idea of the suburban *dacha* played a major role. To live in a *dacha* meant breathing fresh air that safeguarded health.

Alakbarli[20] introduced a tradition from Azerbaijan, Persia and Turkey where during the ninth to fourteenth centuries the aromatic oils of about 50 species of herbs and flowers were added to bath water or applied externally. Bathing and saunas were associated with good health and wellbeing from early on: Alakbarli writes how 'to maintain health, it was recommended that a person visit a bathhouse at least two or three times each week'. He further notes how these bathhouses served as both beauty parlours and health clinics.

Merviö,[21] in turn, introduced a well-established bathing tradition from Japan. It was a means of improving public health. Merviö provided an example from the city of Edo, Japan (later named Tokyo) to illustrate how a country that by definition was supposed to be pre-modern, and that due to its security concerns had limited foreign contacts, was still able to design large-scale sys-

tems that effectively minimised health risks, contributed to public health and cut environmental pollution and wastage of scarce natural resources. In Edo, the old system was so effective that when it was modernised at the end of the nineteenth century, the only major work required was to replace the wooden pipes with metal ones.[22]

3.5 Flood management and rainwater harvesting are still relevant

Rainwater management has regained interest in various parts of the world: it is still a relevant factor in managing drainage and sewerage and pollution control and water security. Koch introduced the debate in Germany sparked off by river pollution due to sewer overflows – especially from combined sewer systems – in the mid 1960s, which was a severe problem throughout the 1970s.[23] Similar debates could and should be conducted in numerous other countries as well: the choice between combined and separate sewerage is still relevant. Water security adds another dimension to the need of managing rainwater with more care: groundwater recharge and rainwater harvesting for direct use have potential. An example was presented during the IWHA 2007 conference by Wagle.[24] The warming climate has brought up this issue in areas like Scandinavia where winters seem to be getting wetter. Because rainwater enters sewerage by different routes, treatment plants may receive increasing volumes of cold water that reduce the efficiency of the biological process.

Drainage and flooding can also be seen in a broader context, such as the one presented by Germano,[25] who claimed that few historians have studied the social significance of urban flooding. Germano presented a case study of the 1913 flood in the city of Indianapolis, USA, and claimed that 'responses to flooding hold the power to reshape the cultural future of cities worldwide. Without acknowledging this power, communities echo and repeat responses to flooding that result in disjointed urban sprawl, unhealthy sections of cities, shifts in social power, and other undesired and unintended changes'.

4. SPECIFIC HEALTH HAZARDS AS DRIVERS

4.1 Discovering microbial life and understanding water quality

Establishing the link between microbial life, poor water and non-existent sanitation took a long time. Vesilind[26] points out that micro-organisms remained a mere scientific curiosity for some 150 years after Anton van Leeuwenhoek first discovered the microbial world with his simple microscope in the late seventeenth century. The idea that these small organisms could cause disease was considered unlikely. While all European cities suffered periodic epidemics of cholera, typhoid fever and other diseases in the nineteenth century, there were many theories of why these epidemics occurred. For instance, Chadwick,

like many others at the time, believed that odour was to blame: 'All smells, if it be intense, initiate acute disease'.[27] It has been argued that Chadwick and his contemporaries did not see odours themselves as the cause of the illnesses, but rather as an indication that *miasma* was present, that the disease causing agents were present in the air.[28]

Until the 1840s, when the first scientific analyses were carried out by pharmacists and chemists, knowledge about water had been exclusively based on sense perceptions and subjective experience: sight, smell, taste and touch made it possible to elaborate and regularly re-evaluate a certain hierarchy of different qualities of water. Perceptions concerning the quality of water were based not only sense impressions, but also on its origin, the nature of the terrain it traversed, and how rapidly it flowed.[29]

Drinking water standards were developed nationally in different industrialised countries during the early twentieth century. The need for safe and potable water became urgent with the increase in travel, particularly air travel, especially in the 1950s. Safeguarding of public health in the international community was entrusted to the World Health Organisation (WHO). WHO played an active role in developing international standards for drinking water, and sponsored a series of expert consultations and meetings in the 1950s. WHO also published a special water sanitation issue of the *Bulletin of the World Health Organisation* in 1956. After several years of preparation, WHO published the *International Standards for Drinking Water* in 1958, followed by revised editions in 1963 and 1971. The WHO Regional Office for Europe was active in the preparation of international standards and had *European Standards for Drinking Water* published in 1961, followed by a second edition in 1970. WHO further elaborated the international standards in the *Guidelines for Drinking-water Quality*. These appeared in three volumes: the first edition in 1984–1985, the second in 1993–1997, and the first volume of the third edition in 2004.[30]

Many countries are taking steps towards WHO drinking water quality standards. During IWHA 2007, Chikhladze and Dadiani[31] presented the case of Georgia, dividing the history of water quality in Georgia into three periods: The Soviet period (before 1990), the period of transition (1990–2000) and the period of development (2001 to present). During the Soviet period, Georgia had a lot of normative documentation but nothing conforming to international standards. During the transition period, existing normative documentation was unusable, but new documentation was not elaborated. The new water law was adopted by the Georgian government in 1997. From 2001 on a lot of documentation was elaborated concerning the epidemiological and hygienic norms of water, and in 2005 the Safety and Quality of Food Act was adopted and responsibility transferred from the Ministry of Health and Social Care to the Ministry of Agriculture of Georgia, Department of Food Safety. The statutes are not in perfect accordance with the guidelines set by EU and WHO.

Wastewater standards involve an altogether different dimension of water quality. Vesilind[32] points out that the initial objective of wastewater treatment was the destruction of microbial life, based on the realisation that infectious diseases, such as cholera and typhoid fever, are caused by microorganisms. Vesilind's paper focuses on the man credited with first realising the benefits of microbial action, William Dibdin, who in the late 1880s designed the first large-scale biological wastewater treatment plant. By 1900 Dibdin's reputation was established, and wastewater treatment plants using biological treatment processes were constructed in Great Britain and the United States. The British press hailed biological treatment of wastewater as a significant advance, but could not understand why it took so long to discover such a simple thing.[33]

Wartiovaara[34] noted how definitions of pollution link the concept of water quality to different human needs. He concluded by explaining how in the past the sector was characterised by low technology, low-intensity competition and unlimited abstraction rights, whereas presently high technology, insistence on high water quality and tough competition are the norm. For the future, Wartiovaara envisions application of simple technologies, regulated competition and global competition at various levels. Water, sanitation and related water quality and usability are no longer local issues.

4.2 Typhoid fever

Typhoid fever was one of the diseases which by the 1870s were considered to spread through contaminated water. In the late 1800s and early 1900s, typhoid fever was also a common disease in the United States. Kent[35] introduced the case of the City of Boise in Idaho, USA, where typhoid fever rates were similar to other cities. At one point, Boise's water supply was demonstrated to be the source of the disease, while at the same time the private water company was complimented for its efforts in controlling the spread of typhoid fever. Yet the City took no action to take over the supply. In 1900, a higher than average number of contagious disease cases were reported in the north end of Boise. This time the public water system was not blamed for the outbreak because many residences obtained water from private wells 'into which flows the slimy, germ-breeding corruption from cesspools and closets' (*The Idaho Statesman*, 4 February 1900). Typhoid fever outbreaks continued to plague Boise also later, and although the water supply was generally thought to be the basic cause, other sources were also identified, including vegetables, natural ice and dairy products. In 1905, 44 cases of typhoid fever were diagnosed in a two week-period. Eventually it was found that the source of the typhoid fever was untreated sewage from a small town upstream of Boise.[36]

4.3 Cholera

Cholera is another widely known and feared disease which still continues to kill. William Farr, one of the greatest public health physicians in mid-nineteenth-century Britain, believed that cholera was contracted through the atmosphere, via something he called 'cholerine', a zymotic material of cholera. Vesilind notes that Farr was an excellent epidemiologist and one of the first to apply statistics to disease prevention.[37] He plotted the incidence of cholera in London as a function of elevation above the River Thames. Yet, he concluded that cholera must be contracted via the air, the 'miasma' evaporating from the river that carries the 'cholerine' particles with it.

Now that the cause of cholera is well established, it appears to have become another key 'disease driver' in various countries for water and sanitation related development. Cholera makes news because severe, untreated cholera can lead to rapid dehydration and death: if untreated, 50 per cent of people with severe cholera will die. In numerous now-developed countries, cholera gave a boost to the development of modern water and, indeed, sewerage systems, as epidemics effectively forced water quality and sanitation issues on the public and political agenda. Yet cholera continues to be a real threat. In 2000 cholera cases and deaths were officially reported to WHO from 27 countries in Africa, 9 countries in Latin America, 13 countries in Asia, 2 countries in Europe, and 4 countries in Oceania.[38]

4.4 Lead

Lead is a toxic substance which, when present in drinking water, seldom originates from natural sources. Lead was well known already in antiquity, and because pipes can be quite easily made of it, it was widely used in water supply systems. It was, however, considered hazardous to health already in antiquity, and for that reason it was not a recommended material for water pipes. Despite several reports of waterborne plumbism (chronic lead poisoning), especially in the nineteenth century, the use of lead in plumbing systems continued. After the Second World War it was recognised that old lead pipes can expose people to elevated lead concentrations in water, but the major health threats from lead were found to be occupational exposure and children's exposure to old plasters and paints containing lead.

Replacement of old lead pipes, which are still part of many old water supply systems worldwide, has been considered too expensive.[39] Firstly, lead is a fairly durable pipe material. Secondly, it is believed that lead does not necessarily dissolve into the conveyed water if a protective layer forms on the inner surface of the pipe. The validity of that belief has not been established.

5. POLITICAL AND INSTITUTIONAL DRIVERS AND OBSTACLES

5.1 Reconstruction and urge for modernity as drivers

The history of sanitation is also the history of rising standards of living, modern housing and convenience. Sanitation is linked to the striving for modernity. Large European cities faced the challenge first, followed almost a century later by smaller cities. The conditions in London in 1858 were captured by the term 'Great Stink', which referred to the appalling smell of the heavily polluted Thames. It was increasingly felt that it was not acceptable in a modern city.[40] Vesilind[41] describes how 'the stench from the Thames was so bad that the House of Commons, meeting in the Parliament building next to the river, had to stuff rags soaked with chloride of lime (calcium hypochlorite) into the cracks in the shutters to try to keep out the awful smell.'

In many European cities sanitation was closely linked to the 1950s post-war reconstruction. The Second World War was a turning point also from the engineering point of view. Reconstruction and modernisation led to technical changes. Bertrand-Krajewski[42] lists the following factors which might explain these changes since the end of the 19th century:

- the increase of domestic and industrial water consumption, leading to larger flows in sewers with higher transport capacity;
- the development of asphalted roads with less solids entering the sewers;
- the decrease of large solids inputs (better waste collection);
- the lack of reliability of flushing systems;
- the high operation costs, especially when drinking water is used;
- the dilution of sewage, which has negative impacts on the efficiency of downstream wastewater treatment plants;
- the development and use of other more efficient devices using less water with a higher efficiency, like e.g. high-pressure jetting or vacuum suction used in upstream sewers where most tanks were installed.

Aarnio[43] notes how Finland, among others, wanted to be a welfare state after the war. Water supply and sewerage systems of towns were seen as symbols of modern Finland in the same way as railways. Aarnio writes:

> the new buildings were equipped with all modern conveniences. Apartments were warm, sunny and clean. Many former back-breaking works became easier with the water pipes and sewers. People who moved into their new homes described them as a paradise or a heaven. There were bathrooms, water closets and modern kitchens with sinks of rustless steel.

Aarnio also points out how 'housing comforts were part of the bigger whole; both materially and mentally, when people were at the beginning of a new era' .

Aarnio describes how the coverage of water closets in the City of Turku, Finland, evolved from 2.3 per cent in 1910 to 29 per cent in 1950 and to 96.7 per cent in the 1970s. Wastewater treatment, however, did not evolve at the same pace. The first wastewater treatment plant was completed in 1972, and by 1976 practically all households were connected to the system.[44] Before then, septic tanks were used following the example of Stockholm, Sweden. Already in 1905 each house with a WC was expected to build a septic tank system, and in 1919 the city established the post of an inspector who monitored the condition of septic tanks.[45]

The relatively late introduction of the flush toilet system in Finnish and other Scandinavian cities resulted from the fact that, before about 1905, most city officials opposed the building of water closets, fearing water pollution and related health risks. The first water closets in Finland were built in Vyborg and Helsinki by rich businessmen in the 1880s, but the Finnish Senate forbade their use. In the early 1900s the practical arguments put forward by the proponents of the flush toilet system already overshadowed the more diffuse health arguments supported by scientists which started the cultural revolution of moving the toilet from the backyard into the house.[46] One might argue that it was a manifestation of the engineering profession overriding the wishes of the medical profession in sanitation.

5.2 Sanitation – an economic driver or obstacle?

Many international stakeholders today agree that inaction on sanitation and hygiene is not a viable development option: failure to invest in the improvement of sanitation and hygiene will undermine any efforts to promote economic growth and poverty reduction. Of course, that idea is nothing new, as shown above: a modern city just cannot allow a 'Great Stink' within its borders. Sanitation is an economic question, of which reformers such as Nightingale were well aware. McDonald[47] described Nightingale's profound understanding of the political process as he wrote: 'In a democracy there must be political will to achieve change: questions in the House of Commons, media coverage and the good will of the relevant professionals and opinion leaders.' According to McDonald, Nightingale actively approached both royal commissions to have the right people review the reports in the right journals: she knew the circulation of the major periodicals, and she understood the importance of getting a story or letter-to-the editor into *The Times*. Nightingale essentially conceptualised the welfare state with her vision of a profoundly reformed system. In her vision, the private sector was largely running the economy, while necessary measures were taken for income security, savings and pensions, employment stimulation in bad economic times, better housing, provision for the disabled, aged and chronically ill, and a comprehensive system of public health care. We may take

this as an example of how sanitation and hygiene indeed are embedded in the broader context of the economy of a state.

At the IWHA 2007 Conference, Mäki,[48] among others, linked water and sanitation to economics. He raised important questions relating to municipal sanitation and even water improvements in his comparison of two South African cities: Grahamstown and Cape Town. There the supposed beneficiaries were not very enthusiastic about the reforms, and Mäki wondered why the working class was against improvements that were supposed to improve its living conditions. Why did they not see it in their interests to get drains and sewers working properly? Mäki pointed out that even the expected improvements in the health situation did not change the attitude of the working class:

> 'the 'conservatives' resisted reforms because they realised they would have to pay for them; the underclasses rejected water schemes because they feared an increase in rents, and similarly saw water schemes to be in the benefit only of the merchant and commercial interests.'

Mäki continued, 'there were allegations that municipal leaders were just thinking about their own interests'. In Grahamstown, where political and social distinctions between different groups were not very clear, municipal conflicts were mostly based on personal and religious grounds.

In a European perspective, an additional, seldom recognised driver could be identified, i.e. the 'business' driver or the need for fertilisers for the fields around growing cities. The idea of collecting biological waste for farm use was suggested already in late-eighteenth-century Paris. Later, the push for separate collection of biological waste was discussed in the context of water pollution control and the need for sewers and thus became a health-related issue.[49] The health issue is still relevant in many peri-urban areas in the fast growing metropolitan cities of developing countries which rely (partly) on peri-urban agriculture for food security. Reuse of wastewater, usually in an uncontrolled manner, is a daily practice. There are certain drivers for increasing safe hygienic use of excreta and wastewater in agriculture worldwide. These include increasing water scarcity and stress, degradation of freshwater resources resulting from the improper disposal of wastewater and excreta, population increase and the resulting higher demand for food and fibre products, and the growing recognition of excreta as a nutrient resource.[50]

5.3 Institutional fragmentation as an obstacle

Institutions are often defined as formal and informal collective rules of behaviour involving laws, contracts, conventions and codes of conduct, which regulate human interaction and limit individual choices. An additional dimension of that framework is good water governance, which 'refers to the range of political, social, economic and administrative systems that are in place to develop and

manage water resources, and the delivery of water services, at different levels of society'.[51] The key determinants of good water governance are protection of public health and safety, environmental protection, accountability, transparency, user participation, gender and equal opportunities, balancing equity, efficiency and effectiveness of performance, financial sustainability and transparency.[52] All are highly valid dimensions of sanitation and wastewater management. Yet, in the case of sanitation, good governance has been and still is difficult to define. Sanitation has often been viewed as an add-on to water supply, but as became evident earlier, sanitation also includes drainage and rainwater management in urban areas, as well as solid waste management and vector control. The institutions in charge of these multiple tasks are equally varied, from those dealing with public health to those dealing with infrastructure services (water, drainage, waste) or the environment.

Beveridge and Pflug[53] described the institutional development of water services in the UK and Germany. In London, private water companies, operating under a competitive system, supplied water to the city since the late eighteenth century, while wastewater and river management services were not yet fully developed.[54] As indicated earlier, the growing population and economic activity led to increased pollution and problems in supplying clean water, and eventually to the 'Great Stink', which referred to the appalling smell emanating from the heavily polluted Thames around 1858.[55] The response at the time was a gradual shift towards municipalisation of water services throughout the second half of the nineteenth century. Water was increasingly considered a public good, and local authorities began supplying water free of charge to the city's poor. At the same time, legislation prompted the development of London's water supply and sewage system as well as the creation of a regulatory framework to tackle the problems of sanitation and pollution, which were increasingly regarded as unacceptable in a modern city.

There are also rare cases where wastewater management has been managed by private operators. Britto[56] introduced such a case from Brazil, where Rio de Janeiro had private, mostly British, companies operating public services in the mid-1800s. Interestingly, in 1876, the city's water supply was run by the state, whereas its sewerage was run by a private company created in 1857 by the association of British and Brazilian capital, under the concession of the monarchical national government. One of the main reasons for direct state intervention was the rapid growth of the urban population and the sanitary problems associated with it, such as cholera and smallpox, which threatened the entire population irrespective of social class.

Britto identified two co-existing drivers of sanitation in the last decades of the nineteenth century and the beginning of the twentieth century: 1) *public health* which was promoted by the medical professions and associated with the control of diseases originating from environmental conditions; and 2) *city expansion*, i.e. the idea of preparing space for city expansion, filling up flood

plains, channeling rivers, controlling landfills and eliminating risk areas like wetlands and ponds, which due to environmental conditions were potential sources of epidemics. Later on, by the mid-1950s, a new concept of sanitation, designated 'basic sanitation', arose, introducing a new group of specialists, the sanitary engineers. More recently, in the 1990s, a new dimension has been added to environmental quality: the concept of environmental sanitation. Britto focuses on the historical evolution of these concepts using Rio de Janeiro as an example.

Bohman[57] argued that institutional change in the water supply and sanitation sector must be considered in the context of broader societal trends, as a mirror of the country's economic and political history. Bohman analysed the institutional changes in Ghana, from 1965 when the Ghana Water and Sewerage Corporation (GWSC) was established until 2005 when a contract was signed with a Dutch-South African joint venture.

> In line with general efforts of decentralization, responsibilities for sewerage were now devolved to the waste management departments of the district assemblies. All other aspects of waste management including liquid waste from septic tanks, were handled by the waste management departments, hence it was expected that this aspect would be better taken care of at this level. (…) While the initial argument for a common water and sewerage authority was that water and sewerage require joint planning, it is now believed in the principle of specialization and decentralization, hence local authorities through their waste management departments are expected to handle the sewerage aspect better than central government bodies. My impression is that in the decentralization process there is also an element of 'getting rid of the unwanted' (…).[58]

Wastewater remains the unwanted in numerous cases.

5.4 Sanitation and hygiene in developing countries – history in the making

Before the industrial revolution, people of the northern hemisphere lived in health conditions comparable to those of the rest of the world: trachoma, tuberculosis, typhoid fever, malaria and leprosy were as common throughout the world as they are today in the developing world. Kabange and Mara[59] refer to a classic work which presents deaths by age in London in October 1764. It found that 50 per cent of the deaths occurred among children under five years, a situation worse than that found in the poorest nations of the world today. Because of the extremely high childhood mortality, life expectancy at birth in the industrialised towns of England in 1840 was 17 years.[60] Lack of clean water and sanitation, inadequate personal hygiene, poor housing and malnutrition were identified as the fundamental reasons for the high prevalence of diseases. The situation in developing countries is today as alarming as in England then, if not worse.

Kabange and Mara,[61] as well as Fisher,[62] compared the case of present day developing countries to those of industrialising Europe. Several other presenta-

tions focused on the more recent history of sanitation and health in developing countries. Adane[63] presented experiences from the development and implementation of a rural sanitation strategy in the Amhara Region of Ethiopia. Ferede and Suominen[64] provided further dimensions by describing the development of community financing and experiences from its implementation in rural water supply and sanitation in Ethiopia. Dukuduku[65] described how water supply, sanitation and hygiene education have been integrated in Tanzania. Rautanen- showed that sanitation and hygiene promotion (Fig. 2) have remained an add-on to water supply projects and development plans without very much substance or budgeted funds.[66] For instance, in Nepal the importance of sanitation was acknowledged very early in national development plans, but focused action is very recent. Skyttä[67] outlined the lessons learned in World Bank funded projects over the past decades, noting how sanitation has proven to be a complicated component to implement.

FIGURE 2. Local latrine builders in training in Nepal (Photo: S-L Rautanen).

6. CONCLUSIONS AND RECOMMENDATIONS

A number of presentations dealt with large water systems, such as transboundary waters, dams for hydro power and/or irrigation, and related ancient systems. The majority of the papers acknowledged the problems related to deteriorating water

quality, pollution and scarcity. They very rarely mentioned health, sanitation, wastewater or generally the need to manage both point and non-point sources of pollution. Quite surprisingly, the classical nineteenth century authors, who have been considered fundamental for the history of sanitation, water and health, were very seldom referred to at IWHA 2007. The British Edwin Chadwick (1800–1890) and John Snow (1813–1858) were represented, but such important individuals as the Germans Max von Pettenkofer (1818–1901) and Robert Koch (1843–1910) were not mentioned at all. Both the groundwater theory of von Pettenkofer and the bacteriological theories based on Koch's findings have had a great influence on the practical implementation and scientific justification of building sewers. All in all, the presentations at the congress on the development of different aspects of personal and public hygiene during the nineteenth century – the most important epoch in the modern history of sanitation, water and health – covered the subject field to a quite limited extent.

The question posed was: Did sanitation and related public health issues evolve from medical sciences, or can we distinguish other drivers, such as politics, economics, the strive for modern standards of living and convenience, or even religion? We did! The earliest driver appears to have been the need to remove human excreta and other wastes from densely populated urban areas. It is as ancient as urban environments and city states themselves. Urban drainage systems were considered to serve the dual purposes of waste and storm water conveyance. The need to protect urban environments from flooding continued to be the main driver until the industrial revolution (c.1750–1850).

Improved public health became a significant driver in the nineteenth century, first based on the miasma theory, and later based on the germ theory of disease. Improvement of public health should be a strong driver, but it often came second to those with obvious, direct economic benefits. In Europe and the United States public health was closely linked to industrialisation and the rising standards of living in urban areas which made 'modernity' and convenience into strong drivers, as hinted by a number of authors. The concept of 'modernity' is still a significant driver. Yet, can we see alternative courses of action towards that which is perceived as 'modern' today? We would recommend more detailed research into antecedent circumstances and contemporary factors contributing to problems and alternative courses of action – how and by whom were the alternative scenarios discussed – if at all?

What can we conclude about our future health in light of the IWHA 2007 Conference, based on past efforts and processes of change, successes and failures? First, that the debate is not over, not even from the purely technical point of view. The debate is also closely to the economic aspects of sanitation and health. For instance, sanitation and wastewater management have suffered from institutional fragmentation from very early on and still do. Whilst water supply has been a pleasant and potentially profitable activity, wastewater management has not. Many countries still face the dilemma: who should be in charge of

sanitation and wastewater management? Why is it still easier to talk about and invest in water services than in sanitation?

Theoretically, sanitation planning and wastewater management interventions and policies (public health goals and pollution control) should be integrated into urban and environmental/river basin development, even into water resources management. Ideally, holistic thinking results in the most effective identification of infrastructure needs, control, incentives, interventions, and allocation policies. It should also address social objectives within the framework of particular social, economic, political, technical and environmental constraints. From the economic point of view, this is too big a task, as it raises sensitive questions about land and property rights and sparks off environmental debates.

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II

COMMUNITY-DRIVEN MULTIPLE USE WATER SERVICES: LESSONS LEARNED BY THE RURAL VILLAGE WATER RESOURCES MANAGEMENT PROJECT IN NEPAL

by

Rautanen, S.-L., van Koppen, B., & Wagle, N. 2014.

Water Alternatives, 7(1): 160-177.

Online:
http://www.water-alternatives.org/index.php/alldoc/articles/vol7/v7issue1/239-a7-1-10/file

www.water-alternatives.org Volume 7 | Issue 1

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

Community-Driven Multiple Use Water Services: Lessons Learned by the Rural Village Water Resources Management Project in Nepal

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ABSTRACT: This article examines community-driven multiple use water services (MUS) as pioneered by the Rural Village Water Resources Management Project (RVWRMP) in the Far and Mid-Western development regions of Nepal. These regions are characterised by poverty, remoteness, rugged terrain, food insecurity, water scarcity, and post-conflict legacy. Water provision for domestic and productive uses provides opportunities to address poverty and livelihoods in environments with highly decentralised governance. This study explores the first-hand lessons learned in the RVWRMP in Nepal since 2006. This project is embedded within the local government. Key project entry points are decentralisation, participation and empowerment. This article reflects how the community-managed systems are used for multiple uses whether they were designed for it or not. It focuses on household- and community-level changes and related institution building and participatory planning through Water Use Master Plans and a Step-by-Step approach. Recommendations are made for scaling up multiple use services.

KEYWORDS: Multiple-use water services, local governance, Nepal

INTRODUCTION

Secure water supplies, irrigation, environmental sanitation and also renewable energy are vital for alleviating poverty by opening up livelihoods opportunities and improving food security and health. Communities with agriculture-based livelihoods depend in many ways upon water (van Koppen et al., 2009). Many countries have a long tradition of communities developing their own multiple water sources for multiple benefits. In Nepal, ancient traditional irrigation canals, medicinal springs, sacred ponds, and waterspouts are still in daily use and constitute an integral part of culture, religion, and well-being. The sustainability of some of these ancient structures indicates high initial quality and strong willingness and ability of the users to contribute to their maintenance.

Nevertheless, sustainability of rural water infrastructure, whether constructed by the community or by any external agency, is not to be taken for granted either from a technical, financial or institutional point of view. A recent study on the functionality status of public water supply and sanitation in Nepal found that while the coverage for piped drinking water supply was high at 80%, only about 18% of the systems were functioning well and delivering the expected services fully (Department of Water Supply

and Sewerage, 2011). Similar findings are reported elsewhere (World Bank, 2004; Lockwood and Smits, 2011).

In the development literature various reasons have been identified and solutions have been proposed, but empirical insights in factual implementation of these solutions are still scarce – a void that this paper seeks to fill. One of the common reasons for lack of sustainability is the top-down planned and constructed infrastructure that is cast off on communities without true participation, capacity building, and consequent feeling of ownership from the community's side. This applies to community-managed water supply, micro-hydro power and irrigation systems alike. A water services paradigm is needed that ensures the sustainable provision of water of an agreed quantity, an agreed quality, at a given time, with agreed reliability, and at an agreed site. These services have both hardware and software components. Hardware components concern infrastructure or technology including issues such as technology availability, spare parts, engineering skills, or water resources assessments, while software components represent issues such as support for institution building (leadership, rule setting and enforcement), water allocation and conflict resolution. Another important aspect is the continuity of services: services are not time- and location-specific 'once-off projects' that are finished once the Users Committee is trained and the scheme is physically completed. Rather, services are continuous and provide for post-construction technical and institutional support as well (Lockwood and Smits, 2012).

The importance of decentralisation, participation, and empowerment in the general global thinking on the roles of communities, governments, NGOs, donors, and civil society in sustainable services delivery, is equally valid for water services delivery. This relates to accountability, transparency, user participation, gender and equal opportunities, balancing equity, efficiency and effectiveness in performance, and financial sustainability (Rogers and Hall, 2003). Interactive participation strives to empower the communities to be the leading decision-makers, planners and implementers. As community members are encouraged to use their own knowledge, abilities, and local materials and techniques, the project benefits from local skills and resources. Numerous studies have discussed the merits and challenges of different degrees of participation, and the problems of supply-driven conventional top-down approaches. Interactive participation has been considered the most advanced form of community participation. It can be defined as "a process that encourages joint analysis of information leading to action plans and the creation of new local institutions or the strengthening of existing ones" (Gomez and Nakat, 2002). Learning good practices in procurement, logistics, decision making, and financial management are foundations for the future professional management; this is specifically relevant where the complexity of the infrastructure calls for professional service delivery rather than for a system that builds on volunteerism.

Empowerment is another important foundation for future sustainability when the users are expected to maintain and operate, even further fine-tune, improve and extend their water services. Empowerment can be a goal in its own right in local development, including the development of community-managed rural water services. Aslop et al. (2006) define empowerment as a group's or individual's capacity to make effective choices and then transform these choices into desired actions and outcomes. Empowerment and related capacity-building are also needed for building local resilience for changes. Pahl-Wostl et al. (2008) note how uncertainties such as variability in weather, impacts of climate change, and changing socio-economic conditions provide new challenges that cannot be tackled within the established technology-driven command-and-control management paradigm. This prevailing paradigm is based on a firm belief that risks can be quantified and optimal strategies chosen, that there can be controllable and predictable technical infrastructure based on fixed regulations. Pahl-Wostl et al. (2008) call attention to the notion of 'living with water' where the limits of control and the importance of uncertainties are clearly acknowledged. The authors note how "this cultural framing supports integrated solutions and the implementation of a multi-functional landscape with an increased adaptive capacity of the system" (Pahl-Wostl et al., 2008).

In Nepal, the above is particularly relevant. People in Nepal have always lived with water in a rugged landscape where uncertainty is certain: landslides, floods, weak winter rains, and unpredictable behaviour of the monsoon do not come as a complete surprise. Increased intensity of human activities has accelerated natural processes making them more unpredictable, and such activities as road cutting, overgrazing and deforestation have contributed to even more unstable mountain sides in Nepal. Even normal variability in weather patterns has adverse impacts in the driest corner of Nepal where less or complete lack of winter rains translates immediately into food deficiency and water scarcity.

Decentralised, participatory and empowering water services will also build on communities' realities of managing multiple water sources for multiple uses. Many studies have shown that water services typically enable multiple uses, also when the infrastructure was designed for one single purpose (Smits et al., 2010). Multiple uses and the related multifaceted appreciation of water are inbuilt into the Nepalese culture and tradition. Yet, this is hardly reflected in the delivery of public water services and related sectoral policies. Public services are compartmentalised and fragmented with single mandates (either domestic, or irrigation, or hydropower). Interventions remain parallel, irrespective of communities' own priorities about next steps of improving their access to water for multiple purposes to improve their livelihoods. Sector-specific policies promote a single mandate and guide the related institutions accordingly. For example, Drinking Water Supply Users Committee or Micro Hydro Users Functional Groups throughout Nepal are expected to cater exclusively for the given sector, and are expected to operate within the sector-specific policies, standards and practices. At the same time, there are also policies that allow working across the sectors, providing a potentially useful policy frame of reference for ways in which the users' groups should be organised and operate, even across prescribed sectors. Examples in Nepal include the Local Self-Governance Act 2068 and those related to the multi-purpose cooperatives.

Globally, a new approach has emerged since the early 2000s that seeks to overcome these sectoral divides and enhance sustainability: multiple-use water services (MUS). MUS can be defined as "a participatory, integrated and poverty-reduction focused approach in poor rural and peri-urban areas, which takes people's multiple water needs as a starting point for providing integrated services" (van Koppen et al., 2009). The operative word here is water service as MUS represents "a new and alternative way of thinking about water services provision for sector agencies, in the sense that MUS fundamentally changes the objectives of water services provision, and the expected impacts they can generate" (Smits et al., 2010).

While there is global consensus that the application of the general principles of decentralisation, participation, empowerment and MUS is likely to lead to more sustainable water services delivery in Nepal and elsewhere, there are still very few real-life efforts to apply these principles. The RVWRMP in Nepal is one of the few projects that pioneered participatory approaches to MUS at scale, being embedded in local government. It provides any combination of the following services: drinking water supply, water for sanitation and hygiene, both conventional and unconventional irrigation, micro-hydropower (community-managed hydropower), improved water mills, and water for livestock. This project started moving beyond the conventional sectoral barriers of the domestic and productive sectors. While the MUS approach is increasingly accepted, there is even less evidence on whether and how it can be made to work on the ground in Nepal or elsewhere. The present paper also fills that gap.

OBJECTIVES AND METHODOLOGY

The purpose of this study is to analyse the experiences of the RVWRMP in implementing a MUS approach in order to identify strengths and weaknesses of the services to sustainably meet people's multiple water needs, including the needs of marginalised groups.

The RVWRMP is fully embedded into local government structures, so it is expected that if the MUS approach works in these remote regions, it should be possible to apply the approach through local

government structures in other parts of the country as well. Hence, the present study will inform policy debates on community management, service delivery models, sustainability and, generally, how to address poverty through water sector development, both in rural Nepal and, indeed, elsewhere.

The analysis and structure of this paper follow the conceptual framework presented in van Koppen et al. (2009). It focuses at the household, community and intermediate levels, drawing conclusions and recommendations for intermediate, national and international levels. The specific questions, and the structure of this paper, are organised accordingly:

At the household level the study addresses two aspects: the change in service levels before and after the schemes were completed, and the productive uses of water schemes originally designed for domestic uses only.

At the community level of the Village Development Committee (VDC), the questions are:

- *Inclusive community institutions*. What are the institutional arrangements at the community level for planning and implementing schemes? What kind of tools guide remote isolated and less-experienced communities through potentially complex sets of choices and actions to be taken?
- *Sustainable water sources.* How are water sources identified? Appropriate technology: What are the actual technology choices? How do these serve people's multiple needs?
- *Financial arrangements*. What are the costs of different options? What kind of financial contributions and arrangements are in place?

At the intermediate (District Development Committee) level, the questions relate to participatory planning, strategic planning and coordinated long-term support.

The conclusions synthesise the strengths and weaknesses identified and formulate recommendations for RVWRMP, national and international policy-makers.

The methodology used is both quantitative and qualitative, drawing on materials and data from RVWRMP covering the period of September 2006 to June 2013. Quantitative data were derived from the Water Use Master Plans (WUMPs) prepared in 2007/2008 that served as baseline data at the time. These were compared to the data collected in 2010/2011 when the WUMPs were updated for the project's Phase II. These covered all VDCs in the hills. The qualitative analysis utilised the primary data collected through field visits and interactions with the communities, the local governments and other district-level stakeholders, and the project staff members to enrich and triangulate all information. Before answering the questions, background information is provided on the country context of Nepal and RVWRMP.

STUDY BACKGROUND

Country context of Nepal

Nepal is predominantly a rural society with 83% of the population living in the rural areas (Central Bureau of Statistics, 2012). This mountainous country of diversity has 26.5 million people and more than 100 caste/ethnic groups with some 60 distinct languages or dialects. Extreme slopes, high snow-blocked passes, seasonally flooding rivers and landslides, as well as tropical lowlands with tropical dangers, such as malaria, have historically led to strongly localised cultural and religious patterns. Against this background local governance is nothing new: local decision-making and taking action accordingly have been a matter of local survival.

The regional disparities within the country remain evident. Nepal's decade-long civil war came to an end in 2006 but the overall political instability continues. It has had a severe impact on Far and Mid-Western development regions. These remain the least developed regions in Nepal measured by

practically any development indicator and when compared to the rest of Nepal: gender and social discrimination indices, life expectancy, literacy rate and GDP per capita stand out (UNDP, 2009). The Far and Mid-Western regions are also consistently food-deficit. The soil quality is poor and access to fertilisers low, the rain-fed agricultural techniques relying on age-old manual methods and oxen. The RVWRMP mid-line study in 2011 found that in most of the working VDCs household production is typically only sufficient to meet demand for 3-5 months of the year. This is critical for farming communities that rely on their own production. Consequently, there is a high seasonal migration over the border to India for low-paid unskilled labour.

Far and Mid-Western regions are seasonally water-scarce and generally dry compared to the rest of Nepal. The average annual rainfall of the country is about 1530 millimetres (mm) with sharp spatial and temporal variations in rainfall. Rainfall distribution varies in both north-south and east-west directions. The monsoonal rain which accounts for 80% of the total rainfall, declines westwards: whilst eastern Nepal receives approximately 2500 mm of rain annually, the Far-Western Nepal receives 1000 mm (Government of Nepal, 2008). Unpredictable and missing winter rains in RVWRMP working VDCs means that most of the 6 m^3 rooftop rainwater harvesting tanks constructed remain empty for a large part of the year; this has not encouraged others to request for these systems. Yet, rainwater harvesting is of high importance in terms of capturing large amounts of rain for recharging seasonally drying water sources, and for irrigation and livestock.

Rural village water resources management project

RVWRMP is a development cooperation project supported by the Governments of Nepal and Finland. RVWRMP is fully embedded into the lowest tiers of the local government structures. In June 2013, RVWRMP had 73 active VDCs in Achham, Baitadi, Bajhang, Bajura, Dadeldhura, Dailekh, Darchula, Doti, Kailali, and Humla districts selected according to the poverty indicators and water-related coverage of infrastructure service. RVWRMP aims to improve the quality of life of the local people and environmental conditions, and to increase opportunities to rural livelihoods through rational, equitable, and sustainable practices of water resources planning and use. To achieve this, the project enhances local capacity to manage local water resources sustainably, and provides technical, financial and management support to increase access to sanitation, drinking water supply, community-managed irrigation, and small (micro) hydropower and improved water mills, and any combinations of these that the project defines as multiple use systems (in the project, but not in this paper, also abbreviated as 'MUS') in the sense of infrastructure designed for multiple purposes. The overall approach is holistic, participatory, inclusive, and bottom-up.

RVWRMP Phase I (2006-2010) piloted water services that were specifically designed to serve multiple uses, rural micro-finance, and sustainable livelihoods through home gardens and value chain development to address poverty and food scarcity. In Phase II (2010-2015), these are being scaled up across all working areas with an increasing awareness of the diversity of available technological options and their livelihoods applications. Micro-financing through formal multi-purpose agricultural cooperatives as well as through informal saving and credit groups is closely linked to overall livelihood development. MUS can serve these needs by making water available and hence opening up opportunities that did not exist previously.

FINDINGS AND DISCUSSION

Household-level findings

This chapter reflects the changes in access to water comparing the baseline made in 2007/2008 with the mid-line study made in 2010/2011 when updating the existing WUMPs in 47 hill VDCs. While most of the data directly supported the communities in an update of their WUMPs, it also served the project

as the mid-line study, being baseline for Phase II. The data for the mid-line study were collected by the same people who facilitated the WUMP update process in each VDC. Data collection formats were prepared for VDC-level, cluster/ward-level, schools, households, health posts, and community organisations. The enumerators/facilitators were trained and supervised by the project staff. The sample size for the household survey was 10% of the total number of households in each VDC, with a minimum sample of ten households in each ward, and a total minimum of 90 households. The sample had to cover a representative proportion of households from each ethnic/caste group living in each VDC. See RVWRMP (2011) WUMP Review and Baseline Guidelines for the complete process and all formats. The originals were in Nepali.

Most of the WUMP priorities identified in 2008/2009 related to drinking water supply, and consequently, 59% of the schemes completed in Phase I were gravity-flow piped drinking water supply schemes. Yet, as has been observed thereafter, most of these are used as multiple-use system. As is evident in tables below, there were in total 5352 more households identified in 2010/2011 compared to the original WUMP baselines. This can be explained by how the people defined or rather, identified, their household and who belonged to it, given the large number of households with extended families, and by the fact that the first batch WUMPs did indeed miss out clusters of houses.

The Service Level score is a composite indicator of five parameters: quantity (litres per capita per day), continuity of service (hours/day), reliability of the service (months/year), water fetching time (collection time, including travel to the water point, waiting, collecting and carrying the water back), and water quality (as assessed visually, i.e. water quality was ranked as 'good' if no possibility of contamination was observed). In the mid-line study 27% of the households had reached the best Service Level 1, up from 6%. Overall, by the mid-line study more than half (59%) of the households were within the Service Levels 1 and 2, up from one-third (35%) only a few years earlier.

Table 1. Changes in service level 2007/2008 compared to 2010/11 in 47 VDCs.

Year		Service level				Total Households
	Unit	1	2	3	4	
2007/2008	No. households	2178	10,598	10,377	13,934	37,087
	% of total	5.9	28.6	28.0	37.6	100
2010/2011	No. households	11,359	13,481	8896	8703	42,439
	% of total	26.8	31.8	21.0	20.5	100

Source: RVWRMP WUMPs 2007/2008 and RVWRMP WUMP review data 2010/2011.

Water fetching time is one of the parameters and directly related to MUS: it is assumed that the longer the water fetching time, the fewer the MUS applications. Table 2 shows how water fetching times have decreased. In 2010/2011, almost half of the households are within the 'best' time bracket compared to one-fifth in the baseline. In terms of quantity of water available the change is more subtle, yet, apply to 8042 households: in 2007/2008 out of 37,087 households 69% had more than 45 litres per capita per day available. In 2010/2011 out of 42,439 households 79% faced the same situation (Table 3).

The rising service levels have opened up new opportunities by making water available near the households. For instance, according to the May 2013 monitoring data collected for the project from each working VDC, the home gardens, which are new in this area, have now been taken up by 11,581 households which did not have home gardens previously (RVWRMP monitoring data, May 2013). The project promotes the use of tap stand drainage for irrigation of home gardens, among others. In a focus group discussion with 32 representatives from 12 drinking water supply schemes in May 2013, all

stated that it used to take them more than half an hour to fetch water and that at that time none of them had a home garden. Now with the new gravity flow piped water near their houses, all had home gardens and six respondents had increased the number of their livestock.

Table 2. Changes in water-fetching time in 47 VDCs.

Water fetching	2007/2008		2010/2011	
Minutes	Nb. households	%	Nb. households	%
< 15	7615	20.5	20,197	47.6
>15-30	13,452	36.3	11,847	27.9
>30-45	8808	23.7	6181	14.6
>45	7212	19.4	4214	9.9
Total	37,087	100.0	42,439	100.0

Source: RVWRMP WUMPs 2007/2008 and RVWRMP WUMP review data 2010/2011.

Table 3. Changes in water quantity in 47 VDCs.

Water quantity	2007/2008		2010/2011	
Litres per capita per day	Nb. households	%	Nb. households	%
< 45	25,547	69	33,589	79
25<45	5625	15	5140	12
15<25	2516	7	2064	5
< 15	3399	9	1646	4
Total	37,087	100	42,439	100

Source: RVWRMP WUMPs 2007/2008 and RVWRMP WUMP review data 2010/2011.

In May 2013, members of the RVWRMP field staff were requested to categorise the overall water use in the completed gravity flow water schemes that they were directly working with. In this sample, out of the total 314 schemes serving 174,938 people, 68% were used for vegetables in addition to domestic uses. Only 26 schemes were designed for multiple uses, yet multiple uses for livelihoods improvement were clearly evident in other schemes. Just over a quarter (28%) of the schemes was reportedly used for drinking water only, typically where the design flow is very low and the intermittent system can only provide a limited volume of water per household (RVWRMP staff survey, May 2013).

Community (Village Development Committee)-level findings

Community institutions

The institutional arrangements at the community level are in the most critical condition for community-level MUS to work. In RVWRMP, these have been aligned with the institutional structures described in the Local Self Governance Act 2068, both when planning and when implementing individual schemes. Thus, the project chose to strengthen the weak local governance system by encouraging the citizens to operate within it, and avoid the establishment of parallel project-specific structures that tend to bypass local governance.

In RVWRMP, there are two distinct types of community institutions: one VDC-wide Water Resources Management Committee that has a representation of each of the nine wards that constitute a VDC; and another, a Water Users Committee, representing the users of each individual scheme that enters into planning and consequent implementation of the scheme. Both of these are in line with the local institutions as defined in the Local Self Governance Act 2068: the first in having an advisory role at the

VDC level, and the other in terms of having registered users groups for a specific local development purpose.

At the VDC-level, the first type, the Water Resources Management Committees were established as soon as a VDC was selected for preparation of the Water Use Master Plan (WUMP). This committee was supported by the WUMP facilitators who in Phase I were external consultants (from Kathmandu) hired by the project and in Phase II persons hired locally by VDCs and the District Development Committee (DDC). The Water Resources Management Committee has representatives from each of the nine wards and, in Phase I, from subbasin committees also established by the project. In Phase II, the subbasin committees were merged into ward-wise committees as the subbasin structure was found to be confusing. Residents in their clusters of houses and wards were used to organising themselves in human units, not divided by boundaries drawn by external people. Water Resources Management Committees have recently been re-named as VDC Water, Sanitation, and Hygiene Coordination Committees (V-WASH-CCs) as defined in the newly launched Nepal National Sanitation and Hygiene Master Plan to align these institutions fully with the recent policy changes as far as WASH is concerned. Yet, the original water resources thinking remains on the agenda: V-WASH-CCs continue to plan for more than WASH; their Terms of Reference are more than what is outlined in the National Sanitation and Hygiene Master Plan.

At the individual scheme level, the second type, the Water Users Committees (WUCs), were established for each scheme that had been selected from the WUMP for implementation. WUCs are registered under the Water Resources Act and by doing this, they establish a right to their water source and become legal entities as formal users groups. The premise is that by bringing the scheme budgets and related decisions down to the lowest appropriate levels the principles of good governance, including financial transparency and accountability, can best be realised. In many VDCs, the RVWRMP schemes were the first opportunity for the community to take the driver's seat and plan, procure, implement and manage their scheme and related budget. By contrast, many other projects and programmes still have shared bank accounts between the WUC and its supporting non-governmental organisations (NGOs).

Two key process tools used by the respective institutions are the VDC-wide WUMPs and the individual scheme-specific Step-By-Step approach. Both are supported by the Gender Equity and Social Inclusion Strategy and structured monitoring.

WUMPs became the entry point to any action within a VDC. In Phase I, WUMPs were prepared in 47 hill VDCs in collaboration with Helvetas Nepal and by the technical support of Kathmandu-based consultants. In RVWRMP, WUMPs consist of pre-planning, planning and post-planning phases which include a total of 17 steps. In the pre-planning phase, the VDC is identified and the committees are established. In the planning phase, each ward-wide committee and eventually the main VDC-wide committee identify the existing structures, water sources, needs, and priorities with a five-year vision and annual works. In the post-planning phase, the WUMP is introduced and included in planning procedures at the district level, in an attempt to trigger interest by others working in the district to take up and finance schemes from the priority list.

One lesson was that the multiple-use and multiple-source approach does not come automatically. The first WUMPs suffered from the single-mandate approach and short-cutting in what was meant to be inclusive participatory processes: many facilitating consultants assumed that drinking water supply was the priority and acted accordingly. The participatory ward-by-ward meetings were not very thorough. The first batch of WUMP consultants did not question whether any additional nearby sources existed in the large mountainous VDCs but rather, accepted without doubt what certain community members decided to tell them. This met not only their interests but also communities' short-term interests in wage labour as designing large systems would result in more wage labour in construction. However, during the WUMP reviews in 2011, the project facilitated a WUMP review in all 47 VDCs as

part of the Phase II baseline verification. The project staff facilitating the WUMP review data collection and community planning meetings identified all water sources, including those previously "hidden" and "missed MUS opportunities". These additional sources have opened up more MUS potential in these communities, where the water source can provide more water for multiple uses rather than designing the system to deliver only for purposes of drinking water. Thus, RVWRMP brought productive water uses for livelihoods, and also sanitation, higher on the agenda than in the earlier versions of WUMPs.

Another lesson learned from the WUMP process was that its preparation needs to be institutionalised into the VDCs' existing planning process to ensure a sense of ownership and consequent use and update of the plan. The basic WUMP itself relies on local knowledge and shared understanding on the present status of the VDC, ward-by-ward: where are the gaps in various water resources and environment-related services; who is left out; and what are the priorities? The new WUMPs cost less owing to the use of local human resources instead of high-tech applications such as GIS mapping. The modular thinking remains: if more financial and other resources are available, GIS-based maps or draft technical drawings can be prepared.

Lastly, an important lesson learned is that the WUMP process addresses the shortfalls in many so-called demand-driven development approaches whereby only the well-voiced communities used to get development activities. Transparent and inclusive planning over several years through WUMP appeared effective in avoiding ad hoc lobbying for individual schemes by the more powerful and in ensuring the inclusion, voice, and priorities of each of the nine wards that constitute a VDC in Nepal. However, risks remain. Even in RVWRMP, some wards of a VDC have several layers of infrastructure efforts in various degrees of functionality, whilst some other wards in the same VDC never had anything at all.

The Step-By-Step approach to scheme implementation and sustainable services guides each project selected from the WUMP. It identifies tasks to be completed and training to be done before proceeding from one step to another. Each step involves structured monitoring on the basis of which the budget is released in instalments to be remitted to the WUC's account. The leading principle of the Step-by-Step approach is that specific activities including both capacity-building and physical works need to be satisfactorily completed and monitored before moving to the next step and having additional funds released. The Step-By-Step approach remains a constant work in progress, aiming at both fully functional physical structures as well as active WUCs to ensure sustainable water services. The systematic capacity-building, step-by-step through learning-by-doing and specific training events, all aim to build WUCs that will be able to operate and maintain their schemes.

One lesson of the Step-By-Step approach is that since the members will be changing, capacity-building and learning-by-doing do not constitute a one-off activity. The WUC itself needs to adopt a continuous learning culture within itself, both for orienting and training new members and for improving the practices and services as the demand amongst the users changes. The post-construction support is meant to assist WUCs in this but eventually it all depends on the internal dynamics in the individual WUC members: there are cases where all members have been changed. WUCs should periodically re-elect their members but in practice, the resigned, deceased, or otherwise missing members continue to be missing until something, usually major damage such as a landslide that needs immediate attention, triggers the committee back into action. Yet, intermediate-level post-construction support for the capacity-building of new WUC members, remains a challenge. In case of RVWRMP, the post-construction phase support remains. However, at the district level these services are not available and the operation and maintenance (O&M) issue even within one sector remains a hot topic in Nepal, contributing to the poor functionality of the water supply systems across the country.

It was also realised how participation entails risks of corruption, self-interests and downright criminal activities. The more complex and costly the infrastructure, the more the procurement and decisions involving financial transactions involved. There were a small number of cases where the core WUC members themselves abused the funds regardless of the public audits and calls for transparency.

Out of 265 WUCs and over 900 individual schemes by the end of May 2013 one case has resulted in formal criminal charges with police search warrant for the Users Committee Chairperson still effective for more than two years.

Overall, the empowerment and continued capacity-building have mitigated these risks. For instance, the Step-By-Step approach includes public audits prepared by the WUCs to show the community its income and expenditure, and to answer any questions relating to procurement. At the community level it is easy to verify items such as the number of bags of cement or other materials procured, and to question issues such as costs related to transportation. Public audits and hearings are appreciated at the community level to the extent that the people started asking the other projects and programmes in their villages to do the same.

Last, in both the institutions described above, the gender equality and social inclusion principles that guide the Finnish development cooperation are also addressed: there must be a balanced representation in the committee by women and by disadvantaged groups. Further, separate planning meetings need to be organised with women-only or disadvantaged caste groups-only if their voices cannot be heard otherwise. Out of the total 2712 members in 265 Users Committees, 44% are women. However, only 6% of the Chairpersons are women although this is slightly balanced out by 61% of the Vice-Chairpersons being women. Around 17% of the Secretaries and 60% of the Treasurers are women (RVWRMP scheme database, May 15, 2013). Qualitatively, there is still room for improvement in leadership. Literacy amongst the women is very low, and many semiliterate female Treasurers have been identified, indicating that a woman was only selected because the project has insisted on having women on the key posts and that in practice someone else was taking care of the bank account.

Water resources

Water resources are identified as part of the WUMP preparation process. These locations are identified with GPS and their flows are measured just before the monsoon, i.e. at the driest possible moment. In the Far and Mid-Western context, these are usually springs or streams, or combinations of these, i.e. springs which also receive subsurface flows from the streams, making these sources vulnerable to contamination. River sources are typically utilised for conventional hill irrigation and micro-hydropower applications only. There are very few lakes in the two regions and none in the working VDCs. Yields in all water sources vary between the different seasons and so do their uses. Where possible, multiple sources are identified and tapped into the one gravity flow water supply system. The WUMP reviews in 2011 highlighted the importance of maintaining the traditional small water sources as an emergency back-up, should the main system fail for any reason.

WUMPs have helped to identify available water resources in a holistic way in a micro-basin. Because a VDC as an administrative unit does not necessarily follow micro-basin boundaries, water sources are also identified from the adjoining VDCs. In some cases, relevant clusters from adjoining VDCs have been included into the actual WUMP for action, especially if the water source is outside the VDC and where the sanitation behaviour of the adjoining VDC is felt to be a risk to water quality.

Upstream-downstream issues are usually localised within a water system: for instance, in a large gravity flow system the users of the upper taps may compromise with the availability of water for those at the end of the branches. This has become evident especially where irrigation for homestead gardening has become more popular but where water saving practices including drip irrigation practices have not been fully applied and where the WUC has been unable to respond to higher uses by regulating water rotations in different branches to accommodate such higher uses. Water shortage within the system can be found where the use of drainage water from the public tap stands for home gardens below the tap stand have become popular: people keep the taps running as long as there is water (or somebody else comes to close it) to flood-irrigate their gardens below the tap stand.

Table 4 shows the changes with regard to the main water sources as identified for clusters of houses. It shows improvements in terms of moving towards theoretically safer and more reliable water sources. Due to poor sanitation and the fact that many sources, even spring sources, receive subsurface and surface flows, bacteriological safety is not to be taken for granted. In Table 4, 'tap' refers to the public tap stands in a gravity flow piped water network. The source is usually, but not always, a protected spring. Generally, this source is considered the safest from the point of view of drinking water quality. 'Spring' refers to unprotected springs which usually receive subsurface flow water. 'Canal' is a traditional open irrigation canal which may or may not be lined with cement. It receives water from the rivers and bigger streams and, hence, with the possibility to have more abundant quantity available but with questionable quality. These receive both river water and any surface flow from the hill sides.

Table 4. Main water sources used in 47 VDCs.

Water source	2007/2008		2010/2011	
	No. of households	% of total	No. of households	% of total
Tap	9957	26.8	25,481	60.0
Spring	15,844	42.7	10,620	25.0#
Water spout (traditional spring)	6245	16.8	2811	6.6
Spring-fed stream	312	0.8	153	0.4
Stream	3728	10.1	2288	5.4
Canal	532	1.4	411	1.0
River	142	0.4	82	0.2
Rainwater	-	0.0	168	0.4
Other	327	0.9	425	1.0
Total households	37,087	100.0	42,439	100.0

Source: RVWRMP WUMPs 2007/2008 and RVWRMP WUMP review data 2010/2011.

Appropriate technology

Individual schemes in RVWRMP were and continue to be identified through WUMPs. Smart combinations of water sources and integration of existing infrastructure into new designs, among others, is highly recommended but hampered by prevailing reluctance to rehabilitate anything. New construction remains as the preference. This is a national-level policy dilemma as there are no clear policies for rehabilitation or for using old structures. Even tapping into more reservoir capacity by rehabilitating available and repairable reservoir tanks in the system is rare; ignoring them is the usual practice. Yet, it has been noted that micro-hydro schemes get very quickly repaired by the community's own effort should, for instance, a landslide wash out any canal works. Somehow, the lack of electricity impacts the communities harder than a lack of drinking water supply. It has been observed in many cases that the gravity flow drinking water supply systems do not get the same attention and immediate action. This may be a gender issue: it is women who carry the water, and it is women who lack a voice in most of the communities.

In the course of the years, RVWRMP has acknowledged that practically all schemes are used for multiple uses but that there are also distinct differences on how this is done and what future steps can be.

Firstly, there are schemes that are multiple-use systems 'by design' and identified as such in the WUMP. The beneficiary population and service coverage are clearly defined, capacity-building and other kinds of support are tailored to fit the MUS system and thinking, and there is one WUC to plan and manage the scheme.

Secondly, there are schemes where the initial approach was sectoral following the single use priorities identified in the WUMP, but the end-result clearly served multiple uses. These services may be offered by one WUC through one system; or by several WUCs through separate systems. Since these schemes were planned through participatory processes through the WUMP and then implemented through the Step-By-Step approach, they can be defined as inclusive. The capture of the process by elites is less likely. The schemes in this category have all potential of being full-fledged MUS. With some improvements, such as by adding more reservoir capacity or distinct irrigation taps into the system, these could be developed to fully serve multiple purposes. In these schemes there is a need to shift the mindsets of WUCs to service-delivery-thinking and overall awareness of the multiple benefits that their system can offer. WUCs need to unlearn what they learnt from single-use sectors and acknowledge the multiple services they can deliver. MUS thinking is new to WUCs from technical and management points of view even if de-facto multiple-use of water is a daily practice.

Thirdly, we have also identified schemes that are MUS for some beneficiaries only. In these cases the system is used for individual multiple use (livelihood) applications by the individual users but not across all the users of the given system. The uncontrolled private use and related private water connections to small greenhouses and other homestead irrigation purposes may exceed the capacity of the water source and thus, compromise the access to basic drinking water by the other users, usually the ones downstream. This case is the most conflict-prone: water is used for multiple purposes in an unplanned manner that compromises basic drinking water needs of others. WUCs in these types of schemes need to address the water uses when preparing the O&M plans including water tariff, and overall system-level rule setting.

Fourthly, as already mentioned, there are also systems that remain as single-use systems. In these cases the water sources are just enough to cater to an intermittent distribution system and basic domestic use; no effort is made to tap into more water sources or to add, for example, rainwater reservoir tanks into the system. The latter could generate multiple benefits but this is not recognised and no action has been taken to develop the system and services further. There is a WUC for each individual system but no attempt to join the forces for tapping into any potential outside an immediate single system.

Individual schemes in the two last categories would need further attention and technical support in shifting them towards full MUS. The entry point for all is that the water users will try to use the water for multiple uses anyway, and that this could be done in an inclusive and planned way, ensuring also water use efficiency and future sustainability. In all four cases, one needs to be aware of the political and other local power relations: there will always be individuals who are not in favour of sharing their present benefits. Such hierarchies can be anticipated and addressed in transparent planning and rule setting. WUMPs can be used as a tool also for addressing this.

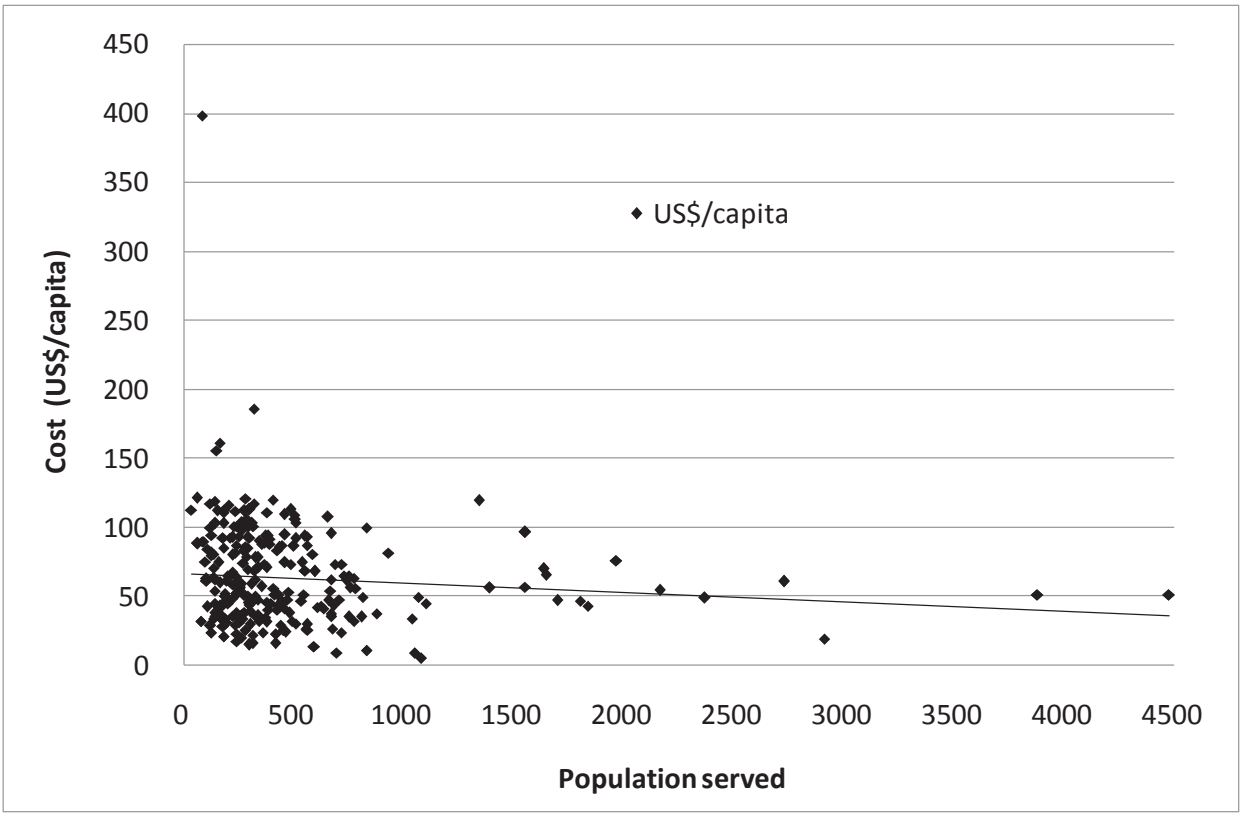
Sustainable financing sources

The financing sources in RVWRMP include the donor (Finnish bilateral grant), Government of Nepal (through Ministry of Federal Affairs and Local Development/Department of Local Infrastructure and Agricultural Roads), the two lowest tiers of local governments (DDCs and VDCs), and the users (beneficiaries) themselves. There are also other donors for the micro-hydro schemes including the regular government subsidies. The contributions from the two governments are deposited to District Water Resources Development Funds in each district under the local District Development Funds. The Government of Finland contribution flows directly into these local-level funds. Since these are established to serve local development, they are not narrowly earmarked. District Management Committees, led by the Local Development Officer, prepare the annual plans and make the operational decisions with regard to releasing funds into the WUCs accounts. These District Management Committees also release the payments for the Support Organisations (local NGOs) or to the Support Persons (individuals hired by the DDC to support project activities).

Cash and in-kind contributions are expected from the users and the VDCs according to the type of technology selected. For instance, for a piped drinking water supply scheme (usually gravity flow water system) the VDC is expected to contribute NPR100 (about US$1.1) per tap and the users NPR500 (about US$5.6) with another NPR500 allocated for the future O&M fund. In addition, the users are expected to contribute one working day per household for non-local material transportation from the road head, one working day per household for the collection and transportation of local materials, and unskilled labour for the trench digging and pipe burying for the total length of the system. For drip and sprinkler irrigation, the community contributions are calculated per beneficiary household, and for conventional irrigation schemes per plot size in the command area. For micro-hydropower schemes VDCs were expected to contribute NPR100 (about US$1.1) per capita while the households were expected to contribute NPR500 per kW (about US$5.6).

The per capita costs of 280 completed and financially cleared schemes in 2008-2012 are very divergent as shown in Figure 1. Costs not only diverge, but economies of scale are also weak; the cost per capita does not significantly decrease with the size of a scheme. This sample includes 35 schemes that have been designed for irrigation and micro-hydro, all with essentially multiple-use characteristics. These do not stand out from this sample other than for one individual small MUS-by-Design (US$398/capita) that includes drinking water supply, irrigation and a very small hydropower (peltric) set. As described earlier, all gravity flow water supply systems are used for multiple-uses in practice.

Figure 1. Investment costs per capita for 280 water schemes.



Source: RVWRMP MIS Data, 07/2012.

Each scheme is unique, also from the point of view of per capita cost. This per capita cost includes the contributions by all stakeholders, also those in cash and kind by the communities. The two highest per

capita costs are for combinations of gravity flow drinking water, micro-hydro and conventional irrigation. The one that stands out as highest per capita cost is the very first MUS-by-design scheme that serves only 84 households, featuring all services within one system. The cost is explained by the long transmission line and the electro-mechanical investments made for a small number of households. This pilot case has clearly too high costs per capita to be replicable but has served as a technical inspiration to various stakeholders. The four cases with highest costs per capita are for multiple uses in the sense of including hydropower and related conventional hill irrigation but after that, the other schemes with combined services, including hydropower in most cases, do not stand out from the rest of the schemes. Amongst the ten lowest per capita cases, five are conventional irrigation schemes, all with a fairly large number of beneficiaries, ranging between 297 and 1080 per scheme. As discussed earlier, practically all gravity flow drinking water systems serve both domestic and productive uses. Most have sanitation-related costs included. All micro-hydro schemes are also for irrigation.

RVWRMP does not have per capita cost ceilings given its remote working area where the transportation costs alone influence the costs. Again, these costs diverge depending on the accessibility of the VDC and the location of the scheme within: some of the VDCs are geographically large and topographically demanding. This has led some stakeholders, even within the staff, to think that RVWRMP can do anything at any cost. Since 2013 there is an ongoing debate about whether to establish a per capita cost ceiling or other criteria for cost-efficiency. Essentially, this is about agreeing that 'water for all' may not be possible unless individual scattered households and very small clusters of houses agree that the only option for them is to improve traditional sources. The sustainability of large systems for a small number of beneficiaries is questionable as maintenance of long transmission lines in landslide-prone areas is a challenge even to larger groups of houses that are in a position to pay for a full-time maintenance worker.

In remote locations without formal banks, RVWRMP realised the importance of including micro-finance strategies both in terms of informal saving and credit groups and in terms of formal multi-purpose agricultural cooperatives, opening up opportunities that were not in the villages before. In the cooperative VDCs, the WUCs have deposited their O&M funds into the cooperative accounts, hence keeping the funds safe and gaining interest. This practice gives an opportunity to formally mobilise these funds locally instead of keeping them idle or mobilising formally within the WUC.

Geographic or poverty targeting is an option to offer subsidy only in certain areas or to certain groups of people. In the case of RVRWMP, the project itself is geographically targeted to the most disadvantaged regions of Nepal. At the community level, even the 'moderately poor' are, after all, poor, and disadvantaged. RVWRMP also collaborates with programmes that provide food-for-work, especially in very large schemes where the expectations for community's contribution are equally large, such as constructing several kilometres of water canals or digging pipelines.

Intermediate (District Development Committee) – level findings

Participatory planning at district level

While local political settings are always critical, this is especially the case in Nepal during the years of civil conflict and later, during the post-conflict transition. Local politics and power relations could even be ignored less: civil society organisations including WUCs and many beneficiary groups do have their political affiliations. Elected leadership is missing at all levels resulting in lack of long-term visionary commitment and accountability. In this challenging context, it appeared even more important to have robust methodological tools across the working VDCs, such as WUMP and the Step-by-Step approach, to enable bottom-up integrated planning according to people's priority needs.

Strategic planning at intermediate level

WUMPs are visioning tools and serve the VDC level fairly well in establishing strategic directions over a five-year period and in identifying annual works. Yet, long-term visions and related commitments are hard to find at the district level. Climate change and the legacy of the decade-long internal armed conflict in Nepal add more layers of unpredictability into this already complex system. The VDC-level WUMPs feed into the existing strategic local government planning system. In contrast, many civil society organisations and even government line agencies tend to bypass the VDC-level planning cycle: their annual work plans are not done through Village Council planning meetings. Further, some civil society organisations bypass even the district-level planning processes. The situation is complicated by the long-term absence of elected local bodies and high staff turnover of the government bureaucracy that has been operating the local governance since 2003.

Coordinated long-term support at intermediate level

Coordinated long-term support to communities is currently lacking within the government institutions. This together with the historical lack of interest in post-construction services in practically any sector is a real challenge: all stakeholders want to report new beneficiaries and new works; rehabilitation is not popular.

RVWRMP aims at institutionalised capacity at district level to continue integrated water resources planning and to support communities in implementing and maintaining WASH and livelihood activities. RVWRMP has a substantial capacity-building programme for various district-level stakeholders, including district-level government officials, local civil society, and local students in terms of internships. Representatives from all political parties are regularly invited to join the monitoring visits and special events in the VDCs to increase awareness of the range of development work being done; hence, introducing MUS and other non-conventional solutions to politicians. The RVWRMP has signed a Memorandum of Understanding with departments out of which especially the Department of Agriculture and the Cottage and Small Industries Development Board are active partners, allocating also their own financial and human resources for joint activities. All micro-hydro schemes are funded and implemented together with the Alternative Energy Promotion Centre, the central-level governmental coordinating body, and its programmes.

Whilst at the present time the shape of the future local and district governments is not known, RVWRMP has made an attempt to build capacity and awareness on a number of issues, MUS and sanitation included, across a range of stakeholders from government officials to civil society to political representatives at both VDC and district levels. It is hoped that whatever shape and boundary the possible federal states will have, there is the critical mass of people with capacity and open minds for ideas such as MUS services.

CONCLUSIONS AND RECOMMENDATIONS

This paper presents the experiences of RVWRMP in applying decentralised, participatory and empowerment approaches in water services for multiple uses. These are all important conditions for inclusive sustainable water services. Even though the project is still young and long-term evidence on sustainability is not available to further prove this relationship, experiences presented and lessons learnt on the various conditions at community and intermediate level that need to be in place for such approaches to work are indications for improved sustainability.

At household level, the paper compares the situation in the working VDCs when the WUMPs were done for the first time in 2007/2008 to the situation when the WUMPs were reviewed and updated in 2010/2011. This shows that there has been a substantive increase in service levels. The number of households in Service Level 1 has increased from 2178 to 11,359. This means that access, availability, quality and reliability of water services have all improved for these households. The shift towards better

service levels implies, for instance, that the time used for fetching water has decreased significantly: whilst in 2007/2008 only 7615 households had water available within a 15 minutes return trip, in 2010/2011 there were 20,197 households in this category. These households have started home gardens that were not practised earlier due to lack of water.

At community level, RVWRMP provides intensive support for participatory planning and implementation, and institution-building to that end, embedded in local government. These two tools that aim at building resilient WUCs with a sense of ownership are: VDC-wide WUMPs and Step-By-Step approach to individual scheme planning and implementation. These approaches consider communities as the core group of stakeholders, and therefore their values, perceptions, needs and traditional knowledge and related ways of 'living with water' are as much as possible taken as a point for entry into delivery of sustainable water services. This is expected to build a sense of ownership for the constructed infrastructure and appreciation of the services delivered.

The identification of water resources is central to WUMPs. While some infrastructure was designed for multiple uses from the outset, gravity flow water schemes designed for domestic supplies massively turned in reality into multiple-use systems. Both project management and communities appeared to have to unlearn single-use mindsets. Therefore, promoting multiple water uses and multiple water sources is all about acknowledging that this will happen anyhow, whether or not the systems are designed for it. At the same time the various stakeholders must remain vigilant that basic needs for drinking water supply do not get compromised.

At intermediate (local government) level VDC WUMPs' procedures were fully embedded in local government planning processes. This planning, prioritisation and institution-building appeared to be robust even in the highly politicised context with no elected councillors in place. The project's capacity-building for critical mass is expected to have a long-term effect whatever the new local government structure will be. The modular approach to WUMPs makes the basic process affordable and as such, any VDC can now prepare WUMPs without external financing. Lastly, longer-term transparent planning avoids ad-hoc elite capture to at least some extent.

These lessons learned from RVWRMP's decentralised, participatory and empowering MUS approach embedded in local government have national and international implications. The WUMPs and Step-by-Step procedures are replicable and can be scaled throughout Nepal and indeed elsewhere. This will challenge policies and standards that prescribe one-fit-for-all solutions within restricted earmarks of funding and strict sectoral mandates. Integrated participatory approaches in water services according to people's priorities imply, above all, that they build on the ways in which rural communities manage the complexities of multiple water sources for multiple water uses as a way of life; they learn and adapt. Continuing to operate within single-sector mandates, the full contribution that water can have for rural livelihoods and well-being will continue to be missing. RVWRMP considers all uses, users, sites of use and water resources and infrastructure holistically.

Therefore, for scaling, national policies need to be equally responsive, adaptive, and dynamic by decentralising decision-making about fund allocation to communities and local government. This integrated perspective also opens up smart combinations of water sources and integration of existing infrastructure into new designs, among others. In practical terms this means, for example, that standard designs used at intermediate level should allow for local applications, such as additional reservoir tanks and irrigation structures in what is traditionally considered as gravity flow piped drinking water systems. Since MUS is about locality-specific applications, national scaling up of MUS calls for simultaneous action across sectors, emphasising the above call for working through decentralised systems and local government structures. It cannot be centrally planned; even large-scale MUS must be grounded in its own locality. As long as funds are not too strictly earmarked and broad technical capacity is available, no national coordination is necessary.

As a first step in scaling this approach, it is recommended to start with developing a vision and a related strategy at all levels. Since planned intentional MUS is something different to many stakeholders who are used to, and do, operate within their single-sector mandates, a shared vision should be established to trigger interest and understanding. At community and local government level, WUMP is a useful tool for outlining this vision. At the intermediate level, the vision could be specific for each region and district, somehow unique for the administrative unit and watershed within which the action is to be taken. Its strategic elements should be do-able actions building on existing practices, such as utilising the local development funds as local basket funds for non-earmarked pooling of financial resources. At the national level the vision should be about creating an enabling environment: to encourage work across sectors, disciplines, and financial streams without losing the lines of accountability. Further, action-research is recommended on how to realise these changes and on medium- and long-term impact assessments for sustainability of water services for health and livelihoods.

In sum, RVWRMP's experience shows in practice that there is human drive to use a system as a multiple-use system and that this can be promoted at scale. A clear vision of what MUS has to offer in a country context, bringing together water, sanitation, food security, energy, and environmental issues for everybody could appeal to politicians and policy-makers seeking to improve the well-being of their voters.

ACKNOWLEDGEMENTS

The authors wish to thank the Rural Village Water Resources Management Project (RVWRMP) team and the Users Committees who contributed to this study. They further acknowledge the Ministry for Foreign Affairs in Finland, the Ministry of Federal Affairs and Local Development and its Department for Local Infrastructure Development and Agricultural Roads in Nepal and the consultant for the project, FCG International, for their knowledge shared and continued support to RVWRMP.

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III

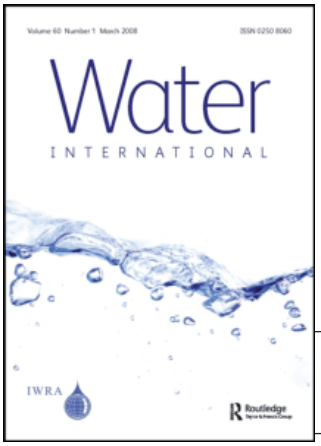
TECHNICAL WORK OF WOMEN IN NEPAL'S RURAL WATER SUPPLY AND SANITATION

by

Rautanen, S.-L. & Baaniya, U. 2008.

Water International, 33(2), 202-213.

doi:10.1080/02508060802027687



Water International
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t792815876

Technical work of women in Nepal's rural water supply and sanitation

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Online Publication Date: 01 June 2008

To cite this Article: Rautanen, Sanna-Leena and Baaniya, Usha (2008) 'Technical work of women in Nepal's rural water supply and sanitation', Water International, 33:2, 202 — 213

To link to this article: DOI: 10.1080/02508060802027687
URL: http://dx.doi.org/10.1080/02508060802027687

Water International
Vol. 33, No. 2, June 2008, 202–213

Technical work of women in Nepal's rural water supply and sanitation

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(*Received 14 December 2005; final form 16 January 2007*)

The Rural Water Supply and Sanitation Support Programme (RWSSSP) in Western Nepal trained more than 940 persons as village maintenance workers, local latrine builders, rainwater harvesting jar masons and water technicians. Of these, 116 were women. This study investigated the status of these women years after the training, paying attention to the technical quality of work, personal attitudes, views of the family and community, and socio-economic impacts. The interviewed women were positive about the training and related work, 77% were working, and all clearly had the support of their family members. Yet, there are many areas for improvement.

Keywords: Rural water supply and sanitation; gender; technical training; Nepal

Introduction

This study investigates the status of the women trained in technical works in the Rural Water Supply and Sanitation Support Programme Phase III (RWSSSP). RWSSSP was carried out in three phases in 1990–2004 and covered eight districts of the Western Development Region in Nepal. It was a joint effort between His Majesty's Government of Nepal through the Ministry of Local Government, Department of Local Infrastructure Development and Agricultural Roads, and the Government of Finland through the Ministry for Foreign Affairs.

The purpose of RWSSSP Phase III was to contribute to the achievement of the overall objective set for water supply coverage and to address the underlying challenges by contributing to the following (Rural Water Supply and Sanitation Support Programme 1999): improvement of the institutional capacity of the districts to enable decentralization from the national level to the districts and from district to users for implementation and sustainable management of rural water supply and sanitation; provision of financial support for implementation of water supply and sanitation facilities on a demand-driven participatory basis; and improvement of methods for implementing and operating and maintaining water supply and sanitation facilities.

The RWSSSP aimed to strengthen democratic institutions and civil societies through working with the District Development Committees, the Village Development Committees, and the Water and Sanitation Users Committees (WUCs) as democratically elected representatives of the people, as well as the non-governmental organizations and the community-based organizations (CBOs) as local civil actors and support organizations for Water and Sanitation Users Committees. Unfortunately political instability hampered the work with local government bodies and overall capacity building efforts during the final years of RWSSSP. Yet, the promotion of decentralization together with democracy and good governance formed the basis of RWSSSP

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ISSN 0250-8060 print/ISSN 1941-1707 online

DOI: 10.1080/02508060802027687
http://www.informaworld.com

Phase III approach. RWSSSP continued to be run through District Projects and related district funds, managed by District Project Management Teams, also through the difficult times. In Phase III alone, District Projects together with Water and Sanitation Users Committees and their support organizations completed some 900 water and/or sanitation schemes, and over 217,000 people benefited from the water supply facilities and over 307,000 from the sanitation facilities.

At the community level, the Water and Sanitation Users Committees were the primary actors in scheme planning and implementation. During RWSSSP Phase III more than 1,000 committees were established as some larger schemes also had "sub-scheme". They purchased construction materials and managed the scheme funds through their own bank accounts. This practice was unique to Nepal and highly appreciated at the local level. It increased transparency, direct and interactive participation, and the interest of both women and men leading in many cases to a strong sense of ownership crucial for the long-term sustainability of the facilities. According to various in-house monitoring studies and field observations over the years, the committees were effective managers of small and medium-size schemes. Local contributions from the District Development Committees and the users, both in cash and kind, were noteworthy.

The RWSSSP planning and implementation was built on the participatory Step-by-Step approach. It aimed to encourage democratic and transparent decision-making and to increase equal participation by clarifying the roles and responsibilities of different stakeholders. This highly decentralized people-oriented approach necessitated a large number of human resource development activities as part of overall capacity building endeavours. A range of training events, workshops and seminars, awareness campaigns and experience sharing at various levels were constantly under way. Training topics ranged from such highly specific topics as account management to more general awareness issues concerning hygiene, sanitation, and gender. Technical training events aimed to build local technical skills to ensure the sustainability of the facilities for the future. The training was provided by local support organizations, including NGOs and CBOs, and occasionally also by the staff of District Development Committees and the RWSSSP Programme Support Unit. During the final years of Phase III many activities were designed to benefit especially groups that had been under-represented previously.

The WUCs were supported through various training events, experience sharing visits and by organizing annual events in the communities. There were also a number of hands-on type technical training events for village maintenance workers (VMW), local latrine builders (LLB), and rainwater harvesting jar masons (RWH).

The RWSSSP was committed to the promotion of gender equality and contributed to gender mainstreaming through its integrated gender plan. The working principles included involvement of women and disadvantaged groups in the WUCs, calling for balanced representation of both women and men in training events and meetings, and prioritization of schemes in hardship areas. Realization of the principles was also monitored. Women's participation in technical training went from zero in the first reporting year up to 17% in the final reporting year. Gender was included as a topic in all scheme-related training, and gender-specific events were organized for particular target groups, such as a gender mainstreaming workshop for district-level local authorities.

The RWSSSP Phase III had a total of 77,000 participants in various human resources development events of whom 60% were female. To ensure that each scheme had an adequate number of skilled technical people, more than 940 persons were trained. Some of these trained persons later became trainers in other parts of the country. Of these, 116 were women (Rural Water Supply and Sanitation Support Programme 2004). A total of 95 trained women attended a two-day seminar at the RWSSSP office in Butwal in 2004, and 97 returned a questionnaire. This paper focuses on the experiences of these 70% of the women trained in the technical sector by RWSSSP.

Objectives and methodology

This study aimed to give a voice to the women trained in technical works and to encourage them and other women to continue to acquire new skills in a technical or a non-technical field. Dissemination of the findings at different national and international forums aims to give further visibility to women's contributions in the technical field and, thus, contribute to gender mainstreaming in Nepal and other countries. The analysis focused on demographic and educational characteristics of the trained women; employment and income status resulting from the training provided by RWSSSP; women's participation in decision-making and organizational involvement; attitudes of the women, their families and communities to involving women in technical works as well as their social status and general feelings after the training; physical status of water supply and sanitation facilities constructed by the trained women; and options for a better future and more efficient capacity building efforts through water and sanitation sector programmes.

The methodology involved three phases, and the following findings are presented in the same order:

(1) Qualitative field study concerning nine women. A series of semi-structured interviews and field observations were video-recorded to provide authentic material for the external evaluators who scored the interviews and provided written summaries. These preliminary findings were presented in the International Conference on Security and Sustainability in Water Resources in November 2004 in Kathmandu, Nepal, and in the Women in Technical Field Seminar in Butwal, earlier in November 2004. The video recordings were edited into Nepali and English language promotional videos and were also shown in the seminar with the consent of the women themselves.
(2) A two-day seminar was held in Butwal to give more depth to the qualitative aspects of the women's work in the technical field. All women trained in technical works by RWSSSP were invited to share their experiences and to explore future options. The event had 95 participants who during the first day shared experiences in small groups according to their training and working experiences. During the second day they presented the results and their plans for the future in a plenary session.
(3) Nepali-language surveys were conducted by the local Butwal Multiple Campus environmental students who were trained as enumerators. There were 97 responses, which are statistically significant.

Results

Findings from the field

The video-recorded interviews and field observations were conducted with nine women from the Argakhanchi, Nawalparasi, Rupandehi and Palpa Districts in Western Nepal. One was trained as an RWH mason, four as VMW, and four as LLB. Five women represented the Magar ethnic group, two were Brahmins, one was Kami and one Damai. Five out of nine were also active in other community activities, including Water Users Committee (four), Ward Committee (one) and Savings Group (one). Even though all were literate, their overall educational level was not high. Only two had a School Leaving Certificate – one of them had also passed the intermediate level and was a graduate student involved in NGO work.

In rural areas practical skills and attitude matter. The livelihoods included agriculture (six), unskilled labour (two) and business (one). All lived in fairly small families by Nepalese standards, five being married and four single. The youngest woman interviewed was 21 years old, and the oldest 28 years. All four VMWs were actively involved in the implementation of their schemes.

Two of the local latrine builders had constructed 45 latrines together, and another two had constructed 100 latrines together. The only rainwater harvesting jar mason had built 22 RWH jars. The quality of work observed in the field was the same as that of structures constructed by their male colleagues. All the women stated that they had not faced major problems even though the work had been challenging at times.

All women had a similar attitude to their work. They were well motivated, confident and interested in it. They agreed that the work had been completely new for them, yet they had accepted it without hesitation. They had had no prior expectations. They also noted that before they used to work mostly within the household, but now their scope had broadened. All the women shared the view that they were able to divide their time and energy between their other tasks and the new job satisfactorily. In all cases families supported them by sharing the work load. None of the women felt that they had been given yet another burden to carry. Their reproductive role had been complemented by a productive role, and the increased earnings were appreciated by both the women and their families. Even if the new work did not provide a full livelihood to any of the women, the extra income had helped their families pay such expenses as school fees of their children or siblings. The women were interested in being trained.

Family interviews were carried out with members belonging to the same household. We expected that the families would be supportive as the woman would probably not have even participated in the training if the family had not supported the idea. This proved true as family support was evident in all cases. All families encouraged the women to continue to work and were flexible with the time demands and shared the household tasks. In one case a husband who was clearly seriously ill was happy to encourage his wife to carry on the local latrine builders' work while he took care of the household. Husbands and fathers also stated that before, their wives or daughters were not very well known in the community having worked mainly within their own household or immediate neighbourhood, but that now they were well known and appreciated as technical persons in the wider community. None of the families expressed concern over the increased mobility of the women. They did not see the work as an additional burden and also supported the idea of continuing it in the future.

Generally, the community's level of acceptance of women working in the technical field was high. The key problem was WUCs since they chose women to be trained but did not utilize their skills afterwards. Formal agreements did not exist, but this did not seem to bother the women as the work was not their main source of income anyway.

The evaluators observed that, due to the lack of awareness in communities, women's technical work can be quite difficult. They recommended more gender awareness programmes for the communities and further empowerment to fully mobilize available local skills. At district level coordination amongst all stakeholders is needed, including local authorities, donors, NGOs and CBOs.

The evaluators suggested that technical training should also include elements which can motivate women, including women's rights, human rights, leadership and management. Furthermore, the timing and location of the training sessions are critical, and the educational background of the participants should be known to allow tailoring the training sessions to suit the participants. The evaluators shared the authors' view that women's technical work should be highlighted and respected. More women should be encouraged to upgrade their skills, utilize them and get a fair pay for their jobs. This is a challenge also for the development programmes.

Findings of the seminar

The RWSSSP Phase III invited all women trained in the technical sector to attend a two-day *Seminar for Women Trained in the Technical Field* held in November 2004 in Butwal, Rupandehi

District. This section outlines findings of the seminar, during which 95 women shared their experiences after training and made some recommendations. As indicated earlier, they represented 70% of all women trained in the technical field by the RWSSSP. Considering that several years had passed since the training, the remoteness of many villages, the challenging communications and logistics, and the fact that for some women the trip was their first to Butwal, the number of participants in the seminar was remarkable. During the two-day seminar the participants were divided into six groups according to type of training, their experiences and whether they were working or not. The tasks given to each group varied accordingly.

Active village maintenance workers: How is the work itself?

This group consisted of 20 women trained as VMWs for gravity flow water supply systems. On the positive side the group concluded that they were very happy to have received the training, and they saw plenty of work ahead. Even though the work was challenging at times, they had been able to solve the problems and the male colleagues had helped with the heavier tasks such as joining the bigger pipes. However, there were also reports that some male colleagues were not cooperating, and did not give the women an opportunity to work. In some cases these males were family members. There were also reports of WUCs and the users not paying for services.

Day-to-day reality: Are the WUCs and users supportive?

There were 13 women with various backgrounds in this group. This group reported that they were very satisfied to have received the technical training and to have had a chance to apply their skills in practice. They had had a great opportunity to work outside the home, even though they suspected that the male colleagues had more opportunities. The group members had attended WUC meetings to share their technical knowledge and to influence decision-making both from the technical and social perspectives. This meant that a well-functioning relationship with WUC was possible, resulting in more work opportunities and, thus, better maintained water systems and more sanitation facilities in the community. This group had only a few weak aspects to report. Unavailability of equipment, unfamiliarity with the construction materials, their poor availability and high costs as well as gaining the trust of the community were listed. In their opinion, the women had to work harder to prove their skills.

Getting a fair deal: Are the contributions sufficient?

This group of 14 women had participated in all types of training and were chosen for their experience. The group reported having improved the water and sanitation services in their communities. They felt especially good about having been able to help the poorer households to improve their facilities. Their self-confidence had risen, they felt independent, and were happy to take responsibilities in their society. Women reported that their work had been recognized and respected in the wider community. They also acknowledged that it is not easy for women to win trust and get work opportunities in their community in technical works, and that some community or family members do not cooperate or value their work enough. They also realized that sometimes communities, especially their WUCs, do not know what role and responsibilities they should assume in community development and consequently do not see themselves as "employers". They recommended that trained women should take the initiative themselves to get a fair deal, for instance by organizing a community meeting to discuss their contributions and related fair remuneration openly.

Improving livelihoods: What are the other options?

This group of 15 women represented those who were unemployed. The group acknowledged that they were motivated to work and applied their skills to small maintenance tasks, such as changing taps. Some were frank about their lack of interest and skills as the reason for not seeking technical work, and some agreed that they had not been active after the training and had never shared their knowledge with the WUCs. In other words, they did not make it public that they had been trained to do technical work. Some schemes simply did not offer any work after the scheme was completed. This group recognized that even if they were not working, they were trained and consequently still had a role to play in their communities and committee meetings. For a local latrine builder, increased sanitation awareness can eventually open up new work opportunities, whether there is an externally supported sanitation programme or not.

Rainwater harvesting for water security: How can an RWH mason continue to work?

This group of 14 women was trained as rainwater harvesting masons. Rainwater harvesting from roof tops is a fairly new technology even though rain-fed open ponds (*Pokharis)* are a traditional water source in hill areas. The RWSSSP introduced a rainwater harvesting jar in the shape of a traditional Nepali water vessel, the *gagri.* This group saw many positive aspects in rainwater harvesting, including the time saved in not having to fetch water. Some agreed that they had had problems in the beginning but now felt confident and considered the work very interesting. They were happy to have the skill and be able to earn some extra income, and to have an equal opportunity to work with male colleagues. However, not all got the same remuneration as their male colleagues.

Sanitation futures: How can a local latrine builder continue to work for a future where all households have a latrine?

This group of 19 female local latrine builders reported that there was a high demand for more latrines and that many households were eager to cooperate also with the female local latrine builders. They did not consider construction of *Sulabh*-type latrines very hard after having received the training, even though there had been some difficulties initially. They were very confident that their quality of work was very good and recognized as such in the communities. On the negative side, the other groups had also received reports that WUCs did not give women an equal opportunity to work and that male colleagues were favoured and/or received better remuneration. Some communities clearly were unaware of the importance of sanitation.

Conclusions about seminar findings

Each group expressed a number of similar issues. All groups were generally happy about the training and having learned new skills they could use for the benefit of their communities. The women saw that establishing functional and mutually beneficial relationships between themselves, WUCs and the users could provide work opportunities. They also acknowledged that they were now more confident and also had some personal funds. The women requested more training to upgrade and maintain their skills and called for more coordination between the various development programmes and district authorities and recognition for their work. The newly established WUC Network and human resource records kept by district level authorities were seen as ways to get recognition as skilled workers.

Findings of the survey

More than half (61%) of the total number of 97 respondents represented the hill districts. Considering that the RWSSSP has been active in the Terai districts (plain areas) for nearly 15 years, the women's share of technical training was notably low in Nawalparasi and Kapilvastu Districts, possibly reflecting the traditional gender attitudes of the Terai belt. It was found that the two major ethnic/caste groups consisted of Brahmins, Chettris, Thakuris and Rajputs (45%) and the hill tribes, mainly Magars (36%). The Terai indigenous group Tharu had the next largest representation (9%). A surprisingly small number of traditional vocational castes (Damai, Kami, Sarki) participated (6%). The age of the participants varied from 16 to 55 years, the average being 29 years. The majority had small families and 70% had two or less children. One third of the women were single. All but one were literate, and interestingly the women with more education (School Leaving Certificate or higher) appeared to be in a worse position as many were not working, or if they were, they were expected to do voluntary work. Because of their educational background, they were also more aware of the shortcomings of the WUCs.

Each scheme and village is different. Therefore, it was expected that the rainwater harvesting masons and local latrine builders would have had an opportunity to work at least during the scheme implementation, with occasional private projects later on. It was expected that the majority would report that they were not working. The overall figure was thus fairly surprising with 78% responding that "yes, they do work". Of these, 56% reported "sometimes" while only 6% reported working frequently. Of these, four were local latrine builders and only two VMWs. Yet, only one of those reporting frequent work also reported a regular monthly salary for the local latrine builder's work. People had different views on what number of days meant "frequent" or "sometimes". Interestingly, those who reported "yes, but very rarely" indicated working more days per month than many of those who considered that they worked "sometimes". Thus, the answer depended on the current stage of the scheme: if the question had been asked at another point in time, the answer could have been different.

The RWH masons had constructed a total of 725 RWH jars between them. The highest number constructed by one person was 130 jars, by a 21-year-old literate single Magar woman from Palpa who received her training only a year earlier. The local latrine builders had constructed 1,810 latrines between themselves, the highest number of latrines constructed by one person being 380. Interestingly, this person also reported that she was not paid but was a "social worker".

The question of fair pay was also a topic in the seminar. Out of 94 respondents, 52% stated that they were paid, including those who stated that they were not currently employed. Of those who said they were paid, 36% stated that they were paid per job per day when working. Only 3% reported a regular monthly salary. Other forms of payment were per latrine constructed, per job, and "other". Nine per cent stated that they were not paid but were "social workers" or volunteers. See Figure 1 for the remuneration of those who stated "Yes, I work."

Even though it appears from the above that the work was highly random and rarely remunerated, the responses to the livelihoods questions were encouraging. The questionnaire offered the option to "tick all that apply". A total of 97 respondents ticked 144 options. Of these, 17% stated that the new work was their main source of cash income, 6% that the income from the new job makes no difference, and 28% stated that the new work had not helped at all. An interesting aspect of the livelihoods issue was that 15% stated that the work had helped them establish some other income generating activity, such as a shop, while another 6% indicated that it helped them buy more animals. A very positive finding was that 11% had been able to send one or more children to school. A chance was also

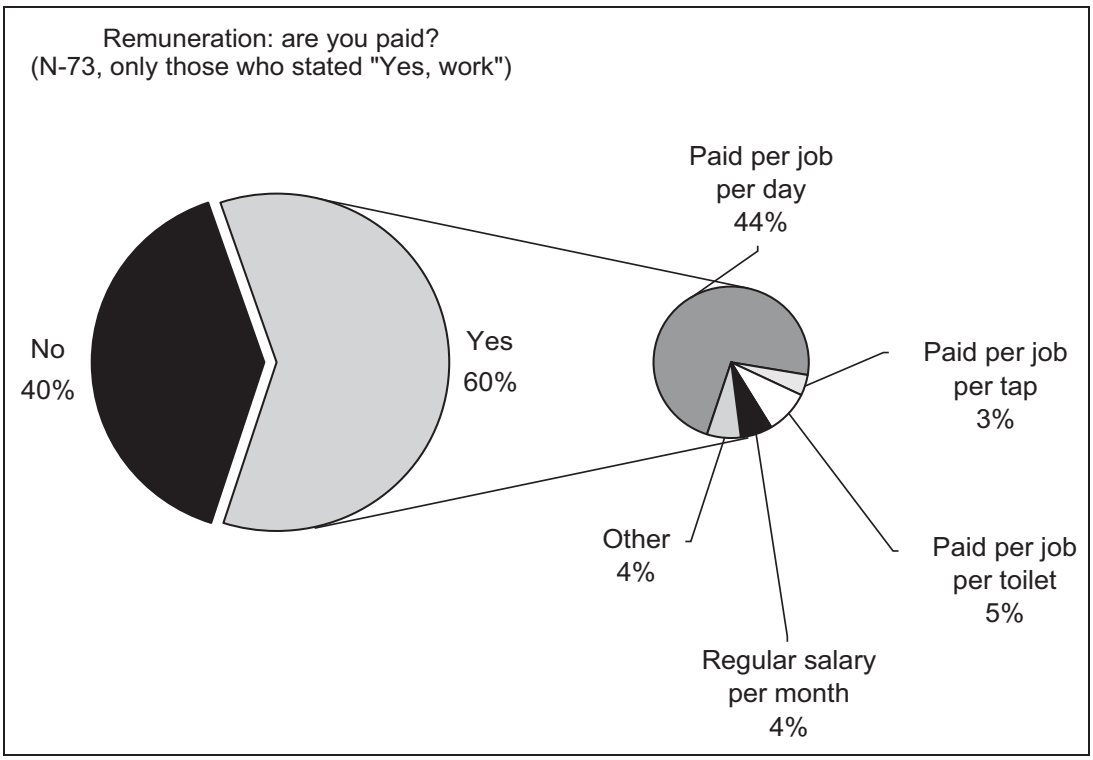

Figure 1. Remuneration of women's work: are you paid?.

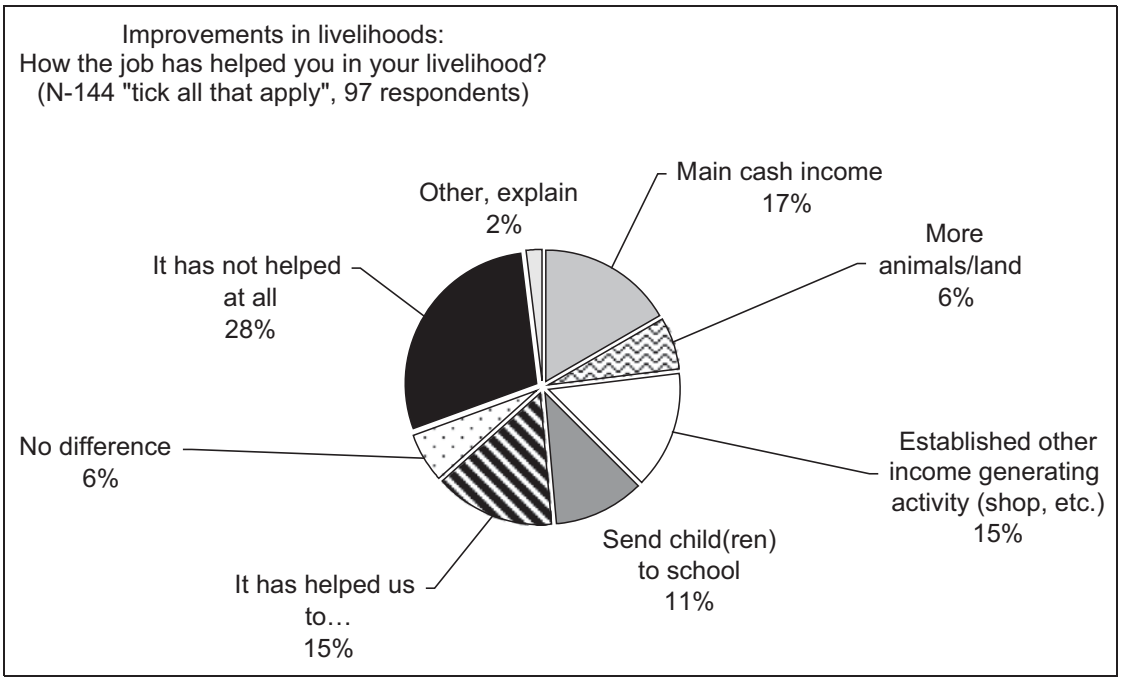

Figure 2. Improvements in livelihoods: how has the job helped you in your livelihood?.

given to give an open-ended reply to "it has helped us to . . . ." (15%). The usual answer was "buy household items" reflecting how any extra income, however small, was appreciated by women as their own private cash stash for household expenses. See Figure 2 for the livelihoods question.

Women trained in the technical field appear to be very active members in their communities. Only 4% stated that they were not involved in any community group while the rest of the respondents ticked 139 options. Of these, 39% were members in a Mothers' Group and 17% were Female Community Health Volunteers. The voluntary nature of the work may explain why so many were not paid. An interesting aspect is that many were also members of other rather technical users groups. For instance, 16% were members of the irrigation users group and 10% of the community forestry group. Many also stated "others" – of them 34% were WUC members. Under "others" fell also various women's groups and health groups while family planning, social mobilization and agricultural groups were listed as other activities. See Figure 3 for involvement in other community development groups.

As many women were active members of their communities, it could be expected that they would also participate in decision-making. A total of 58% of the 96 respondents stated that they "always" participated, and another 25% that they "sometimes" participated, in the decision-making of the WUC. The WUC is essentially their "employer", and as was seen earlier, many are also members of this committee. Of those who stated "no", 12% did not participate at all, 3% gave no reason, and 2% indicated other reasons. The most common reason for all "no" answers was that there was no scheme and the WUC was no longer active. This applies to the sanitation and rainwater harvesting schemes where the WUC considers that it has no role to play after the construction has been completed.

Practically all women were positive about the training, whether or not it was a source of income or frequent work. This was expressed both in the surveys and during the seminar in the working groups. In the survey, 69% of the respondents stated that they are an example for the villages, and another 25% that their social status had increased. Only 5% stated that their social status had not changed, and nobody that it had decreased. Setting an example for the village was not connected to better livelihoods, as 48% of the women who stated that they were an example, also stated that the income had not made any difference or improved their livelihood.

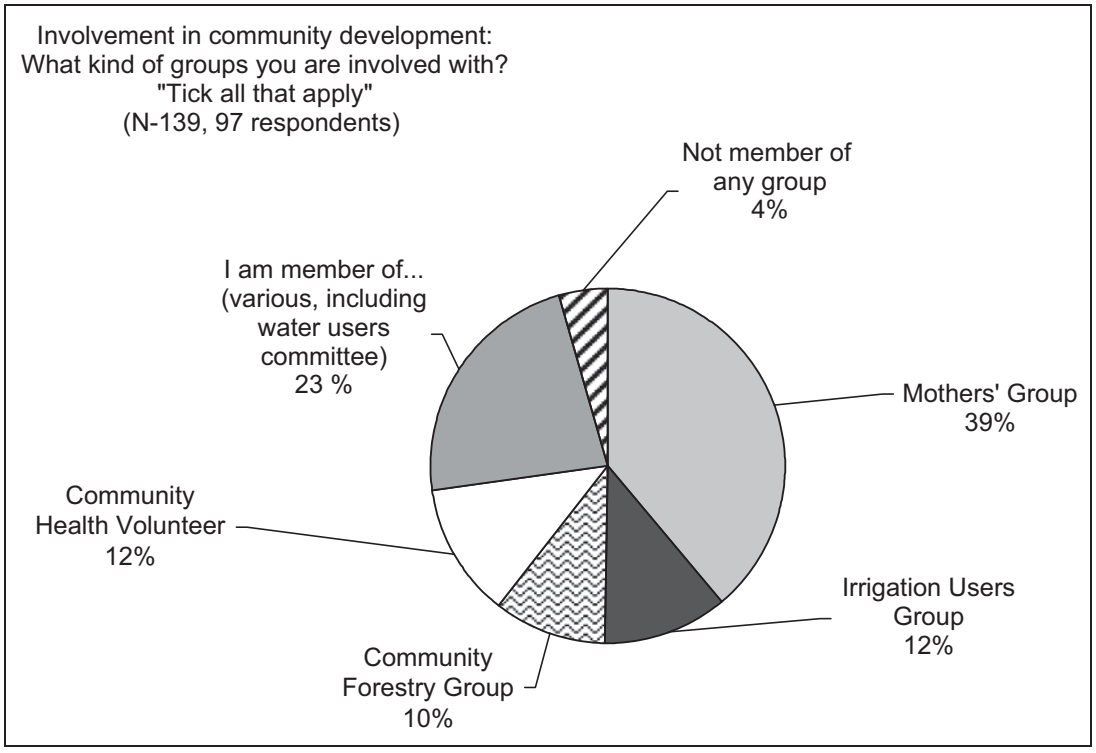

Figure 3. Involvement in community development: what kind of groups you are involved with?.

Conclusions and recommendations

Conclusions

Women in the rural areas have always participated in technical works, yet usually as unskilled labourers carrying materials. This can be observed at building construction sites in Nepal where women usually carry bricks and cement. By ignoring women's potential and creativity as skilled crafts persons, half of the total human potential is simply lost. Application of artificial boundaries based on caste/ethnic background further limits the human potential. This study compiled real-life evidence on how women can contribute to the sustainability of water supply facilities and continuity of sanitation improvements through skilled technical work. It was also observed that trained women were less likely to migrate as professional plumbers to work in other locations as has been the case with many trained men: we were able to reach the majority of the women trained over the years by RWSSSP.

The women trained in the technical field were personally positive about their work. This attitude was shared by their families and to some extent also by the communities. Each scheme and village was different, and it was expected that the rainwater harvesting jar masons and local latrine builders would have had the opportunity to work at least during the scheme implementation, with occasional private projects later on, and that consequently the majority would report "not working". The overall figure was thus fairly surprising with 77% responding "yes, I do work" although only 6% reported working frequently. Yet, there were issues that need to be improved.

One-off training can raise unrealistic expectations about future work and income. The current random work and remuneration do little to increase livelihood security, alleviate poverty or help maintain skills in the long run. Without follow-up and attention from the local institutions, such as local authorities and WUCs, many trained people can go unnoticed and their newly acquired skills become wasted. More opportunities to work and further develop skills and awareness are needed to empower both trained women and men to maintain and use their skills. Registration of skilled trained technical persons at the district level *and* actual use of their skills were suggested but still remain to be implemented in practice.

Local authorities, development programmes and water sector authorities are by no means the only important players. WUCs play a key role as managers of water supply facilities. They should fully understand the roles and responsibilities required of them and other local actors in keeping the water facilities working and in advocating improved sanitation. The WUC Networks possess great potential as a horizontal peer support system and a channel for WUCs to seek trained, skilled people in the local area. The WUC Network and WUCs could be the prime champions and institutionalize practices related to good water governance and gender mainstreaming.

Water and sanitation activities have demonstrated their potential in bringing women to the public decision-making forum. Yet, water and sanitation services and related activities are only one of the many factors that shape, change, or keep alive the socio-economic, historical, cultural, and political relations between men and women. Gender equality and poverty reduction require changes in society beyond those related just to water and sanitation. A water programme alone cannot guarantee future work opportunities, fair pay or further skills development. These are local and institutional matters. For this reason, the water sector should look into the future, and besides actual skills development, establish local institutional structures and governance practices as needed.

Recommendations

Development projects and programmes cannot neglect indigenous management practices and the tacit knowledge of women. Women and men should be treated equally as water managers and decision-makers. Yet, in practice, gender awareness has still not reached all levels, and

gender policies are not yet being fully translated into practice. The process is time-consuming as many traditions relating to gender and ethnic/caste background run deep, and will keep confining people's potential for years to come. Based on the women's seminar, various monitoring studies done in RWSSSP, field observations and discussions with men and women alike, we recommend the following:

- Gender-sensitive capacity-building activities should be made an intrinsic part of capacity building efforts in the water sector with relevant monitoring procedures and follow-up covering *also* the post-construction phase and highlighting continuity and sustainability.
- In formulating a capacity-building plan and articulating the substance of related activities, there should be close coordination between relevant local authorities and development programmes, including the education and health sector actors. Increased coordination would greatly benefit from the use of the same baseline data, training of trainers, combining of events, sharing of information from monitoring and follow-up visits, etc. It would be especially relevant in a rugged country with logistics and communication problems.
- Gender-sensitive approaches should be further sharpened by making an effort to truly encourage women to come forward. Tailor-made courses for illiterate women, special group events organized close to the cluster of households, and a series of short events could give an opportunity to women who often have children and others to look after, and may not have the time or social approval to leave the house for long periods of time to attend training elsewhere.
- Realistic and measurable qualitative indicators should be integrated into existing monitoring systems. Having a large number of participants with a certain percentage of them women will not produce sustainable results. Participatory monitoring and evaluation is an option as it can provide direct feedback to the communities and an opportunity to periodically have an open dialogue about the status of the scheme.
- Training of trainers should be systematic and carefully executed, with a practical gender-component even in technical curricula. Experienced and trained trainers should be rewarded for their work. The lowest bid does not favour the most skilled professionals and NGOs. Lack of effective monitoring gives uncommitted trainers too many opportunities for substandard training and general short-cutting.
- CBOs should not be forgotten. They represent local actors and provide sustainable human resources for their locality. Dynamic capacity-building activities focusing on CBOs should build on their previous experience and educational level as well as the community-specific situation.
- Continuity, learning-by-doing and follow up support are indispensable for sustainable results. One-off events should be reserved for special occasions, such as celebrating the World Water Day, the World Environment Day or the International Women's Day.

Capacity-building should be futures-oriented at all levels and responsive to changes. At the community level, capacity building should continue after the actual scheme implementation is completed. This is especially true for WUCs and technical personnel who only find out during the practical work whether the skills provided are adequate. Follow-up monitoring should find out areas where further training and upgrading of skills are needed to enable local institutions and the programme to respond. There is a lot of human potential and indigenous and tacit knowledge in the field that should be given an opportunity to flourish. WUC Networks could serve as umbrella institutions for releasing this potential.

Acknowledgements

Financial support from Academy of Finland (210816) is greatly acknowledged, this case study being a part of the study on *Governance of water and environmental services in long-term perspectives* (GOWLOP). Special thanks for making the participation in the Delhi Conference possible are extended to the Embassy of Finland in Kathmandu, Nepal, and Maa-ja Vesitekniikan Tuki Ry, Helsinki, Finland. The authors also wish to thank Plancenter Ltd, Helsinki, Finland, the consultant for RWSSSP, the fellow colleagues in the Rural Water Supply and Sanitation Programme, and the CADWES Research group at the Tampere University of Technology, Tampere, Finland, for their continuous support and encouragement.

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IV

USING EVERY DROP – EXPERIENCES OF GOOD LOCAL WATER GOVERNANCE AND MULTIPLE-USE WATER SERVICES FOR FOOD SECURITY IN FAR-WESTERN NEPAL

by

Rautanen, S.-L. & White, P. 2013.

Aquatic Procedia, 1, 120-129.

doi:10.1016/j.aqpro.2013.07.010.

Available online at www.sciencedirect.com

SciVerse ScienceDirect

Aquatic Procedia 1 (2013) 120 – 129

Aquatic Procedia

www.elsevier.com/locate/procedia

World Water Week, 26-31 August 2012, Stockholm, Sweden

Using every drop – experiences of good local water governance and multiple-use water services for food security in far-western Nepal

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Abstract

This paper describes tools and lessons learned in operationalizing the principles of good local water governance and multiple-use water services for food security in mid- and far-western Nepal. In these poor, water-scarce and food-insecure regions, the Rural Village Water Resources Management Project has shown that integrated water resources management for both blue and green water is a must. Water use master plans (WUMPs) and a participatory step-by-step approach, both backed up by a gender equality and social inclusion (GESI) strategy, ensure appropriate and fair use of scarce water resources. Multiple-use water services (MUS) maximize livelihoods opportunities in a difficult environment.

Selection and peer-review under responsibility of the Stockholm International Water Institute

Keywords: Nepal, multiple-use water services (MUS), governance, community, food security

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2214-241X
Selection and peer-review under responsibility of the Stockholm International Water Institute
doi:10.1016/j.aqpro.2013.07.010

1. Introduction

Integrated water resources management (IWRM) opens up a multitude of opportunities to address livelihoods and well-being, including food and water security. To do this through a holistic yet targeted action requires working across sectoral policies, budgets and programmes. Translating the policies and cutting-edge knowledge into feasible, appropriate local actions at sub/micro-basin level in line with local good water governance is complex. It calls for daring to move across the sectors and standard designs, bringing together green and blue water at the level where it makes a difference, where the tangible changes in livelihoods and poverty can be observed. This has implications for planning, implementation and post-construction support, as well as for capacity building and institutional development, all of which calls for attention at the local level as well as at the policy level.

The Rural Village Water Resources Management Project (RVWRMP) in mid- and far-western Nepal has gone beyond theory and piloting to broad-scale implementation in a difficult environment. In this paper we explore the first-hand experiences, tools and lessons learned so as to contribute to further policy debate regarding good local water governance and multiple-use water services (MUS) for food security.

We introduce RVWRMP's approaches to planning through inclusive local government level water use master plans (WUMPs) and how the individual schemes are further translated into action through a step-by-step planning and implementation approach. MUS is considered the point of entry in scheme identification and as an approach for planning with communities. Basic livelihood activities benefit all working areas and focus on home gardens to improve nutrition and generate small incomes. Advanced-level livelihood activities build on sub-sector analysis of viable products and services that also consider aspects such as access to markets – many of the RVWRMP working areas are far from the accessible roads. The gender equality and social inclusion (GESI) strategy has been mainstreamed as a cross-cutting theme, ensuring equitable access and bringing in a human rights perspective.

2. Setting the scene: mid- and far-western development regions in Nepal

The mid- and far-western regions of Nepal are characterized by remoteness, rugged terrain, difficult access, food insecurity, water scarcity and therefore extreme poverty. These regions were the hotspot of the decade-long internal armed conflict, which further kept them cut off from mainstream development. The post-conflict legacy can still be felt. In these poverty-stricken rural areas it is essential to broaden the scope across conventional sectoral thinking to address the roots of poverty and food insecurity. From the start of RVWRMP it was clear that the project had to provide more than drinking water and sanitation alone.

The mid- and far-western regions are seasonally relatively water scarce and drier than the rest of Nepal. While eastern Nepal receives approximately 2500 mm of rain annually, far-western Nepal receives 1000 mm within a few months (the monsoon rain accounts for 80% of the total rainfall) (Government of Nepal, 2008). Given the topography of the region, there are few lakes. Unpredictable and missing winter rains have decreased community interest in rainwater harvesting in the RVWRMP working areas, as their 6-m^3 domestic rainwater harvesting tanks remain empty for a large part of the year. However, rainwater harvesting remains relevant for capturing large amounts of rain for groundwater re-charge, irrigation and livestock.

The uncertainties related to climate change make the prediction of long-term climate change effects difficult. However, it can be anticipated that it will affect both the quantity and the quality of available water. The tendency already is for a shorter but more intense rainy season and absent or scanty winter rains. Any variations in the monsoon have an immediate impact in mid- and far-western hills and mountains, which are consistently in food deficit, even during so-called normal years. Rain-fed agricultural techniques rely on age-old manual methods and cattle for ploughing. The soil quality is poor, agricultural knowledge is weak and access to fertilizers limited. In many districts household production is typically only sufficient to meet demand for three to five months of the year. This is critical for farming communities that rely on their own production. Consequently these two regions

keep relying on food aid and migration to unskilled, low-paid jobs in India; practically every household has sent at least one man to work somewhere else. This has social implications, and has made certain districts in these regions the HIV/AIDS hotspots of Nepal.

The more intense rainfall also increases the risks for the infrastructure itself: many roads in mid- and far-western Nepal are already damaged or made temporarily unusable by extreme weather events, including seasonally repeating landslides and floods. At the sub-catchment level, changes in the availability and quality of water will exacerbate existing or latent conflicts between various communities and types of water users: we can already see water source disputes where water sources dry up seasonally or their yield is reduced enough to limit water uses. These are especially critical with livelihoods applications: it is exactly during the dry season that irrigation needs are the greatest, even for home gardens. Lack of water has also hampered progress in sanitation and hygiene.

3. The Rural Village Water Resources Management Project

Nepal faces a significant problem of governance, as elections have not been held for many years and there is considerable instability in the national government and operating environment. RVWRMP focuses on working with the more stable village development committees (VDCs) and communities. To enhance ownership and sustainability, the project emphasizes inclusive participation and the responsibility of the various key stakeholders in planning and implementation. RVWRMP follows the local development planning cycle adopted by the district development committees (DDCs) as per the Local Self Governance Act and Regulation. Seeking synergies across sectors, RVWRMP has signed memorandums of understanding at central level with a broad range of government departments active in the region including the Departments of Agriculture, Livestock, Cooperatives, Irrigation, Women and Children, the Cottage and Small Industries Development Board, and the Alternative Energy Promotion Centre, the governmental umbrella organization in charge of renewable energy. These have provided additional funding to expand activities. The project collaborates with other donor-funded initiatives in Nepal – for instance, funding from the Nordic Environment Finance Corporation brings additional funding for renewable energy.

RVWRMP has worked in mid- and far-western regions of Nepal since 2006. At present it works in 10 districts with 73 VDCs through district-level local governments. The VDC is the lowest administrative local government unit in Nepal, often representing sub-catchments fairly well, given the topography of Nepal. These are the operational units where the WUMPs are prepared. RVWRMP's technical options include sanitation, drinking water, community-based conventional and non-conventional irrigation, micro-hydropower, improved water mills, environmental works (usually relating to erosion control and water source protection), sustainable livelihoods (basic and advanced-level), and institutional capacity building, including multi-purpose agricultural cooperatives. Rainwater harvesting for source recharging and for the use of livestock or non-conventional irrigation have just begun piloting, but are yet to show the tangible results in the real-life situations of a region where the geo-hydrological realities can be highly diverse and the results accordingly unpredictable.

RVWRMP is a bilateral rural water resources project that is fully embedded into the local governance structure, operating and channelling funds through the district-level local governments. The project is supported by the governments of Finland and Nepal and the two lowest tiers of local government, with substantial in-kind and cash inputs from the local communities. The executive agency is the Ministry of Federal Affairs and Local Development and its Department of Local Infrastructure Development and Agricultural Roads (DoLIDAR) together with participating DDCs.

Since 2007 a water resources management committee has been established in each VDC. These are aligned with the National Sanitation and Hygiene Master Plan VDC WASH Coordination Committees. As a result, 47 VDC-wide WUMPs were prepared in 2007-2008, reviewed and updated in 2011, and translated into action through the step-by-step approach. A new generation of WUMPs is in process in May 2013. As of May 2013 total 674 water users committees (WUCs) with a total of 6,600 members have been established, registered and trained. Of the

WUC members, 44% are women and 23% from disadvantaged groups. Since 2007 there have been 906 individual schemes, with outreach to a total population of 481,303. In addition 25,000 people have directly benefited from livelihood activities (i.e. home gardens, nutritious food) since late 2010. In addition, more than 2600 people are newly employed by commercial-level livelihood activities (i.e. agrovets, local fibre processing, pickle making, out-of-season vegetable production, spices, multi-purpose nursery). During the past reporting year, in total 38,103 people benefited from capacity building efforts funded through the District Water Resources Development Funds, and another 1677 from targeted capacity building activities funded from the technical assistance budget, including participants from the local civil society, multi-purpose cooperatives and local technicians. In one reporting year, 5260 leader farmers were trained. In addition RVWRMP has about 20 to 30 on-the-job trainees from the local schools at any given time, mainly agriculture technicians and social mobilizers.

RVWRMP uses the following tools to enable sound decision making and implementation, for sustainable and efficient investments in institutions, infrastructure and information:

- WUMPs aim at effective, equitable and efficient use of water at the local level. They translate the principles of IWRM into practice across a VDC. WUMPs identify available potential water resources, present structures, existing plans and gaps in services. Attention is paid to sanitation, MUS and livelihoods. WUMPs provide a five-year vision, and identify immediate priorities for a one-year action plan. WUMPs serve the local government planning cycle.
- The step-by-step approach to community management guides multiple stakeholders through the planning, implementation and post-construction support phases. It translates the multi-layered, complex principles of good local water governance and IWRM into feasible steps and actions backed up by capacity building. The very first step is WUMP preparation. The step-by-step approach for micro-hydropower schemes is aligned with the funding partners. The step-by-step approach for sanitation is aligned with the National Sanitation and Hygiene Master Plan.
- Community-based MUS: a participatory approach that pays attention to the multiple domestic and productive uses of water. The technical options include combinations of water supply, conventional and non-conventional irrigation, water mills and micro-hydropower. Sanitation and hygiene are always included.
- GESI strategy: to ensure active, free, meaningful and equitable participation. It consists of clearly defined steps and activities with related indicators all mainstreamed across the step-by-step approach, WUMP and related monitoring practices. It prioritises women, dalit (the so-called 'untouchable' caste), indigenous people, the ultra-poor and other groups that are often excluded from services, decision-making processes and related benefits.

4. RVWRMP, food and water security

In the situation of increasing water scarcity and unreliability, careful application of MUS is important for maximizing local nutrition and food security. Food security can be divided into three components: food availability, food access and food use. Water resources management has the potential to address all these dimensions. RVWRMP improves local availability and access to food by increasing food production at the household and community levels, through the home garden concept and both conventional and non-conventional irrigation. The home garden concept introduces new crops and techniques that can significantly diversify the present practices. All this builds resilience for climate change adaptation and disaster risk preparedness.

Malnutrition, sanitation, health and water resources management all relate to each other. The link between malnutrition and many waterborne diseases is evident as frequent diarrhoea and intestinal parasites cause malnutrition, which also renders children more susceptible to other diseases. Safe drinking water, sanitation and hygiene (WASH) contribute significantly to the increased capacity of individuals to absorb and use the nutrients in their food.

Out of the 24 districts in mid- and far-western Nepal, 14 face regular food deficits and depend on external support to feed their populations. RVWRMP is not a targeted food security or nutrition project as such; however, RVWRMP has results' targets for nutrition, food security and overall livelihoods development. In the baseline

made in 2011, 41% of the total number of 4,901 households sampled had food security from their own production for up to three months only, while fewer than 1% had any surplus to sell. RVWRMP emphasizes that it is important to maintain a holistic integrated approach, and not to support individual activities in silos. The leading message is 'feed the family first'. This means that households should make sure that they meet their own nutritional needs before they sell any food. We often observe that high-value and highly nutritious crops such as beans, lentils or other pulses are grown and sold outside the community, and with that money, low-nutritional value white rice is bought. RVWRMP tries to change this mind-set, and to encourage home garden development in every household as a basic safety net. In 2011, there were only a few households in every VDC producing vegetables commercially, whereas by the end of 2012, 43% of the households participating in the water schemes are now managing a wide range of seasonal vegetables in their home gardens (some of them for sale), and over 3% are now managing out-of-season vegetables. Many households now also grow fodder for livestock (45% from recent sampling), thus reducing environmental damage.

5. What have we learned and why it is policy relevant

5.1 Water use master plans for local integrated water resources management

WUMPs provide a practical tool for the local institutions operating in a decentralized environment. VDC-level water resources management committees with broad representation ensure inclusion and holistic integrated planning. Over the past year these committees have adapted the role of VDC WASH coordination committees as defined in the Nepal National Sanitation and Hygiene Master Plan, aligning themselves with the national-level policies, yet doing so without losing the focus on local water resources. Increasing access to information is inherently built into WUMPs, which are all about making information available for local decision making.

During 2012 a new WUMP concept was developed to maximize the use of local human and financial resources. The modular thinking makes it possible to prepare a basic WUMP for visioning and basic planning, leaving more high-tech additions such as GIS maps and detailed technical drawings as additional modules for those cases where there are more financial and human resources available. The cost has been reduced, and through maximizing local contributions the ownership appears to have increased: the WUMPs are now owned by the VDCs who know exactly what is in them and what they mean. Disaster risk preparedness aspects will need further strengthening in WUMPs. This aspect is now more pronounced at scheme level when the WUCs prepare water safety plans for their individual schemes.

5.2 The step-by-step approach to good local water governance

As the individual scheme is taken up for implementation, a WUC is established and registered. The step-by-step approach guides the WUC at the scheme level through planning and implementation, including such as community mapping, public hearings and public audits, bringing the principles of good governance into action. The step-by-step process includes regular monitoring at each step, recommending the next budget release to the WUC. These monitoring visits pay systematic attention to GESI principles, encouraging separate meetings for women or disadvantaged groups to truly hear their voice. Participatory monitoring is carried out by local government and project staff together with WUCs. The step-by-step process supports appropriate decision making for each scheme (regarding technology, location and use). This is also where the community itself can address its water and food security related needs and plan accordingly.

5.3 Gender equality and social inclusion strategy and human rights

GESI principles guide all RVWRMP activities from the preparation of VDC-wide WUMPs for individual schemes. The WUMP preparation process brings together the different groups from all wards, including women and the disadvantaged, to identify their group's needs. The project actively facilitates discussion of social division

and inequality, and ensures inclusive participation in the step-by-step process. Close monitoring follows the results – for instance, of the 30,285 people who participated in RVWRMP-sponsored capacity building events in the past two years, 53% were women and 24% were dalit or ethnic minorities.

The project has used the GESI strategy to address the roots of the decade-long internal armed conflict in Nepal. Rather than avoiding or ignoring the history of the conflict, RVWRMP has been working deliberately on conflict and peace-building in a conscious attempt to design programmes in such a way that they benefit the priorities identified by the community itself. RVWRMP will continue to contribute to post-conflict peace consolidation and consensus building in its working districts. The GESI strategy and action plan, WUMPs and step-by-step approach all provide highly applicable tools in this regard. Accountable good governance as well as democratic and transparent planning and budgeting procedures are part of the strategy, and the individual actions of the step-by-step approach include public hearings and public audits. The WUMP process provides further open platforms for constructive public debates.

The policy dimension of ‘water in peace processes’ needs further thought. Water conflicts are well elaborated at the policy level, but using water 'action' in non-water related conflict or post-conflict peace processes could benefit from further attention. Bringing community members together regularly to work on water and food issues can promote cooperation and reduce violence. This is linked to food security through livelihoods opportunities in conflict and post-conflict situations, and to human rights in general.

5.4 Multiple-use of water services for food security

The community-based MUS approach acknowledges that people will use water for productive uses and livelihoods anyway, whether or not their water system is designed or even has capacity to do this, with the risk of compromizing the basic water supply needs of other users and possibly leading to conflicts. MUS is more than technology. At the community scale MUS considers all uses, users, sites of use and water resources and infrastructure holistically through a participatory approach. MUS is essentially an integrated perspective that pays attention to smart combinations of water sources, existing infrastructure and also to livelihoods potential, among others. Therefore, the MUS paradigm is clearly embedded into IWRM thinking, operationalizing the principles through multiple local applications. The MUS paradigm is also about service delivery at the local level (Smits et al., 2010).

Overall, there is an increasing interest in introducing income-generating activities into water projects, partly as a means of ensuring funds are available for future operation and maintenance. Some projects and programmes have attempted to ground the broader concept of IWRM at the community or micro-basin level in search of more locally rooted and balanced approaches to IWRM. These have been reviewed by Butterworth et al. (2010), Smits et al. (2010) and van Koppen et al. (2009), among others. At the same time many projects and programmes continue to operate within a given sector with a tight focus on sectoral objectives, policies, standards and budgets even when there would be a chance to widen the reach. For instance, drinking water supply projects are about drinking water, so the design flow, water quality standards, size and location of structures, related budgets and possible subsidies are planned accordingly.

An example how a WUMP has been translated into action in one of the working VDCs

Results in Bhatakatiya VDC, Accham District

Total: 878 households, population 5268 (2011)

2007: water resources management committee established and WUMP prepared. 52 individual schemes identified, seven for immediate action.

2007 to 2012: safe and accessible drinking water supply coverage from 21% to 92%. Total 810 households at Service Level 1 (up from 23 households in 2007) as of 15 July 2012. The gravity flow water supply system is also widely used for home gardens.

2010: declared an 'open defecation free' VDC.

2012: all wards served by electricity from micro-hydropower (25 kW + 35kW micro-hydropower + irrigation). When a recent landslide destroyed the canal supplying the micro-hydropower plant, the highly motivated residents repaired it immediately with their own resources, demonstrating strong local ownership.

2012: cumulative status in December 2012: total 24 schemes, 17 completed. Planning a multiple-use system to bring water from another catchment with gravity flow system to benefit seven wards out of nine. System combines both closed and open canals, feeding the existing water supply system with more water to enable more irrigation.

2012: multi-purpose cooperative established. Micro-hydropower and various skills development programmes open up new livelihoods opportunities. Computer class set up at the local school.

Other: the neighbouring Sutar VDC, inspired by the changes observed in Bhatakatiya VDC, started preparing a WUMP with maximum use of local resources in early 2012. In March 2013 this new WUMP was complete and Sutar VDC has been declared 'open defecation free'.

Photo credit: Bhatakatiya micro-hydropower plant and penstock pipe

Photo credit: Bhatakatiya women's contribution to canal works

Photo credit: Bhatakatiya – accessible taps for small water users for washing hands with soap

6. Conclusions and policy implications

Working in the most disadvantaged regions of Nepal in 10 districts across sectors, RVWRMP is fortunate to be able to both pilot new ideas and to scale them up.

Technical assistance: The project, with all its activities and joint management responsibilities, operates fully at the local government level, where the operational everyday realities of remote locations become evident and need dynamic responses. At the same time, the bilateral project status and the existence of the technical assistance team

close to operational level give opportunities to explore ways of working across the sectors together with the local stakeholders, and to feed results back to national policymakers. International and local advisors work with local government and communities to ensure social inclusion and consideration of human rights, acting as catalysts or change-makers (without which the previous status quo might continue). Practical results can be more easily achieved in this way, given the present shortcomings in local governance and the remoteness from national decision-makers. By focusing work on the most stable VDCs and communities, and instilling a strong sense of ownership and the skills to resolve problems as they emerge, there is more chance of sustainability once the project ends. RVWRMP is now phasing out from some of its working VDCs and starting work with new ones. This will give an opportunity, via continued monitoring, post-construction phase interaction and investment phase-out activities to observe the sustainability of the changes.

WUMPs are already in line with the VDC WASH plans described in the National Sanitation and Hygiene Master Plan, but they can serve a number of sectors: water supply and sanitation, hydropower and renewable energy, irrigation, agriculture, local governance, health, environment and soil, and also education (for instance, the project works with schools to develop facilities and community-wide campaigns such as sanitation, hygiene or nutrition awareness). The new WUMP concept prepared with local human and financial resources makes it possible to scale up WUMPs as a local government level planning tool that can address local food security and livelihoods issues. WUMPs are also relevant in the context of climate change adaptation and mitigation, and disaster risk preparedness. Should WUMPs truly become something to scale up, these policy dimensions would need further attention.

The step-by-step approach is already in line with rural water supply policies and the overall drive for decentralized action and participatory processes. It is also in line with the Local Self Governance Act regarding registered user groups, the present Water Resources Act, and the attempts at the central level to harmonize approaches to rural water supply and sanitation. The step-by-step approach clarifies the roles and responsibilities of each stakeholder at each step, focusing on building the capacity of the WUCs through learning-by-doing supported by specific training components. To scale up the step-by-step approach, considerable capacity building and technical support is needed at each stage to keep the WUC in the driving seat. At this point in time, there is a shortage of qualified human resources within civil society (and even in local government) in these two regions, and consequently the project provides significant capacity building support to a range of stakeholders. This could be a problem for scaling up to national level without similar intensive project support.

The GESI strategy and action plan has helped RVWRMP to address poverty, inequality and discrimination. As such, the GESI strategy also provides the project with a point of entry into human rights perspectives. A difficulty with the application of a truly human rights based approach is the lack of duty bearers, in the sense of an elected government and constitution. In this void, RVWRMP can temporarily support improved human rights to water and sanitation, in line with Nepalese policy. The low level of literacy among women and disadvantaged groups and their limited free time makes it difficult for them to take an active role in managing infrastructure works and community activities. RVWRMP continues to look for solutions (including literacy training, decreasing the women's workloads, and community awareness-raising), but this needs further work to reach equitable solutions.

MUS is a demanding paradigm from the policy point of view: it operates across the sectors and calls for participation in local development and local integrated planning. MUS is about good local water governance, about service delivery, about participatory and inclusive approaches and about GESI. MUS opens up livelihoods opportunities that may not have been be possible without the synergetic impact of having adequate water available for multiple uses. This is directly linked to food security and nutrition: through non-conventional irrigation even small additional amounts of water can help to diversify the present diet by introducing vegetables that were not grown before. While all this adds benefits and can increase the sustainability of the system and its services, the overall complexity and costs are also increased. MUS should be embedded into sectoral strategies and policies, making it possible to take up MUS in sectoral work plans and budgets as well. Sectoral policies should

acknowledge the potential of the MUS paradigm to provide further opportunities for livelihoods applications and to address water and food security. At the moment, some of the communities in the far-western region do not want to categorize their schemes as MUS as they expect (with good reason) that nobody will include them in their annual work plans (other than RVWRMP). Working across several sectoral policies, practices and ministries can be a great challenge, but once the tangible results and impacts can be felt in the poor, food-deficit villages it all starts to make sense. Both horizontal and vertical institutional linkages across sectors are needed. Interdisciplinary technical skills and open-mindedness are needed from all involved.

In conclusion, good local water governance has many faces that relate to the protection of public health and safety, environmental protection, accountability, transparency, user participation, equal opportunities, balancing equity, efficiency and effectiveness in performance, financial sustainability and transparency. RVWRMP is constantly developing its approaches, monitoring practices and capacity building components to make it relevant and appropriate in a very diverse environment, where all VDCs have their own dynamics, socio-economic and cultural realities and their own face of poverty. The project acknowledges that there are no 'one-size-fits-all' solutions but that it is possible to develop tools and approaches that allow local application. In the MUS paradigm this scope is further broadened through a range of livelihoods applications to further address food security and climate adaptation strategies. Although complex, institutionalizing the principles locally enhances the chances of future sustainability, ensuring the appropriateness of the technical solutions and building the sense of ownership at each step (thus increasing the chance of sustainability). The political economy and political ecology of WUMPs, MUS and GESI strategies in these contexts need further research.

Acknowledgements

The authors wish to thank the Rural Village Water Resources Management Project (RVWRMP) team in Nepal and the home office at FCG International in Helsinki, Finland. We further acknowledge the continued support to RVWRMP by the Ministry for Foreign Affairs in Finland and the Ministry of Federal Affairs and Local Development and its Department for Local Infrastructure and Agricultural Roads in Nepal.

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IN SEARCH OF DRIVERS FOR DRY SANITATION

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Rautanen, S.-L. & Viskari, E.-L. 2006.

Land Use and Water Resources Research, 4(6), 4.1-4.9.

Land Use and Water Resources Research,
Centre for Land Use and Water Resources Research

http://purl.umn.edu/48075
http://ageconsearch.umn.edu/handle/37722

Land Use and Water Resources Research

In search of drivers for dry sanitation

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Abstract

There is increasing awareness and concern about water pollution and water scarcity, and sanitation has been acknowledged as a critical dimension of both. This paper summarises the findings from the 2nd International Dry Toilet Conference 2006 (DT2006), held 16–19 August, 2006, in Tampere, Finland. The main objective is to publicise a range of research and real life experiences dealing with an uncommon subject: dry sanitation (DS). It was concluded, among other things, that continued technical and institutional development is needed because DS as a decentralised option calls for innovative approaches. Dry toilets based on urine diversion were recommended also for urban areas as urine has high concentrations of both nutrients and such micro-pollutants as pharmaceuticals and oestrogens, both of which are difficult and costly to remove by conventional wastewater treatment processes. The Conference urged continued serious and systematic research, also in the real life context, and taking small but tangible and sustainable steps towards better sanitation.

Introduction: rationale for dry sanitation

The sanitation crisis gets more serious every year: about 2.6 billion people, or 42 per cent of the world population, lack access to basic sanitation. That is more than double the number of those who lack access to safe drinking water — 1.1 billion people, or 18 per cent of the world's population (WHO/UNICEF, 2005). In 1990, the Millennium Development Goal (MDG) 7 set the target of halving the proportion of the population not served by 2015 (The World Bank, 2004). To achieve this, an additional 1.8 billion people need to be provided with improved sanitation between 2002 and 2015. Even if that target is achieved, another 1.8 billion people will still lack adequate sanitation in 2015 due to population growth (WHO/UNICEF, 2005).

Sanitation and water quality problems are further aggravated by poor or non-existent wastewater management: about 90 per cent of sewage in developing countries is discharged untreated into water courses (International Decade for Action: Water for Life, 2005–2015). This problem applies also to so-called developed countries. For instance, it is estimated that some 74 per cent of Europe's rural areas are covered by sanitation, while urban coverage is 99 per cent. Yet this does not mean that all urban people are connected to safe and sustainable sanitation systems. Several European Union member states are yet to satisfy the requirements of the Urban Waste Water Treatment Directive (UWWTD; 91/271/EEC) which calls for all agglomerations of more than 2000 population equivalent to be provided with collecting systems and appropriate treatment by 2005 (WHO/UNICEF, 2005). These pitfalls in wastewater treatment do not only pollute the usable water sources, but water is also wasted when flushing toilets and through leaky toilets.

The results of poor sanitation and water supply are well documented. For instance, it has been estimated that more than 2.2 million people, mostly in developing countries, die each year from diseases associated with poor water and sanitary conditions (WHO/UNICEF/WSSCC, 2000). At any one time, half of the world's hospital beds are occupied by patients suffering from water-borne diseases, and every week an estimated 42 000 people die from diseases related to low quality drinking water and lack of sanitation. Over 90 per cent of the victims are children under the age of five. (WHO/UNICEF, 2005).

There is global epidemiological evidence that sanitation is at least as effective in preventing disease as improved water supply. Studies have shown that water quality alone will not reduce diarrhoea. For instance, Jensen *et al.* (2004) investigated the association between bacteriological drinking water quality and incidence of diarrhoea among

children under five years old, and found no correlation between the incidence of childhood diarrhoea and the number of *Escherichia coli* in the drinking water sources (the public domain). Faecal contamination levels in household water containers were generally high, even when the source water was of good quality, pointing towards the importance of household hygiene and sanitation rather than water quality at the public tap. Tumwine *et al.* (2002) had earlier concluded that determinants of diarrhoea morbidity included poor hygiene (unsafe disposal of faeces and wastewater), education level of household head, water obtained from surface sources or wells and *per capita* use of water for cleaning; they also stressed that hygiene practices are an important complement to improved water supply and sanitation in reducing diarrhoea morbidity. If this is 'old' news, why has the sanitation situation not improved but instead become increasingly worse?

In recent years awareness and concern about water pollution and water scarcity has increased, and sanitation has been acknowledged as a critical dimension of both. Finally, sanitation has become a burning topic in its own right, and action worth its own policy and funding. Unfortunately, many efforts have focused on water-based sanitation as the ultimate solution which, in practice, has only increased or intensified water-related problems in many areas of the world. Therefore, there is an urgent need to broaden thinking and look beyond the conventional systems: centralised and water-based sanitation systems alone cannot solve the sanitation crisis. Decentralised, integrated on-site and ecological approaches are needed also in urban and peri-urban areas. Since water supply and sanitation are inherently integrated and equally important, they also relate to land use and land-related resources. The overall system operates in a rather broad framework which has to do with public health, natural and built environment, agriculture, soil and water management, and socio-cultural and economic issues.

Objectives and methodology

This paper summarises the findings from the 2nd International Dry Toilet Conference 2006 (DT2006), held 16–19 August, 2006 in Tampere, Finland. There were 147 registered delegates from 34 countries who participated in the seven sessions of the international programme, and a 100 participants attending the additional Finnish-language sessions. The main objective of this paper is to publicise a range of research and real life experiences dealing with an uncommon subject: dry sanitation. This, it is hoped, will encourage further dialogue on sanitation options and policies. The literature review also supports the main objective although it must be admitted that the number of serious scientific articles on dry sanitation appears extremely limited. The complete Conference-related documentation is also available on line at http://www.drytoilet.org/dt06.html and at http://kirjasto.tpu.fi/DT2006.pdf.

DT2006 conference sessions

The conference sessions in the international programme:

- *Session 1*: From past to future
- *Session 2*: Architecture & Construction
  Key note : Andreas G. Koestler – *Sanitation for Life* in Natural Disasters
- *Session 3*: Attitudes & Advocacy
  Key note: Ron Sawyer – A tale of two systems: Obstacles & incentives for implementing ecological sanitation in a periurban town, Tepoztlán, Mexico
- *Session 4*: Separation & Re-use,
  Key note: Joachim Behrendt – Appropriate de-central wastewater technologies for low income regions
- *Session 5*: Dry Toilet Technology & Monitoring,
  Key note: Naoyuki Funamizu – Dry toilet: An important system for controlling micro-pollutants from our daily life
- *Session 6*: Integrated Approaches
- *Session 7*: Sustainability & MDGs,
  Key note: Christine van Wijk-Sijbesma – Where softness matters most: scaling up dry toilets in developing countries
- (*Sessions F1 to F3*: Finnish language session - separate programme)

See: Korkeakoski et al. 2006a and 2006b

Conceptualising dry sanitation

Ecological sanitation

Public and private toilets are known to have existed in ancient cities, and the productive use of human excreta is not new. Waste disposal is as old as civilization. Sijbesma (2006) cited a well-known story of the Emperor Vespasian (Rome, 69–79 BC) who levied a tax on the sale of urine from public toilets for the production of wool and leather, and silenced his critics by his remark: *Pecunia non olet* (money does not smell) (Sijbesma, 2006). Yet serious scientific research on toilets does not have equally long roots. Water is popular as a subject of research and a metaphor, while toilets have inspired neither researchers nor artists, philosophers or folklorists. Rather, toilets have been despised and subjects relating to their use avoided as a taboo. In many cultures the caretakers of latrines are often considered the lowest class of people. Furthermore, in poor residential areas, the social status of tenants was determined by their location: the further one lived from the toilets, the higher the status (Juuti and Maki, 2006).

Ecological sanitation (ecosan) has its roots in ancient times when both human and animal excreta were valued as a fertiliser. Ecosan is a way of thinking, an approach and a new philosophy, rather than just a technology *per se*. As such, the concept is embedded in the Integrated Water Resource Management (IWRM) framework. The Global Water Partnership (2000) defines IWRM as *"a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems."* (Global Water Partnership 2000, p. 22), paying attention to downstream vulnerability to upstream activities. It further calls for integrating water and wastewater management but does not pay attention to sanitation specifically and, therefore, to the options of producing no or only a minimum amount of wastewater. In essence, sanitation belongs within the IWRM framework, but as was acknowledged by Werner during her conference presentation, the mainstream debate on IWRM still focuses on water resources, ignoring to a large extent 'land and related resources' and the option of minimising wastewater.

Encouragingly, though, the Global Water Partnership

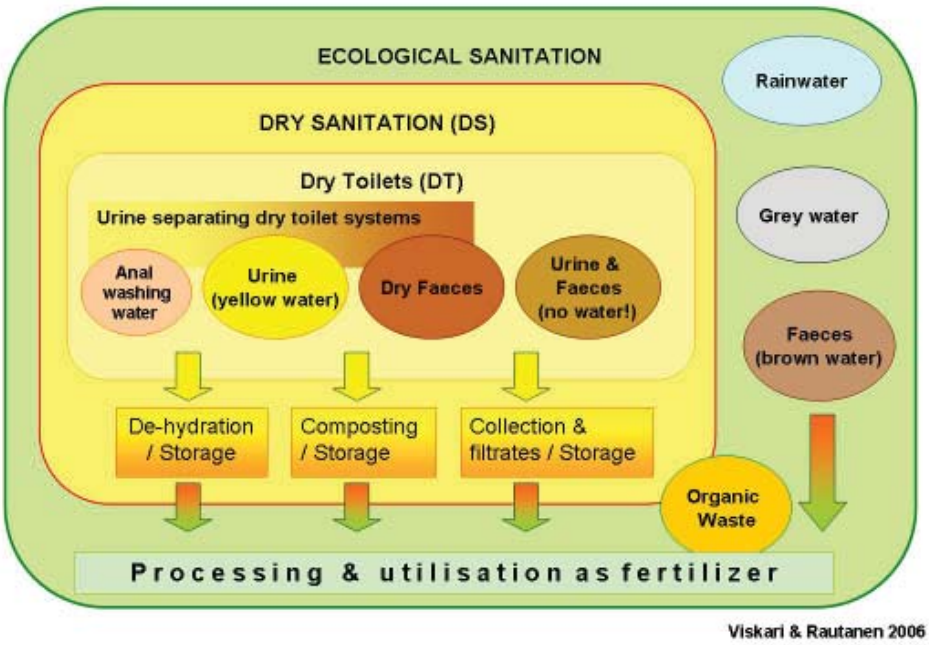

Figure 1 Definition of dry sanitation within the ecosan framework.

has also recently paid more attention to sanitation. Rees (2006, p. 31) identified the advantages of a successful decentralised approach to sanitation: it is demand-responsive with services tailored to local conditions; it allows a wider range of technical options to be used; it minimises free rider problems; it allows phased investments; and it clearly differentiates between the private and public good segments of the sanitation service and shares the financial burden at different geographical levels.

Ecosan could contribute to IWRM in a number of ways. It has vast potential in areas such as saving drinking water, protection of water bodies, reduction in health risks, soil fertility, reduction in costs, use of grey water or wastewater for irrigation, and flood protection (Werner *et al.,* 2006a). Ecosan is based on three fundamental principles: (i) preventing pollution rather than attempting to control it afterwards,(ii) sanitising urine and faeces, and (iii) using the safe products for agricultural purposes. This approach is characterised as 'sanitise-and-recycle' and essentially aims at closing the loop (Winblad and Simpson-Hébert *eds.* 2004).

Note that ecosan is not necessarily dry, but that in the best case scenario dry sanitation (DS) falls within the ecosan framework (Fig. 1). For further detailed conceptualisation, see Winblad and Simpson-Hébert (Eds, 2004), WASTE (2006) and *Deutsche Gesellschaft für Technische Zusammenarbeit* (GTZ) (2006).

Dry sanitation

Dry sanitation (DS) is embedded in ecological sanitation. Its technological manifestation, the dry toilet (DT), is part of *on-site systems* where safe disposal of excreta takes place on or near the housing plot. DS can be defined more precisely as on-site storage *and/or* disposal of human urine and faeces without the use of water as a carrier for flushing. The most modern version of DS *enables, in a controlled environment, potential recovery and reuse of the nutrients* through the 'drop-and-store-and-sanitise-and-reuse' approach which the 'drop-and-forget' approach applied to traditional pit latrines did not allow. A DS system creates a controlled environment into which, by definition, no water should be added. The authors of this paper suggest that further processing and utilisation of the end-product as a fertiliser or in other uses conceptually falls within the ecological sanitation framework, and therefore these issues relating to agriculture and soil management are excluded from the DS framework. Thus, the operational word in the definition above is '*potential':* The nutrients in the DS end-product *can be* recovered and reused (Fig. 1).

The technological alternatives available in DS are the various versions of dry toilets (DT). Traditional *on-site systems* have typically included pit latrines and septic tanks. Of these two most typical on-site solutions, the pit latrine is the one closest to DT. Pit latrines are known as relatively low cost options, consisting of a superstructure which affords privacy to the user, a hole or a seat set into a slab which covers the pit, and a pit beneath the slab into which excreta and anal cleansing materials are deposited. The ventilated improved pit latrine (VIP latrine) is intended to make the system more convenient and safe for the users. Pit latrines are not used in conjunction with conventional flush toilets. Only a relatively small volume of water enters the pit, and liquid is allowed to seep from the pit into the surrounding ground. Under fairly dry conditions excreta in the pit decomposes into humus-like solids, water and gases. Because of the long storage time in the pit, disease-causing organisms (pathogens) are eventually killed (Sanitation Connection, 2006). Yet, in most situations, the pits are rarely emptied and what takes place in the pit is rather uncontrolled. If the culture favours anal cleansing with water or the pit can be flooded with surface runoff, pit latrines will soon become anaerobic nuisances. Excess liquid seeping into the ground can also contaminate ground water in many geo-hydrological conditions. Indeed, pit latrines have given composting toilets and other forms of

DTs a bad name.

DT options can be roughly divided into those that divert the substances, usually urine and faeces, and those which do not. Liquids can also be separated at a later stage, and some applications allow using water for anal cleansing and diverting this flow away entirely from the rest of the substances. Urine diversion is based on the fact that urine contains most of the nutrients in domestic wastewater but makes up less than one percent of the total wastewater volume. Separation of urine at source allows nutrient recycling from a concentrated nutrient solution, thereby reducing the need for advanced nutrient removal from the wastewater (Wilsenach and Van Loosdrecht, 2004, in Maurer *et al.,* 2006). Maurer *et al.* (2006) distinguished between seven main purposes of urine-treatment processes: hygienisation (storage), volume reduction (evaporation, freeze–thaw, reverse osmosis), stabilisation (acidification, nitrification), P-recovery (struvite formation), N-recovery (ion exchange, ammonia stripping, isobutylaldehyde-diurea precipitation), nutrient removal (anammox) and handling of micro-pollutants (electrodialysis, nanofiltration, ozonation). Their recent review revealed that a wide range of technical options is available to treat collected urine effectively, but that none of these single options can accomplish all seven purposes (Maurer *et al.,* 2006). This definition of dry sanitation underlining the opportunity for closing the nutrient loop by treating and reusing the end product safely takes DS into the context of ecosan: re-use is within the domain of ecological sanitation.

Results: reflections from the conference

Research and development

The conference sessions gave a holistic view into the benefits, weaknesses and open questions related to research in dry toilet technology. Attention was paid especially to separate collection and treatment of urine and faeces. The first step in solving the pollution problem is to separate the various substances and flows (Fig. 1). Urine separation reduces significantly the ammonia losses from the dry toilet compost, and at the same time urine can be used for other purposes than just diluted fertiliser. 'Divert and rule' applies, meaning that urine should be diverted/separated from faeces, and various waters be kept separate as dry faeces are much easier to treat: *"dry toilet material should be dry"* (Behrendt, 2006). This was highlighted for instance in a study conducted in Japan concerning the hygienic risk associated with compost toilets using sawdust as matrix. It was found that high temperature and low water content enhanced the rate of decrease in populations of both bacterio-phages and bacteria, emphasising the importance of keeping dry toilets dry (Otaki *et al.,* 2006).

The risk of spreading diseases is real but not necessary very high if the composted faeces and urine are correctly used. Normally, urine is almost sterile and the risk of spreading diseases is low. In the tropics, however, there might be a risk of spreading dangerous diseases, such as schistosomiasis. Long-term storage destroys most possible disease causing agents in urine. Microbiological health risks are, however, not the only health and hygiene issues to be considered. There also micro-pollutants such as pharmaceuticals and oestrogens (endocrine disruptors) which concentrate in urine. The research group from Hokkaido University recommended source separation of urine as a solution to controlling the increasing level of pharmaceuticals and hormones in the aquatic environment (Funamizu, 2006). As an example, they found that the degradation rate of amoxicillin was strongly related to the ammonia concentration in the demonstration plant, and since phosphate and ammonia accumulate in the composting toilet matrix, it can be expected that the more the toilet is used, the faster the reduction in amoxicillin (Kakimoto and Funamizu, 2006).

Several growth experiments examined the use of urine alone, urine and composted faeces, or faecal compost alone. The results show clear increases in yields when sufficient amounts are used at the right time. Results with maize, cucumber, carrot and barley were good, and further research with cabbage and potatoes was under way. The amount, time and method of adding fertiliser should, however, be carefully considered to provide a good yield safely (Viskari *et al.,* 2006; Heinonen-Tanski, 2006; Guzha, 2006). Urine should not be sprayed onto the plant but over the soil. Different plants and trees need a slightly different procedure, and if there are any concerns about safety, non-edible plants, light construction materials and fibre plants should be fertilised instead. Generally, the health risk is very low when urine is used for fruit trees rather than for rootcrops. The food is very rarely eaten without any processing, and the processing destroys many pathogens (Heinonen-Tanski, 2006).

There are other uses for separated urine as well. It can be used to treat green composts, such as straw and corncob, to balance the C/N ratio and to irrigate composts as needed. For example, in Thailand, corncob composts, which require additional N to work properly, are irrigated. Re-using urine instead of water for moisture content adjustment is recommended to provide additional nitrogen for composting (Songthanasak, 2006). On the other hand, urine has been found to act as a source for P recovery as struvite. Tilley *et al.* (2006) concluded that the storage of urine is an essential step in recovering struvite, and that by removing calcium and other non-desirable compounds and allowing the pH to attain an ideal working range naturally, only magnesium needs to be added to recover a pure struvite product. Further examples of case studies presented during the Conference are summarised overleaf. The reader is encouraged to download the Abstract Book for further study (see Korkeakoski *et al.,* 2006b).

Construction and architecture matter

Architecture and construction technology will be of utmost importance should dry toilets ever become as desirable and convenient an option as the present water closet systems. The Conference called for more research and real life applications of various designs: both 'branded' high tech designs and low cost options are needed. Whatever the design, it should comply with the local requirements: cultural, social, ecological and economic realities are as varied as climatic and geo-hydrological environments. Kuria (2006) stated that architecture continuously evolves to reflect changing ecological thinking, material development and changing lifestyles, but that unfortunately sanitary facilities have received very little attention. In many countries craftsmen develop, package and market the products.

An ecosan pilot project in Nakuru town in central Kenya aimed to highlight the ecological, technical and economic

South Africa: More than 40 000 dry toilets have been supplied as basic sanitation facilities in South Africa. The research showed that most of the users accepted the urine diversion toilets as a toilet only, but that their acceptance as a sanitation technology was very low and people still expected to eventually have flush toilets. Only a few users were willing to use the human excreta in their gardens, or generally have anything to do with it. The general norm of not handling human faeces is preventing the full implementation of the UD technology. (Duncker, 2006)

Zambia: Madimba is a Lusaka peri-urban area where local dry toilet design was developed to fit into the given geo-hydrological conditions and cultural environment through paying attention to the perceived needs of the communities and indigenous knowledge. It was concluded that integrated community-based environmental sanitation projects should include income generating activities to encourage people to participate. It was noted that most of the voluntary labour was done by women. (Kawanga and Phiri, 2006, Session 1)

Mexico: the research project in Ciudad Juárez included monitoring 90 composting latrines in a low-income peri-urban community utilising US-EPA guidelines for the end product. The double vault provided clear separation and more room for the urinal but increased costs and space. The dehydrating system was consistently the better choice over the biodegrading system in this study area (very hot desert area, good for dehydration). A research component included also a study on hygiene behaviour, and paid attention to hand washing. The research process had also a strong component for community participation, focusing especially on the youth and general public awareness concerning health, hygiene and sanitation. Users were satisfied with their latrines. (Barud-Zubillaga, Corella-Barud and Peña, 2006, Session 7)

Romania: double vault dry urine diverting (u. d.) toilets were constructed in a primary school to demonstrate how to improve sanitation, the health of the children and to protect ground water against infiltration of human waste in an affordable way. A year after the implementation the evaluation results showed that the dry urine diverting toilets were well accepted and operated by even 6–10 year old children. There were hardly any problems with bad odours or flies. A gender specific pattern was observed: women preferred ecosan toilets while men preferred water flush toilets. More than half of the interviewed citizens were willing to use the urine diverting toilet products for agriculture. They all complained about the odour and flies of their pit latrines. (Samwel and Gabizon 2006, Session 2)

Mexico: The study covered 75 dry toilets. Of all observed toilets, 67 per cent had no odour and 79 per cent had a generally clean appearance. Sixty per cent did not use the urinal even if it was installed, and 51 per cent did not follow the maintenance recommendations. Twenty-four per cent of the 'negative' cases suffered from technical problems, such as broken or blocked pipes, five per cent had turned the structure into a cistern and another five per cent had not finished the construction at all. The chamber had been filled at least once in 48 per cent of the cases, and 92 per cent considered using the contents as fertiliser. In terms of pathogens, the end products were more than just acceptable. It was suggested that the great resistance may have socio-cultural roots. (Ysunza-Ogazón *et al.,* 2006, Session 3)

United Kingdom: the project with the Beacon Hill Allotment and Leisure Gardeners Society, in Cleethorpes, Lincolnshire, aimed to provide an ecological construction within the commercial limitations of a commercial build. As a result, the allotment holders have a building that is interesting both in its purpose and construction. The sanitation facility has made the site more accessible to women, the disabled and the elderly, and it has encouraged the uptake of allotments on the site. The dry toilet gave people an opportunity to test the dry toilet technology and understand its purpose. The construction company learned valuable lessons in ecological design and construction while providing important vocational training for disadvantaged youth. (Gilroy-Scott and Chilton, 2006, Session 2)

Source: Korkeakoski et al. 2006a and 2006b

value of ecological sanitation through a high quality architectural design. The design was geared primarily to evolve a 'modern mixture' concept to improve sanitation's image, to support entrepreneurship and to strengthen environmental linkages. Attention was paid to the different needs of women, men, children and the disabled. The facility for the disabled was constructed considering three types of users: the visually impaired, wheelchair users and those with missing limbs or paralysed. The facility was also designed to strongly portray the imagery and identity of Nakuru town, with sculptures depicting the flamingos of Lake Nakuru in the rock garden and mounted on the internal façade of the entrance lobby wall (Kuria, 2006).

China has a long and vibrant ecological sanitation tradition. The China-Sweden Erdos Eco-Town Project transferred the practices still common in rural areas into an urban context. This was the first time urine diversion dry eco-toilets have been applied to large scale multi-storey buildings in an urban area. The project area comprises about 800 households in its first phase. The community has

its own independent sanitation system (source separation and collection of urine and faeces, separate grey water treatment, sorting and collection of solid waste, composting and reuse of the resources). It is expected that daily water consumption can be cut by about a third while providing 24-hour reliable and sustainable sanitation service. In addition to its environmental benefits, the housing system also aims at resolving the housing problem of mid- and low-income people (Lixia, 2006).

GTZ, the German cooperation agency, has recently been renovating its headquarters in Eschborn, Germany. The new office buildings include a modern system for the separate collection and reuse of urine and a treatment and reuse system for brown water. The central part of the building, housing about 300 employees, the conference rooms and the restaurant, is equipped with a urine separation system. It is expected that the system will save 900 m^3 of water yearly. The project had four main objectives, including (1) reduced emission of nutrients, organics, pathogens and micro pollutants such as pharmaceutical residues and hormones into the public sewer system and receiving water bodies; (2) recovery of nutrients for agricultural use; (3) demonstration of the ecological sanitation concept and contribution to international dissemination; and (4) research on important aspects of ecological sanitation systems in Germany and development of treatment technologies (Werner *et al.,* 2006).

Dry sanitation in emergencies

Sanitation has an essential role to play in emergencies. It is the first barrier between the possible pathogens (in excreta) and the receptors (human beings). The importance of safe excreta disposal is heightened by an oft-forgotten consequence of living in chaotic surroundings, namely stress-related diarrhoea. The local population and organisations are the primary actors in disasters, and the non-governmental organisations (NGOs) can empower the local stakeholders and provide feasible solutions and equipment to different scenarios and conditions.

The real life example from Iran showed how rapid action was crucial to prevent spread of diseases: although the environmental health staff arrived in Bam in less than 24 hours, people had already begun to defecate in various open areas, thus endangering public health (Amin, 2006). He further noted that even rapid action should not override cultural considerations: large refugee camps were built but people preferred to stay close to their homes.

Another example dealt with a refugee camp in Sudan where it was found that lack of appropriate sanitation is only one of a multitude of problems that prevail in a refugee camp. It was emphasised that a refugee camp forms a dynamic entity which is not even meant to be permanent; therefore, any attempts to build permanent infrastructure are futile. Dr Koestler from the Norwegian Red Cross noted that sanitation services can best be improved by integrating public health services with infrastructure rebuilding to be able to cope with future disasters. This could reduce hygienic risks after a disaster and reduce vulnerability of communities in the long run. Dr Koestler called for innovativeness in using local resources and materials, and trained, well-functioning sanitation teams to tackle the sanitation problem from the beginning (Koestler, 2006). The challenge for developing sustainable and appropriate sanitation systems for crisis situations is diversity and uncertainty: it is difficult to get financing for a catastrophe which has not yet happened.

Discussion: to dry or not to dry – is there a problem?

DS is based on long traditions of managing human urine and faeces. At the same time, it also represents something novel for those already used to urinating and defecating into water closets or in traditional ways of using 'the bushes'. In many parts of the world both of these prevailing practices are challenged by the sheer number of people, water scarcity and pollution problems. Yet, even if DS were theoretically and conceptually well developed, it would still be a challenge to apply it in diverse climatic, geo-hydrological, environmental, socio-cultural and economic conditions. Due to a lack of experience and the confidence it could give, it is difficult, for instance, for local leaders and national policy makers to take DS seriously. Failed sanitation systems are difficult to hide.

Sanitation is about dignity, convenience, public health, clean water and healthy environment, and general well-being of the citizens, all of which are issues and concerns for local planning and local governance. A definition states that *"water governance refers to the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services, at different levels of society"* (Rogers and Hall, 2002, p. 16). We would like to emphasise that a similar definition should be formulated for *sanitation* governance as it relates to protection of public health and safety, environmental protection, user participation, gender and equal opportunities, cost efficiency and effectiveness of performance, financial sustainability and transparency, and overall accountability. Many of the sanitation-related problems identified during the conference are related to these.

Sanitation should be a public concern and advanced with public resources even if the facilities as such may be private property. Keeping the environment healthy and sanitary is certainly a citizen's obligation as well as a right. As sanitation is a very local and even a household-specific dilemma, local government should provide the institutional frame of reference where these interests could be articulated and translated into action. To derive the full benefits sanitation can offer, all households must participate. The only option is to systematically work towards full coverage, and this is where local governments as community planners truly step in (Rautanen, 2006). The importance of developments in infrastructure planning and housing design, in addition to continued DT-related product development, were also acknowledged by Mattila in his recent doctoral research. Mattila (2005) called for attention to the quality of activities at all stages: design, contracting, construction, control, operation, maintenance and repair of on-site sanitation systems – with special emphasis on the DT.

During the conference a number of present challenges were identified, including issues such as lack of integrated vision, capacity and commitment at the local government level. It was noted that decisions concerning the water and sanitation sectors are often dominated by political interests and financial concerns which may not be in the best interest of the people and the environment nor sustainable. Key decision-makers are also often unfamiliar with alternative solutions which is why the official sector is not willing to

invest in research of 'unconventional' systems.

Sustainability was also debated during the conference. The findings of a number of case studies relating to the post-construction status of dry toilets exposed two key reasons for poor sustainability. Firstly, technical problems originating from initial poor construction using low quality construction materials. Secondly, there was a general lack of sense of ownership which was reflected in inadequate operation and maintenance: the users' had not chosen the technology and/or did not consider the sanitation facilities a priority. Countless toilets, both dry and otherwise, have been abused, abandoned or transformed into something more useful, such as storage facilities or even kitchens! The question is: how can something 'so simple' be so difficult to make and maintain? More financial data are also needed: what is promoted as low cost should truly be so!

During the conference it was noted that people can have unreasonable wants and needs, or just too high expectations for the sanitation solution. These can easily lead to disappointment. The importance of human perceptions, beliefs and attitudes for the success of ecological sanitation is evident, and a proper approach for managing — not manipulating — them positively towards sustainable solutions is vital. Ecological sanitation education and training should give people the ability to develop, plan and implement sustainable sanitation systems that are hygienically safe, socially acceptable, economically feasible, environmentally sound and technically appropriate, and convenient to use. To achieve this we need to modernise current educational and training systems to inspire all stakeholders. Trans-sectoral and interdisciplinary co-operation and inputs from a range of research fields and well-designed educational materials are of great importance in securing successful education, training and capacity building.

Conclusions and recommendations – the dry future

Based on the findings presented in connection with the DT2006 conference, we recommend that all our fellow sector professionals:

- Continue their serious and systematic research, also in the real life context. Even if a number of pilot research and demonstration projects have been carried out, more research is needed, including a strong advocacy and educational component to help inspire (political) confidence to commit to DS.
- Emphasise sound technical design, good workmanship and durable materials. Cheap and poorly constructed options are not sustainable, and therefore, not cheap at all. Negative experiences undermine sanitation improvements in general, whether dry or not. Failed efforts in sanitation are difficult to hide!
- Make it their aim to bring DS technology to the same level of convenience as the water closet systems now provide. Sustainability and tailor-made products need community involvement and listening to the real users, but also an enabling environment from the local planners and decision makers.
- Always ensure that the recommended options are safe from the public health point of view. To make faecal material hygienically safe, thorough thermal composting and/or after treatment or storage are needed – there are rarely shortcuts. It is also important to pay attention to timing and the type of plants being fertilised: the health risk is very low when urine is used for fruit trees rather than for root crops.
- Dare to suggest urine diversion toilets also in urban areas. Urine has high concentrations of both nutrients and such micro-pollutants as pharmaceuticals and oestrogens (endocrine disruptors). All these are difficult and costly to remove through conventional wastewater treatment processes and, therefore, are found in increasing concentrations in the aquatic environment.
- Strive for long term monitoring of the existing pilots as there is a need for more real life performance data which spans several years into the 'post-programme' period. Anything will work as long as there are enough academics and committed local professionals involved, but what happens when the latrine owners are left to themselves? Replication, local adaptation and scaling up of lessons learnt remain limited. Good practices should be institutionalised in each community as a standard code of practice, similarly to flushing the flush toilet now.
- Do systematic cost and value analysis in a real life context: which are actually the low cost but high quality and sustainable options? What is not proven to be truly low cost, should not be advocated as such!
- Search for new institutional settings. DS as a decentralised option calls for innovative approaches to private sector involvement to ensure the necessary technical services: it should not be expected that individual house owners are willing to maintain the systems themselves or have an interest in gardening.
- Step outside their sanitation and ecosan circles and dare to approach other sectors (water, public health, environmental, social), and actively seek to integrate the principles of ecosan into, for instance, the agricultural and energy sectors.
- Actively contribute to policy and political dialogues at all levels in search for solutions to the sanitation crisis. It is politically difficult to commit to unconventional options if there is no reliable, first-hand experience from their real life performance: therefore experiences have to be effectively shared!
- Consider what are the incentives for sanitation improvements at various levels, from the national policy level to local action level. This calls for an enabling environment and good governance, a system where a positive outcome can be fed back into the broader system.
- Remember that incentives and other drivers for change are community-specific, even within one country or region. Small, tangible and sustainable steps are needed in each to show the direction.

Acknowledgements

Financial support from Academy of Finland (210816) and Maj & Tor Nessling Foundation is gratefully acknowledged. The authors wish to extend their warmest regards to all key note speakers, delegates, chairpersons, rapporteurs and sponsors for making the DT2006 a successful and fruitful event.

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VI

STRENGTHENING BEHAVIOUR CHANGE COMMUNICATION IN WESTERN NEPAL – HOW CAN WE DO BETTER?

by

Gerwel-Jensen, L., Rautanen, S.-L. & White, P. 2015.

Waterlines, 34(4), 330-346.

doi:10.3362/1756-3488.2015.030

Strengthening behaviour change communication in western Nepal: how can we do better?

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The Government of Nepal aims to achieve full water and sanitation coverage by 2017. The bilateral Rural Water Supply and Sanitation Project in Western Nepal (RWSSP-WN) works with local governments in 14 districts, aiming to declare them open defecation free. This behaviour change communications evaluation explored how to improve RWSSP-WN's present practices to reach the diverse target population in the Terai districts, where more than 1 million people still defecate in the open. The study reviewed RWSSP-WN's present behaviour change triggering tools and related communications strategies. Our findings suggest that availability of subsidies seems to change how people think about sanitation and tends to eliminate willingness to pay for a latrine. We recommended strong advocacy for a no-subsidy policy, and more attention paid to alternative financing options with targeted support to the poorest of the poor. The present behaviour change triggering tools do work as intended, but there is a need to develop pre-triggering and post-triggering strategies to increase the overall impact. The pre-triggering strategy would ensure that potential barriers to change are identified and addressed before the actual triggering event, and that the key stakeholders are prepared for the actual triggering event. The post-triggering strategy is needed to continue motivating households to change via messages that tap into the drivers of change, addressing also the barriers which may keep each household from changing behaviour. This paper provides a number of recommendations applicable for those working with local governments and communities to increase the scope and scale of behaviour change triggering.

Keywords: behaviour change communications, water, sanitation, hygiene, Nepal

THE GOVERNMENT OF NEPAL has envisioned achieving universal coverage of basic water supply and sanitation services for its citizens by 2017. This entails that open defecation should end in all districts. The Government of Finland is supporting Nepal in its efforts to achieve universal access to sanitation facilities via its support to the bilateral Rural Water Supply and Sanitation Project in Western Nepal

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http://dx.doi.org/10.3362/1756-3488.2015.030, ISSN: 0262-8104 (print) 1756-3488 (online)

(RWSSP-WN). RWSSP-WN works in 14 districts, of which 9 have been declared open defecation free (ODF) to date. The main challenge remains in the Terai districts where the RWSSP-WN works: Kapilvastu, Nawalparasi, and Rupandehi. Of these, Nawalparasi was declared ODF in July 2015. The target is for these three districts to be declared ODF in a sustainable manner and without subsidy by 2017.

The sheer number of people to be reached is the point of entry for this study. How does a behaviour change communications (BCC) programme reach 1 million people in a manner that also results in a tangible change, i.e. stops open defaecation? According to the 2011 Census (Central Bureau of Statistics, 2012), the number of households without toilets in Nawalparasi district was 38 per cent, in Rupandehi district 41 per cent, and in Kapilvastu district 68 per cent. In total this means that out of 383,859 households in these three districts (population 2,095,640), 179,353 households (population 980,153) did not have a toilet (Government of Nepal, 2011).

All water, sanitation, and hygiene (WASH) sector stakeholders in Nepal agree that the Terai (the southern plains of Nepal) is the greatest challenge. Changing sanitation behaviours and increasing household latrine construction have proven far more difficult in the Terai region than in the mountain regions of Nepal. BCC strategies and tools which have worked well in other parts of Nepal (regarding topics such as toilet use, improved menstrual hygiene, and hand washing) have been less successful in the Terai. The large, high density population and mixture of socio-economic, religious, and cultural identities are factors which may make behaviour change more challenging in this region. Moreover, the long border with India, with significant landless and transient populations, adds a layer of complexity to the Terai's human landscape. Other factors that influence behaviour change include limited space for sanitation facilities, toilet preferences, and the complexity of the toilet-building process in flood-prone flat lands.

To better understand the issues of use and maintenance, as well as to continue and improve programmatic efforts to scale coverage, RWSSP-WN studied its present behaviour change triggering tools and related communications strategies, to learn how to do better in the Terai context. The study was conducted in the above-mentioned Terai districts in December 2014. This article outlines the findings and recommendations, taking the consultant report by Gerwel-Jensen and Poudel (2014) as the basis for further discussion. These findings would be useful for any location, including both sites that have already been declared ODF and those that have not.

What did we study?

The objective of RWSSP-WN Phase II is for all its 14 working districts to be declared ODF. The project approach is fully in line with the Nepal Sanitation and Hygiene Master Plan (Government of Nepal, 2011). Given that RWSSP-WN is a local-government-led rural WASH project, it operates through the District Development Committees (DDCs) and Village Development Committees (VDCs). It also works closely with District WASH Coordination Committees (D-WASH-CCs) and VDC

WASH Coordination Committees (V-WASH-CCs), which have been established to coordinate and harmonize efforts of the multitude of agencies, programmes, and projects – governmental and non-governmental alike – working to reach the ODF goal. To achieve the aim of total sanitation and hygiene behaviour change in the target communities, the project applies a two-stage strategy as follows.

Stage 1: Community-led sanitation behaviour change

The target of this first stage is to bring about household sanitation behaviour change (i.e. stopping open defecation, and encouraging the construction and consistent use of toilets by all household members). Behaviour change is achieved via a so-called 'trigger-based' approach, which is applied at both community and individual levels. This replaces the more traditional top-down, lecturing approach regarding the dangers of open defecation and the importance of toilet use, which proved relatively ineffective in creating significant and sustainable change.

The RWSSP-WN trains V-WASH-CC members and local support persons to plan for and apply various 'triggering tools'. In turn, the VDC stakeholders and support persons train a group of volunteers from all wards in the VDC on the use of the tools. Ward-level volunteers are then expected to carry out community and individual level triggering activities in their local area with support from the V-WASH-CC and RWSSP-WN support persons. The triggering activities are intended to lead to sanitation behaviour change and the achievement of ODF communities via the process described in Figure 1.

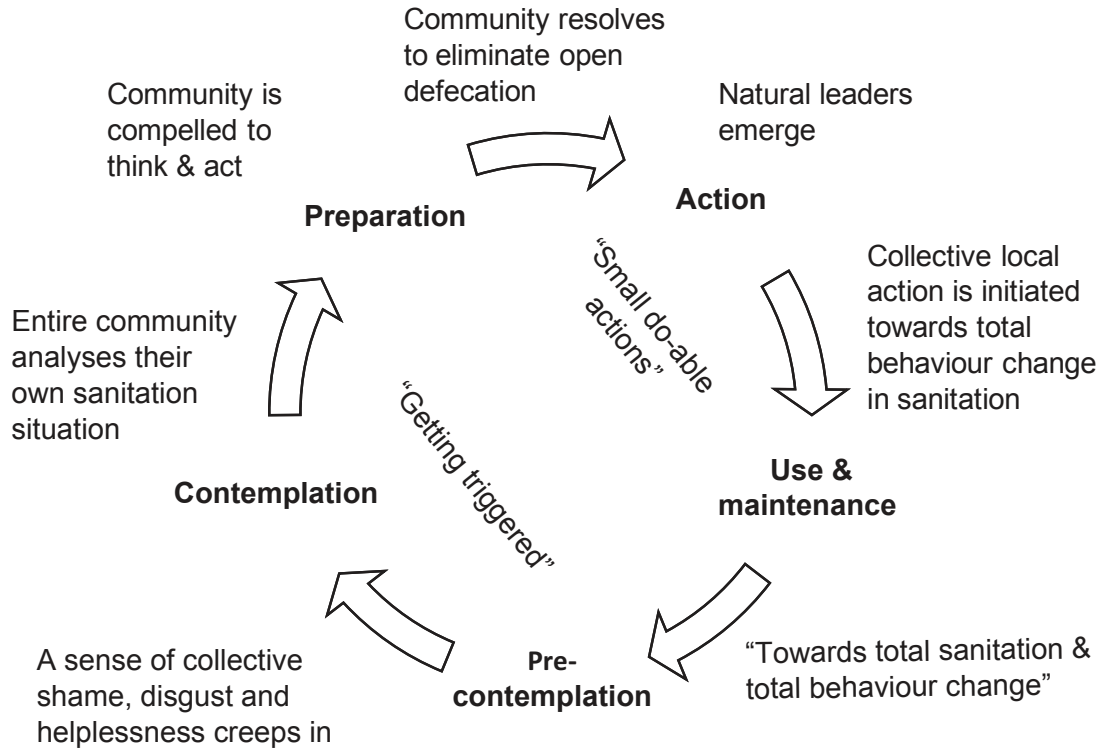

Figure 1 Behaviour change cycle
Source: modified by author from list of community-led total sanitation actions

Triggering activities are supplemented by behaviour change communication via other channels, including street drama, rallies, radio broadcasts, etc. The intended final outcome is the achievement of ODF wards and VDCs. Once a VDC has been declared ODF (after a verification process), the second stage of behaviour change starts.

Stage 2: Total sanitation and hygiene behaviour change

The second stage focuses on promoting five hygiene and sanitation behaviours:

- hand washing with soap or a cleaning agent at four critical times;
- safe disposal of faeces;
- safe handling and treatment of household drinking water;
- regular nail cutting, bathing, clothes washing, daily combing, proper tooth brushing; and
- proper waste management inside and outside of the home.

The main strategy used to achieve these targeted behaviour changes centres on consultations and negotiation at the household level with the Small Doable Actions (SDA) approach. The SDA approach seeks to bring about behaviour change via the following process:

1. Identify feasible incremental steps that move people from the current hygiene and sanitation practice toward the ideal practice.
2. Identify existing hygiene and sanitation good practices to be reinforced and congratulate the householder.
3. Identify practices to be improved and negotiate the options.
4. Visit families to find out how families are able to practise the new behaviours.

Selected natural leaders, lead mothers, teachers, health workers, and female community health volunteers play a key role in this process. They are trained on how to implement the SDA approach, after which they should proceed to visit each household. The intended final outcome of stage 2 is total sanitation and hygiene behaviour change. RWSSP-WN's model of behaviour change thus assumes that triggering will set in motion a mass movement in the Terai communities and that this movement – supplemented by radio messages, videos, etc. – will lead to ODF. Following ODF status, household visits as per SDA will be the main vehicle for behaviour change.

What did we ask?

The study aimed to assess and provide recommendations to strengthen the effectiveness of RWSSP-WN II's BCC activities to improve sanitation practices and toilet access in three western Terai districts (Kapilvastu, Nawalparasi, and Rupandehi districts). The study specifically sought to determine the following:

- Have RWSSP-WN's BCC strategy and activities been effectively implemented?
- Do RWSSP-WN's BCC strategy, messages, and activities adequately respond to the drivers of and barriers to improving household sanitation behaviours in the target population?

Due to limited time and resources, the study focused on the following behaviours:

- ending open defecation;
- toilet investment and construction;
- consistent toilet use.

The study was guided by the Water and Sanitation Program's (WSP) theory of sanitation behaviour change. It considered drivers/facilitators and barriers to sanitation behaviour change and BCC effectiveness related to the demand for improved sanitation behaviour. Acknowledging that sanitation behaviour change is not contingent on people's demand for sanitation exclusively, the study also sought to assess the enabling environment and supply chain for rural household sanitation. Table 1 lists the key questions which guided the design of qualitative research instruments.

The demand assessment of the study, specifically, was informed by SaniFOAM, a conceptual framework for analysing and understanding sanitation behaviour change. 'FOAM' stands for Focus, Opportunity, Ability, and Motivation. SaniFOAM is designed to assist programmers to identify the key factors (determinants) which influence the practise of a desired behaviour (e.g. usage of a toilet) in a target population (Devine, 2009).

In total, 17 focus group discussions (FGDs) and 31 individual interviews were conducted in seven study VDCs. Study participants included:

- adopters: men and women who own and use improved latrines;
- non-adopters: men and women who defecate in the open;
- masons;
- material retailers;
- field level BCC implementers; and
- V-WASH-CC members.

Study limitations included that subsidies for sanitation were or had recently been available on a large scale in all VDCs. This had several negative implications for the study. First, answers may have been biased by expectations that the assessment team was in a position to allocate such subsidies, although great care was taken to emphasize that we were not affiliated with any subsidy-providing programme. Second, few people

Table 1 Key questions

Demand	Do those who do not use improved sanitation have the opportunity to change? Do those who do not use improved sanitation have ability to change? Do those who do not use improved sanitation have the motivation to change?
Supply chain	Are toilet building service providers and suppliers able to provide affordable and desirable toilets? How complex does the existing sanitation supply chain make the sanitation shopping process?
Enabling environment	Do decision-makers and implementers understand the programme's approach? Do decision-makers prioritize sanitation? Do decision-makers buy into and prioritize RWSSP-WN's BCC approach?

Photo 1 Triggering can work. A proud woman shows us the toilet she built with a partial subsidy (Nawalparasi district, Nepal)

had built latrines with their own means, thus providing only a narrow foundation for learning about current drivers of household sanitation investment. Third, the large-scale provision of material subsidies meant that a 'true' sanitation market situation did not exist. Finally, we were able to interview only a small number of masons and suppliers; not enough to get a detailed view of the supply chain situation.

What did we find out about BCC strategy and its implementation?

Key findings with regard to the BCC strategy and its implementation are discussed below.

Smaller than anticipated scale

The assessment findings suggest that the challenges start early at the RWSSP-WN BCC strategy implementation. Contrary to what was intended, triggering is yet to be carried out in a systematic fashion and on a wide scale. The key reason for limited scale is many of the community volunteers become inactive shortly after triggering training (for instance, in one location only 1 of 18 trained volunteers remained active). Instead, most triggering activities are implemented by paid support persons. However, the number of paid support persons is insufficient to carry out triggering on the necessary scale. Additionally, many potential channels for BCC – such as community-based organizations and clubs – remain underutilized.

The result is that triggering has reached only a minority of community members (for instance, respondents commented that only one or two family members were invited to the triggering event, instead of the whole community). Though many

of those exposed to triggering report that it led them to change behaviour, limited triggering means that such behaviour change is not widespread. For instance, one respondent noted that within her concept of hygiene, the first priority was not the toilet: 'We need new saris. If we don't wear good quality saris, other people will say that our family is dirty' (female non-adopter, Rangapur VDC, Kapilvastu district).

VDCs rely on familiar methods, not the RWSSP-WN BCC strategy

At the moment, the bulk of sanitation promotion is done by local government stakeholders, such as V-WASH-CC members. To achieve the ODF target, they tend to fall back on messages and methods which are known to them rather than rely on the RWSSP-WN BCC strategy. ODF and toilet 'promotion' is thus mostly done via door-to-door visits – or interactions at the VDC office – and frequently centres on blaming and threats of sanctions if no toilet is built. Beyond triggering, activities in the community (and at a later stage, SDAs, methods, messages, tools, and guidance for what to do – in particular during household visits) are to a large extent missing.

Messages remain negative and 'educational', potential drivers of change are untapped

Contrary to what the BCC strategy recommends, the focus of VDC and ward level BCC efforts have been on traditional negative messages that 'educate' non-adopters about the need to change their ways and build a toilet. These messages appear to have no impact in terms of motivating change. Current BCC taps into the potential drivers of behaviour change in the target group – the value placed on women's modesty, shame, and the desire for status – to only a very limited extent. Our findings point to the following as the strongest potential drivers of sanitation access for women and men, respectively:

Women. Perceiving having and using a toilet as a social norm (being left behind); shame/embarrassment/protecting one's modesty; desire for status and prevention of gossip about the family.

> If your father-in-law or other important people pass and see you openly defecating, a woman's suffering is unimaginable. It is like being dead (female adopter, Muslim, Sisuwa VDC, Kapilvastu district).
>
> Open defecation was common before, but now many people use toilets. We feel ashamed that we are still defecating in the open (female non-adopter, Bhujuwa VDC, Nawalparasi).

Men. Convenience and comfort of having a toilet near or in the home; desire for status; protecting modesty of, in particular, young women in the family.

> I plan to build a second toilet inside my house; it is more comfortable (male adopter, Bhujuwa VDC, Nawalparasi).

Photo 2 Shop keeper showing his 'Toilet ID card' – this is needed to get services from the local government in this VDC (Rupandehi district, Nepal)

> My son got married to a lady from the town … so we built a toilet thinking that she may feel uncomfortable to go in the open (male adopter, Bhujuwa VDC, Nawalparasi).

BCC activities and messages leave potential barriers to sanitation behaviour change unaddressed

Barriers to behaviour change – such as questions about how to finance one's toilet investment – are not addressed in a systematic fashion. However, such barriers may leave households unable to build a toilet, even though they have the motivation to change. Our findings suggest that addressing the following key barriers could be critical in helping many households move up the sanitation ladder:

- complex sanitation shopping process (lack of local providers);
- lack of accurate knowledge about toilet costs;
- lack of knowledge about attractive low-cost toilets (especially superstructures);
- belief that only a brick/cement block superstructure will survive rainy season;
- not being able to imagine benefits of a toilet;
- no information about or availability of toilet financing options (other than subsidy).

Missing strategy for when triggering does not happen or does not work

The current BCC strategy assumes that a sanitation movement spontaneously will arise after triggering and propel everyone to build a toilet and stop open defecation.

Box 1 Key findings with regard to the implementation of BCC strategy

Some local-government level leaders have been intensely involved in sanitation/ODF promotion from the beginning. Local governments have allocated substantial resources to household sanitation.

Triggering activities have been well implemented when done and can make a strong impact, but triggering could be more systematically and widely implemented.

Many volunteer triggerers have become inactive soon after their training. The number of paid triggerers is just not enough.

Those who do most of the sanitation promotion tend still to 'educate' and blame/threaten those without toilets. The approach becomes negative.

A variety of communication channels to promote sanitation are used; yet, community resources could be better mobilized to integrate sanitation promotion into their activities/work.

Door-to-door visiting, rather than public triggering, is the main approach used. While such an approach often brings results in terms of toilet construction, it does not necessarily lead to behaviour change.

The current process monitoring and supervision mechanisms need attention. Is triggering having an impact or not?

A strategy, guidance, and tools are missing for what to do between triggering and the community becoming ODF. However, triggering is not always implemented as planned, or does not always work as intended, and behaviour change does not always materialize. In the absence of a strategy, guidance, and tools from RWSSP-WN, what happens after – or instead of – triggering is now up to each VDC (with a focus on sanctions and negative messages as a result).

Key findings regarding the enabling context for the implementation and effectiveness of the BCC strategy included the following (see also Box 1).

A continued subsidy focus is to the detriment of BCC

Subsidies continue to play a central role in Terai sanitation. Large budgets have been allocated to household sanitation in the VDCs studied, but most is spent on subsidies. For example, in one VDC just NPR60,000 (US$560) out of a total 2013 budget of NPR1.2 m ($11,300) for sanitation had been used for communication activities; the remainder was used for subsidies. This is in contradiction of national policy, as well as the no-subsidy RWSSP-WN approach. Other researchers and practitioners have noted this problem. For instance, Adhikari (2015) writes 'variations in the financial mechanisms have spoilt the entire game of sanitation promotion. Failure of hygiene and sanitation intervention has resulted because diverse financial supports are applied without proper consideration of the local needs and requirements' (p. 220). VDC leaders provided various reasons for the use of subsidies, such as strong pressure to achieve ODF targets and demands for subsidies from villagers because households in neighbouring VDCs received them. (The proximity of India does not help, as toilets are subsidized on the other side of the border, where many households have family members living.) In all the VDCs, subsidies are provided in the form of materials; typically a set of 3–4 cement rings, a pan set, and pipes. Though some VDC leaders originally intended the subsidies to

Photo 3 Subsidies remove the incentive for households to invest their own funds in a toilet and appear to change the way people think about toilets. Above, a subsidized double toilet with a half-completed superstructure. The household was waiting for an additional subsidy to finish the toilet.

be targeted only at the poor, such targeting has invariably failed and the subsidies have been made available to all households regardless of income and – in some cases – sanitation status. Regardless of the reasons to give subsidies, our findings suggest that BCC became less effective when the subsidies were introduced. In this context, households not only postpone building a toilet until they receive a subsidy, but often appear to have come to see a toilet as 'something you build for the government' (extrinsic motivation) instead of a facility that you build for the sake of your community, family, etc. (intrinsic motivation).

Pressure to achieve ODF targets makes changing course challenging

The local governments are under immense political and time pressures to reach the ODF target. Getting them to truly change course is likely to be a big challenge. Rupandehi district has led the way showing that VDCs can be brought to agreement on a no-subsidy policy. However, in the VDCs visited in Rupandehi, sanctions now appear to have replaced subsidies as the main 'promotion' strategy. A lot of advocacy and technical/capacity-building support may be needed to steer VDCs onto the path of BCC.

The focus on behaviour change is slipping

In most VDCs, the rush to achieve ODF has become more of a rush to reach 100 per cent toilet coverage and actual behaviour change appears to be less of a consideration. VDCs primarily focus their efforts – via subsidies and sanctions – on making households build toilets, not on making them use the facilities. Some VDCs appear to have been declared ODF even where toilets lack a superstructure or have superstructures that cannot guarantee a modicum of privacy (i.e. they are likely unused).

Lack of true ODF and the absence of plans for how to reinforce ODF in the VDCs which had already been ODF declared, points to a danger that open defecation could remain a widespread reality even after the three Terai districts are declared ODF. Interviews conducted by project field staff indicate that in some VDCs, as many as 35 per cent of households had returned to open defecation after ODF status had been declared (RWSSP-WN Field Reports).

What do we recommend?

The study was made specifically to provide recommendations to RWSSP-WN and its core stakeholders on how to better support BCC. Yet, for the purposes of this article we have generalized the following recommendations to be applicable wherever BCC for sanitation and hygiene is applied in the local government and community context.

Recommendation 1: Advocate with the local governments and national level leaders for a no-subsidy policy

Our findings suggest that subsidies currently are a critical obstacle to sanitation behaviour change in the Terai context. Though recent research from Bangladesh has shown that subsidies when provided to a majority of the poorest in a village have a substantial positive effect on latrine ownership among both subsidy and non-subsidy recipients, we did not observe a similar dynamic in the study VDCs (Guitaras et al., 2015). It is possible that a well-targeted subsidy programme could have the same impact in the Terai; however, our findings lead us to be less than optimistic about how feasible such targeting would be on a larger scale. Stopnitzky's (2012b) recent analysis of the subsidy component of India's Total Sanitation Campaign bears out this concern: only a 1.2 percentage point increase in latrine access was attributable to subsidies between 2005 and 2008.

For triggering activities to become effective in the Terai, all stakeholders must abandon subsidies and do so simultaneously, since communities often demand toilet subsidies because 'those next door receive subsidies'. As local-government-level leaders reported pressure from higher levels to adopt a subsidy approach, it may also be necessary to take advocacy for a non-subsidy approach to a higher level. We also note that community-level actors cannot influence ('trigger') the higher level actors who may not be even present in the community.

Recommendation 2: Develop a pre-triggering strategy

Triggering works best the first time it is carried out in a community; the responses of shame and disgust will not be so effectively engendered if repeated. It is therefore important that triggering is done well. A pre-triggering strategy should be developed to help ensure: 1) that potential challenges to the implementation of the triggering and BCC activities are identified and addressed; and 2) that key stakeholders prepare and plan efficiently for the actual triggering event as well as follow-up

Photo 4 Superstructure of the toilet could be better but at least toilet is used. Post-triggering phase needs to make sure that it will continue to be used (Rupandehi district, Nepal)

communication activities at VDC, ward, and cluster levels. In an early stage, a quick enabling environment assessment for each target area should be made. Such an assessment will allow programmers to identify locations where they can get quick results, and in this manner put pressure on the locations that are lagging behind. The analysis allows programmers to identify potential *location-specific* challenges so that these can be appropriately addressed early on.

Recommendation 3: Enhance and expand the implementation of triggering

To increase the scope and scale of triggering, three recommendations are made. First, to better understand the challenge of inactive volunteer triggerers, RWSSP-WN should carry out additional research to establish the level and timing of drop out among the trained triggerers. Such research could also seek to identify shared characteristics of triggerers who continue to carry out activities (to guide volunteer selection going forward). Second, to avoid relying solely on trained volunteers, RWSSP-WN should identify and mobilize the most active community organizations/clubs prior to triggering and seek to involve them in the sanitation promotion effort. Third, trigger monitoring and supervision should be strengthened to ensure that RWSSP-WN has a good sense of where triggering is being implemented and at what scale and, hence, address problems of inactivity earlier.

Recommendation 4: Develop a post-triggering BCC strategy

RWSSP-WN should develop a strategy for BCC after triggering has taken place (i.e. a *post*-triggering strategy). The strategy should specifically focus on motivating households to change via messages that tap into the drivers of change and identifying and addressing barriers which may keep each household from changing behaviour.

While some households may change behaviour instantaneously after being exposed to triggering, others may not do so for a variety of reasons.

The focus of sanitation BCC should be appropriate to where in the behaviour change process non-adopters find themselves. Jenkins and Scott (2007) have developed a simplified model of the sanitation change decision process, which identifies three progressive stages in the decision to change: preference (motivation), intention, and choice. At the first stage, a 'preference' for sanitation improvement over one's existing defecation practice is developed, based on dissatisfaction with one's existing practice and sufficient awareness of the advantages of new options. At the intention stage people start to plan a sanitation change and are typically in need of specialized knowledge and skills (for example, what materials to use and how to use them). At the third stage, the choice is made and the change can take place very rapidly. For this study, we have also included a fourth stage for use and maintenance that does count for long-term sustainability.

The study proposed that the post-triggering BCC strategy should comprise two main components: 1) an integrated communication campaign; and 2) households and small group level consultation. The focus of communication to promote toilet acquisition will differ according to which of the above-described stages of sanitation decision-making non-adopters find themselves. Figure 2 shows the stages and the proposed sanitation BCC focus for each stage.

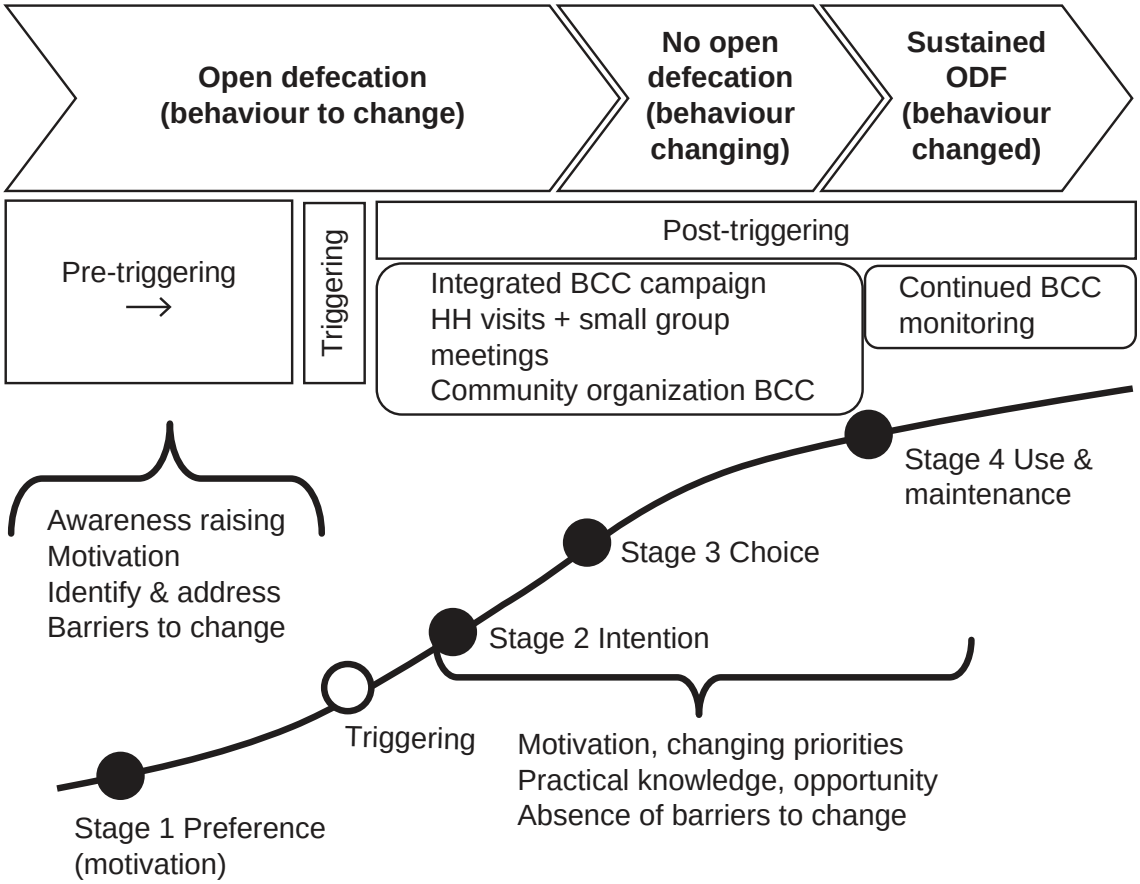

Figure 2 Stages of sanitation change decision-making and the focus of sanitation BCC
Source: Adapted from Jenkins and Scott (2007)

Recommendation 4a: Collaborate with a creative agency or other organization with relevant experience to develop an integrated communication campaign. An integrated communication campaign is essentially a series of coordinated communication activities which revolve around one concept and convey a shared set of messages. An integrated campaign can work to ensure that the target group is repeatedly exposed to a set of tested and effective motivational messages (via multiple channels). The study emphasized that the communication concept and all communication materials and activities developed must be pre-tested with the target audience before they are finalized, produced, and used. Key concepts, based on the findings of the study, could be 'loss of status in the eyes of neighbours/city relatives' and 'loss of a daughter/daughter in law's dignity/honour'.

Recommendation 4b: Remember to target men in BCC too. Men are the primary decision-makers regarding household expenditures, but clearly feel a lesser need for a toilet (though some commented on the advantage of not having to go out in the rain). BCC must seek to make men feel they too need and want a toilet. This could be done by tapping into drivers of sanitation behaviour change among men, for example, by emphasizing the convenience and comfort of having a toilet in or near the home or by seeking to associate having a toilet with high status (and vice versa). Finally, demands for a toilet from prospective brides have been found to be a highly effective strategy to increase male investment in toilets in India, in particular in marriage markets where women are scarce (Stopnitzky, 2012a). Such a strategy could also be effective in the Terai, where sex ratios are similarly skewed (Frost et al., 2013).

Recommendation 4c: Develop a strategy, approach, and tools for sanitation BCC at household and small-group level. Develop a post-triggering strategy which includes small group meetings and/or household visits. A method to conduct the household visits should be in place, to be modelled on the SDA approach. The primary aim of household visits should be to identify and address the specific barriers to sanitation access experienced by each household, while group meetings should seek to address shared barriers and generate a change in social norms associated with sanitation. Peer networks – whether existing or 'engineered' via, for example, health clubs – have been found to have a strong influence on the adoption of improved sanitation (Shakya et al., 2015; Waterkeyn and Cairncross, 2005; Whaley and Webster, 2011). The main messages of the communication campaign should also be integrated into these activities.

Recommendation 4d: Develop a strategy, methods, and tools for community group involvement. A specific strategy to effectively involve community clubs and organizations in the sanitation promotion effort must be developed. This strategy should note when to involve them, to what purpose and with what objectives, and with what target group(s). These clubs need methods and tools to guide and implement their work. It is preferable that they are trained in their use.

Recommendation 5: Consider toilet financing opportunities

Little attention is currently paid to households' capacity to finance a toilet structure, perhaps in great part owing to the large-scale provision of subsidies.

However, a non-subsidy programme must have a strategy for how to enable households to pay for their toilets. Today, money for self-financed toilets comes from the following sources: remittances, sales of crops, and labour income. Households could be targeted more intensively for behaviour change and toilet building immediately before and when they have income from these sources. For instance, a commitment to build a toilet could be sought shortly before the harvest season and/or immediately before and after a family member returns from having worked abroad. To develop a financing strategy that takes into consideration the very different financial circumstances of households in the Terai communities, a more thorough scan of other potential sources of financing – such as microloans – is recommended. Experience from Vietnam has shown that the availability of such microloans can play a critical role in the expansion of sanitation access (Tremolet et al., 2010).

Recommendation 6: Address barriers to change by empowering non-adopters with knowledge and experience

Our findings suggest that a complex sanitation shopping process, a lack of accurate information about designs and costs, and an inability to imagine the benefits of toilets, are barriers to sanitation behaviour change. To address these barriers, the following steps could be considered:

Toilet information materials. Develop a set of toilet information materials with pictures of different toilet options and bills of quantity. Because too many options complicates the sanitation shopping and decision-making process, a limited number of options should be promoted (Water and Sanitation Program, 2012). Posters showing toilets and their bills of quantity can be hung, for example, at the VDC office, health post, school, and other high-traffic buildings. If suppliers are willing, they may also be displayed at their store. Those who promote sanitation behaviour change in household visits and small group meetings should also be provided with a set of toilet information materials (e.g. a flip chart with options). To ease the conversation about the toilet models and to give them a strong profile, consider branding them under a set of (related) names. Use brand names that connote status. Those disseminating these materials could include project staff and local stakeholders such as youth clubs, mothers' groups, V-WASH-CCs, and social mobilizers, as well as the private sector.

In-village or in-VDC demonstration models. Consider training local masons on how to build the specific toilet models promoted. As part of the training, the masons could build a set of the toilets in each VDC or a number of toilets in each village. Doing so will help villagers to imagine their benefits. It is best if the toilets can be built, for example, for volunteer triggerers that do not currently have a toilet. (Because the toilets are test models and villagers need to have access to see and use them for a while, the triggerers could be offered a discount on the price, but they should not receive the toilet for free.) It is not recommended that the toilets are built as public facilities unless an excellent O&M arrangement can be put in place. Without such an O&M arrangement, the toilets are likely to become a disgusting, negative advert for sanitation.

Recommendation 7: Increase the independence and rigour of ODF verification to return the focus to behaviour

The focus on sanitation behaviour appears to be slipping and decision-makers appear more concerned about counting the number of toilets built rather than monitoring and promoting their use. At the moment, Terai VDCs appear able to declare themselves ODF even though open defecation is evidently still taking place. It is proposed that RWSSP-WN explores options for increasing the rigour and independence of the ODF verification procedure, as more rigorous demands for ODF declaration could go a long way to restoring the focus on toilet use. VDCs should not be able to declare themselves ODF solely based on the number of toilets built up to the plinth level.

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ISBN 978-952-15-3707-3
ISSN 1459-2045