Water management in relation to SDGs and national guidance in a low-income country

A case study Devchuli, Nepal

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Abstract:

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Nepal is a lower middle-income country that has agreed to reach the Sustainable Development Goals (SDGs) by the United Nations (UN) by 2030. In terms of water management, this means providing all the inhabitants of Nepal a safe and affordable water management. Currently some of the rural areas of the country have difficulties in providing good quality of water supply. This research examines the sustainability of Devchuli municipality water management and through that seeks to understand if the SDGs are still reachable by 2030. The research will also consider the impacts of current practices of information sharing in relation to development sustainability.

The research was done by conducting nine semi-structured interviews and using thematic coding to analyze the content of those. The interviews revealed that various water management operators had quite different levels of information sharing and emphasis on the guidelines. But all operators highlighted the importance of public and community participation in planning of the water management and implementation. Also, ownership and preparedness for risks were seen as important parts of water management.

Overall, Devchuli water management requires a comprehensive investigation on which areas are still without water management and which methods of water supply could be most functional in those areas. There should also be wide scale testing of the water quality in the municipality to find out if some sources need actions of protection or for example water purification systems. Lastly, to achieve financial sustainability and increase resilience, the wards and WUSCs need to start collecting tariffs with a small percentage to cover operation and maintenance but also to repair the damages caused by disasters. Through many collaborative actions can Devchuli become more organized and resilient in terms of water management and provide a safe water supply for all citizens.

Keywords: Sustainable development, water supply, information sharing, water management, resilience, disaster preparedness, participatory planning

Content

Acronyms

Official acronyms:

DRR Disaster Risk Reduction
INGO International Non-Government Organization
LDC Least Developed Countries
NGO Non-Government Organization
RtD Right to Development
SDG Sustainable Development Goal
UN United Nations
UNFCCC United Nations Framework Convention on Climate Change
WASH Water Supply, Sanitation and Hygiene

Nepal's national acronyms:

CATN Center for Appropriate Technology Nepal
DWSS Department of Water Supply and Sewerage
FEDWASUN Federation of Drinking Water and Sanitation Users Nepal
HRBA Human Rights Based Approach
LAPA Local Adaptation Plan for Action
LSGA Local Self Governance Act
NAPA WASH Nawalparasi and Palpa Districts Sustainable Water Supply and Sanitation
NDWQS National Drinking Water Quality Standard
RVWRMP Rural Village Water Resource Management Project
VCA Vulnerability Capacity Assessment
VMW Village Maintenance Worker
WUSC Water User and Sanitation Committee
WSP Water Safety Plan

1 Background

Nepal is a developing country that in some areas faces shortage in water and lacks efficient ways to secure the safety of drinking water. Even though the water quantity is efficient in most areas throughout the year, the quality generates challenges. Nepal is prone to various natural hazards such as earthquakes, floods and mudslides that can all destroy water sources and systems. Even on a small scale, those can cause damage to water infrastructure and interrupt water supply. While climate change proceeds, those natural hazards could occur more often (National Climate Change… 2016). Because of such development, preparation and resilience building is necessary.

Moreover, the damages that various hazards cause in developing countries have increased (Srinivasan et al. 2009: 27). Different conflicts and natural hazards have amplified the migration rates which drives many people to live in even more vulnerable conditions where the preparedness for a hazard is almost impossible. The reason for migration can also be related to economy and work or lessened natural resources such as water on some areas. In the worst case, migration from these conditions to better ones can take years. During that time the people living in temporary shelters face an increase in vulnerability (Srinivasan et al. 2009: 27). In this type of setting clean water is a key factor in prevention of crowded basic services and increased health problems such as cholera epidemics (Blanchet et al. 2017).

To help countries build resilience with development, the United Nations (UN) has created Sustainable Development Goals (SDGs) to guide the development of countries in many different stages (Global indicator… 2017; The 17 Goals s.a.). SDGs as well as all the relevant concepts that appear in this chapter have been explained more thoroughly in the chapter *3 Theory and Concepts*. From all the SDGs, Nepal has gathered the relevant targets to best serve the country's current stage of development. Many of these SDG targets have synergies with water management (Pradhan et al. 2017), which is why this research cannot only focus on water but also on equality, climate change, culture, and sustainable planning of the infrastructure. These themes are also visible in the SDGs 5: Gender equality, 6: Clean water and sanitation, 10: Reduced inequalities, 11: Sustainable cities and communities and 13: Climate action.

Based on the national legislation and SDGs, Nepal has gathered a series of national WASH (Water Supply, Sanitation and Hygiene) plans to provide tools and methods for adding future resilience (National Water Plan 2005; Sanitation and hygiene master plan 2011; National Water Supply and Sanitation Sector Policy 2014). WASH sector plans are the documents that provide all of Nepal with directions for sanitation and water provision. This guidance is then alternatively implemented in the municipalities, water user committees and households. Municipalities have an especially large responsibility in water management due to their mandate to provide safe water for all the inhabitants.

Finland has been working in Nepal through different development cooperation projects since 1983 (Finland's development collaboration… s.a.). The main points of focus of the Finnish development policy are: 1)Strengthening the status and rights of women and girls, with an emphasis on sexual and reproductive health and rights. 2)Strengthening the economic base of developing countries and creating jobs, with an emphasis on innovations and the role of women in the economy and female entrepreneurship. 3)Education, well-functioning societies, and democracy, with an emphasis on high-quality education, improved tax systems and support for democracy and the rule of law. 4)Climate change and natural resources, with an emphasis on strengthening adaptation alongside mitigation of climate change, food security and water, meteorology and disaster risk prevention, forests, and safeguarding biodiversity (Goals and principles… s.a.).

Finland is one of the countries that has also agreed to reach the Sustainable Development Goals by 2030 and there have also been bilateral projects in between Nepal and Finland to promote that goal. As one of the Finnish development organizations, WaterFinns has been working in Nepal to help the municipalities and villages to implement guidance and improve water management. This thesis research is part of a project "Sustainable water supply and capacity building in Devchuli municipality, Nepal (2019-2020)". The target of the project is to improve water safety and quality and also to help local government self-maintain the water supplies and systems. This project, focused on Devchuli municipality, is an extension to Finland's NAPA WASH (Nawalparasi and Palpa Districts Sustainable Water Supply and Sanitation) project in Nepal in 2014-2016 and is therefore referred to as NAPA WASH 2 in some of the interviews.

Finland has been implementing foreign development assistance for tens of years. For example, it consists of different country strategies for development cooperation which are specific to each collaboration country (Country Strategy… 2017). Overall Finland's large-scale development goals are derived from the SDGs: to eradicate inequalities and poverty. Finland's goals also include good quality water which is available daily and enhancement in poor sanitation which impacts especially women and girls. (Goals and principles… s.a.).

2 Objectives

The aim of this study is to survey the state of water management in Devchuli municipality in relation to the guidance provided by Sustainable Development Goals (SDGs) (Global indicator… 2017) and the national level water supply, sanitation and hygiene (WASH) guidance. There are many types of guidance provided nationally by the government of Nepal for example National Water Plan (2005), Sanitation and Hygiene Master Plan (2011) and Nepal Water Supply, Sanitation and Hygiene Sector Development Plan 2016-2030 (2015). Also, there are many more in the draft stage or under the examination of

the government. This research will focus on household water supply and not directly on sanitation and hygiene due to restrictions in time and extent of research. The research seeks to understand how multilateral national guidance and information sharing between various operators impact the development towards sustainability. The study may also reveal information sharing practices that delay sustainable development.

The SDG's represent a high level of development guidance, which some of the national WASH plans are based on. This study will find out how SDGs 5, 6, 10, 11 and 13 have been considered in Devchuli water management and what actions of implementation have been done to achieve the goals. Implementation is especially examined by focusing on eight Targets which are subgoals to the Sustainable Development Goals. The Targets relevant to water supply were chosen by the author based on how connected it was to the scope of Nepal and Devchuli. Also, the relevance of SDG indicators was considered (Global indicator… 2017). The targets are listed underneath, and full details can be found in Annex 1.

- 5.5 Women's effective participation and equal opportunities for leadership.
- 6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all.
- 6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater.
- 6.A By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes.
- 6.B Support and strengthen the participation of local communities in improving water and sanitation management.
- 10.2 By 2030, promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status.
- 11.5 By 2030, significantly reduce the number of deaths and the number of people affected. Decrease the direct economic losses caused by disasters.
- 13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.

The SDG's are designed to be met by 2030 and therefore the aim of this research is to evaluate how well the water management approaches sustainability by that timeline. This can be done by examining what has already been achieved on Nepal's roadmap towards sustainability and how the guidelines have been implemented to reach the rest of the indicators (Nepal's Sustainable Development Goals Status and Roadmap: 2016-2030). The roadmap is created by the National Planning Commission of the Government of Nepal and is designed to work as a tool for national level implementation and monitoring of SDGs.

This study will research whether the common problems in Devchuli water management have been identified as part of the SDGs and the national WASH plans. Different operators and stakeholders of water management will be interviewed to understand the different

levels and regional variations of the WASH sector and Devchuli municipality water management. This will reveal some of the everyday realities of water system planning and management which may uncover difficulties in implementing national and international top-down guidance. The interviews will also reveal if the local planning evolves more from the grassroot level through bottom-up approach. In particular, this research will answer the following questions:

1. What advantages and difficulties result from the current guidance and information sharing in relation to sustainable water management in Devchuli?
2. Which practices have been used to implement the given guidance in Devchuli water management?
3. How well has the Devchuli water management succeeded in meeting the SDG targets to be implemented by 2030?
4. What are the key aspects and actions of sustainable water management in Devchuli municipality?

3 Theory and Concepts

3.1 Water in development

Access to water and Right to Development are both human rights (A/RES/55/2 2000; A/RES/64/292 2010). Right to Development (RtD) was already established in 1986 by the UN Millenium Declaration of 2000 as in "making the right to development a reality for everyone" (A/RES/55/2 chapter 11). In many communities people are not aware of their right to water and therefore might not actively demand for it.

Clean water has a significant meaning in the development of a region and its communities (Gurung et al 2019). Humans are dependent on water for drinking, washing, growing food and numerous vital actions of households. In communities with lack of water resources, much of the daily energy is focused on finding and fetching water. This can obstruct community and area development because acquiring enough water for the people and livelihoods takes most of the time and resources (Tucker et al 2014). In many low-income countries fetching water is the task of women and children because it is likely for the men to go work (Gurung et al 2019). In rural areas it can take even hours daily to fetch water from natural streams or public wells which is why women and children tasked with this cannot often go to school or work (Tucket et al 2014: 42; Nepal 2019 – Drinking… 2019). In communities with sufficient basic water supply but no safe and clean source for drinking water, health issues can also slow down the development (Hunter et al 2009). The UN has established that having access to basic water supply means that water collection time from a provided improved source is not more than 30 minutes for a roundtrip (National Review… 2020).

In the case of Nepal, poor access to water slows down development because even though

water is there, it often might not be safe to drink and needs treatment (Nepal 2019 – Drinking… 2019). The main reason for the low quality of drinking water is the fluctuations in precipitation caused by monsoon and dry season. Water quality is poor during monsoon due to heavy rainfall infiltrating to water sources carrying contaminants such as E. coli bacteria, higher levels of fertilizers, pesticides, and chemical residues as well as eroded matter which impacts the turbidity of the water (Shrestha et al 2014; Safieh et al 2020). During dry season the water quality might usually be better than during monsoon but on some areas, there is not enough water and the source might suffer from turbidity or bacterial contamination (Mishra et al 2017; Panth et al 2022).

To aid development on areas with sufficient, but not safe and clean water supply, there are many possibilities to improve the situation such as identification of safe water sources in order to build wells, filtering the natural water stream through a gravity based slow sand filtration system or water treatment plants (Rautanen et al 2014). With high fluctuations in precipitation, some areas might have more clean water available than others but due to challenging topography, high altitude differences or dense forest areas the transportation of water is challenging. In those situations, water availability can be tied to the availability to electricity which is needed to pump the water through pipelines up the hill (Rautanen et al 2014). Therefore, some areas might rely on alternative ways of water supply such as rainwater harvesting.

3.2 Sustainability

Sustainable development is defined as development which meets the needs of current generations without depriving the same rights from the future generations. This concept was first introduced in 1987 in a report by the World Commission on Environment and Development (WCED). (Soini & Birkeland 2014). The basic idea is that sustainable development consists of three main pillars: economic, social, and environmental (Mensah 2019). Arguably, there is also a fourth pillar that needs to be considered, which is culture (Soini & Birkeland 2014; Culture: Fourth Pillar… 2010; UNESCO 2013). In this study all the four main pillars will be analyzed because culture is a powerful factor in developing country where discrimination based on castes is forbidden (Constitution of Nepal 2015) but can still appear in everyday life. Also, culture strongly affects peoples' actions towards the other three main pillars (Nurse 2006; Culture in…2018). The United Nations has considered culture as part of the sustainability work already in the Millennium Development Goals, which were preliminary to the SDGs (Culture: a driver and… 2012).

The main pillars of sustainability can also be seen in water management. When water management is economically sustainable, the finance of water operation is balanced and sufficiently profitable. The profit ensures active operation and management such as repairs and necessary monitoring (Babamiri et al 2020). With economic sustainability also loans for future investments are possible.

Environmental sustainability is in key role because it is directly connected to water quality, safety, and availability. When the source is protected from causes of contamination, it enables long-term use of the water. Also, when the water sources are being managed sustainably through for example sufficient groundwater recharge, the water quantity stays sufficient and therefore problems such as salinity, acidification or muddiness in water can be less likely (An introduction to... 2020).

Social sustainability can be seen when water supply is equally accessible for everyone, and the supply is certain and safe. It includes preparation for situations of interruption and disasters. (Offersmans et al. 2011). Socially sustainable planning is done in collaboration with various operators such as the municipality and the public.

Issues of both social cultural sustainability may arise if certain casts are hindered from an access to clean water or participation in planning. Furthermore, cultural sustainability can be seen in the way people value water management. It is about having a sustainable relationship with water as a natural source and understanding that the water source may deplete (Ding 2014). The perception of sustainability varies depending on the environment because the understanding of good quality of potable water also differs based on former experiences of a person (Ding & Ghosh 2017).

This thesis studies sustainability especially by using Sustainable Development Goals (SDG's) as points of measurement. SDG's are objectives created by the United Nations. SDGs are a subpart of the action program Agenda 2030 which was launched in 2015 to promote sustainable development and human rights through different development themes (Sustainable Development… 2015). Moreover, those themes indicate the ongoing major global problems and threats and specify actions that should be taken to reduce the risks. All of the 17 goals consist of subgoals which are called targets (Global indicator… 2017). Under the targets are listed individual indicators that explain how the phenomenon can be measured. In total, there are 169 Targets (Report of… 2016). The indicators also provide numeric and understanding of what needs to be done to reach the target. All the goals and targets are interlinked to each other (Kanade 2017: 7) Nepal has not yet reached the SDGs in terms of water management but is working towards it by 2030. This is a year when all UN countries have agreed to fulfill the Goals. Therefore, this study will examine how the development towards sustainability in water management is proceeding based on the interviews and Nepal's water management roadmap towards sustainability (Nepal's Sustainable Development Goals Status and Roadmap: 2016–2030). The roadmap is created by the National Planning Commission of the Government of Nepal.

Water is acknowledged as one of the basic human rights by the United Nations (A/RES/55/2 2000; A/RES/64/292 2010; The Human Right… 2010). Therefore, this is something that impacts all the countries under UN agreements, including Nepal. Especially in low-income countries poverty makes people vulnerable to climate change.

Higher frequency of disasters often exposes people to more poverty. (Srinivasan et al. 2009: 21). Nepal has also adopted the idea of water management as a human right and raised water management as one of the main themes of the equity based *Leaving no one behind* ideology which derives from the UN Agenda 2030 (Nepal – Taking Action… 2017; Leaving no one behind 2018).

Sustainable water management describes the whole water supply system that has been successfully planned, implemented, maintained, and monitored to meet the present demands without diminishing the same possibilities from future generations (Ding & Ghosh 2017). In sustainable water management the water quantity is sufficient, water quality meets certain standards, and the implementation follows directions which are commonly used and approved by the water management professionals. Also, stakeholder inclusion in the process is high, and preparation for hazards has been planned in advance. In addition to tending everyday operation, sustainable water management needs to be prepared for unexpected events such as risks. Risk management consists for example of preparedness for hazards, disaster prevention, response, and recovery of a disaster (Srinivasan et al. 2009: 32).

Sustainable management of water supply starts from source protection. Water source is strongly impacted by its surroundings and needs to be protected for example from sewage, fertilizers, toxins, and animal contact such as cattle grazing too near to the source (National Review… 2020). Monitoring the degree of groundwater recharge to make sure the aquifer's water quantity stays at sustainable level is critical in order to maintain safe drinking water. This has a significant impact both on the people relying on groundwater as well as the stability of the natural area including soil quality, preventing extreme droughts, controlling heat waves and river water level stability (Benavides et al 2023). On areas where the withdrawal from groundwater exceeds the sustainable limits, the aquifer and wells can face salination and acidification or the ground on top of the aquifer can even collapse causing severe damage (Smith et al 2016).

Clean water as a natural resource can easily be impacted by different risks and the supply can be compromised by various hazards which is why the different WASH operators need to have plans of preparedness for hazards to avoid them becoming disasters. This also reduces the financial risk to a water scheme or system.

Disaster Risk Reduction (DRR) is action where all the risk-causing elements are considered with the possibility to prepare and minimize the impacts of those hazards "within the broad context of sustainable development" (ISDR 2006). This also includes minimizing the vulnerabilities of the society. A natural hazard as such is not yet a disaster but the resilience of the site defines the impact. In a hazard prone area where population density is high and infrastructure is not able to sustain the hazard, the conditions can rapidly cause a disaster. Unsustainable land use and wrongly placed housing can also make a natural hazard such as flood or a mudslide turn into a disaster. Disaster risk

reduction can be evaluated on a national or municipality level by assessing 1) development policies, 2) projects that include evaluation of risks or reducing vulnerabilities and 3) the area's practices for example in agriculture, forestry, and water management (Srinivasan et al. 2009: 32).

In water management, risk reduction is done with good planning and anticipation. Water Safety Plan (WSP) is a risk management tool for Nepal's national water supply (Water safety plan... 2013). It includes preparedness for various risks and ensuring overall water safety. Reducing risks in relation to water safety, the means are water source protection, quality monitoring and purification. Local WASH operators should also have safety plans of action both for the planning, building and maintenance of the water scheme to avoid any risks impacting the safe water supply.

3.3 Management of water supply process

In Nepal the WASH sector has a mandate to provide all water supply for their citizens (Constitution of Nepal 2015). Public WASH sector consists of many operators from the national level. In the case of Devchuli the water management consists of various operators that represent different levels of governance. The federal government has issued a mandate for the municipalities to provide water management to all their citizens. The municipalities have assigned the water supply service provision to part of the municipality, wards, and to Water User Committees which often function on a smaller scale than wards. (Water, Sanitation and Hygiene (WASH) – Sector status report 2016). All of the operators collaborate with one closest to them in hierarchy. In addition to the earlier operators, there are also many NGOs (Non-Government Organization), INGOs (International Non-Government Organization) and bilateral operators working in the field of water management.

Many operators working together is necessary but can sometimes cause miscommunication or overlap in processes or projects which is why structured and open information sharing is needed. Information sharing is a process of receiving information and distributing it to other operators (Bonito et al 2008). Often water management guidelines come from the higher level of governance. This is called top-down approach and guidance, which is one form of development where the directions are given from higher authorities and operators. In many countries the head decision-making body creates laws and directions for wider scale development, which is then channeled forward in the system, towards the lower hierarchy levels. This way laws and guidance can reach all the way to citizens. Top-down approach works similarly in Nepal water management in the sense that higher authorities give out mandates and national level WASH plans for the lower levels to execute. The problem of top-down approach is that sometimes many of the small details and problems of local development are not included in the guidance and therefore will not help the local level to develop (Kubickova & Campbell 2018). In development studies and practice the top-down approach is no longer

as popular and the focus has shifted to participation of the public and learning from the grassroot level (Chambers 2012; Eilola et al. 2019).

In bottom-up approach the information sharing enables citizens and stakeholders in the development process to be on the front line of planning (Wallner et al 1996). This approach starts the planning of development from a small picture and details to make sure the final level of execution will get to tell what functions work in everyday life. From the low level of hierarchy, the propositions then move forward in the system to be processed eventually on the highest level of executional decision making. This type of approach can still get too focused on the small picture and also lose some important aspects on the way because not all the details can be included in the final development plan.

It is important to hear the public at all stages of WASH planning because it enables all stakeholder groups to bring up problems and give ideas of improvement. Participatory planning, building and maintenance of community infrastructure increases the ownership towards it (Rautanen et al 2014; Ambuehl et al 2021). Ownership is a vital feature in making water management sustainable. It is a feeling of ownership and shared responsibility if the water scheme is not maintained properly. Ownership can be built by participating the community in the early stages such as planning of water source and pipe location, funding water purification and supply management. (Ambuehl et al 2021). Through these, people in the community notice why taking part in the water management process is important even when the project is already over.

In many countries water supply is a service provided by a public operator such as state or municipality or provided by a private company. In low-income countries the system can often be complex and include multiple service providers and supply areas can be small and coordinated by either the locals or by a private operator (Post & Ray 2020). The water management operations are typically covered by paying a tariff that is fixed to the usage of water by a household. The tariffs maybe set to a level where some of the collected funds can be saved for future investments and needs of repair. Some water operators also accumulate emergency fund used to protect, repair, and rebuild the water management infrastructure in case of a disaster.

Systemic planning of the WASH process is critical, and it needs to involve many operators of the WASH sector in collaboration. Planning can be done for example through roadmaps which are a planning tool for building a future vision which can be used for development and achieving planned futures (Roadmap for localizing… 2016). Roadmap does not equal a strictly set action plan. The plan answers to what kind of actions are planned to take, why those actions can be beneficial, how the steps of the vision can be achieved and by what time things need to be done. Roadmap can be formulated in collaboration with various operators related to the development topic, to understand their position and responsibility in the wider vision that is being pursued. Roadmap as a tool can be used

together with various other tools such as SWOT analysis. (Roadmapping at the IfM 2016). In general, roadmapping can be used for example – but not limited to – project or product development, for business strategy or an organization functionality planning.

4 Research area

Nepal is a middle-sized, land-locked country in South Asia with the population of about 30 million inhabitants (Geographic regions 2021). Its neighboring countries are China and India. Since 2015, Nepal has consisted of 7 provinces and 77 districts (Provincial map of Nepal 2017). Nepal is partly located on a mountain area, having the Himalayas as its border in the north. This causes Nepal to have large topographical differences and enables a variety of different environments from snowy mountains to tropical forests (Forest resources… 1999). These features enable the high rate of biodiversity but also pose some challenges. For water management those can be for example accessibility when building pipelines and other water management infrastructure on steep hills and through dense forest.

The precipitation that feeds the rivers draining from the Himalayas is the main source of drinking water in Nepal (Smith et al. 2017; Unofficial translation… 2020). According to Smith et al (2017) there are 10 major river basins in Nepal (Figure 1). Devchuli gets water from one of the largest ones, called Gandaki river basin which begins from the mountain range.

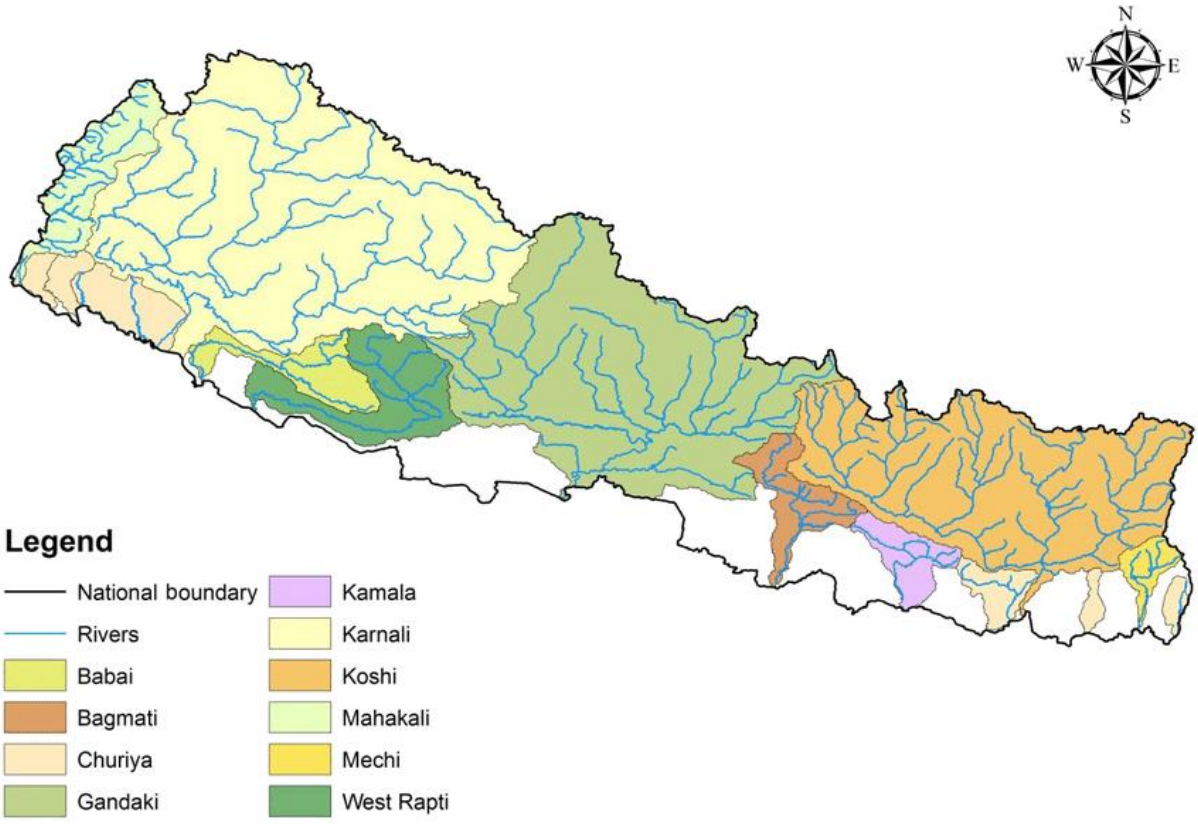

Figure 1. Major river basins in Nepal. Devchuli gets water from Gandaki river basin. Source: Smith et al. 2017.

Nepal has substantial water resources both because of 1570.4 mm of annual rainfall and melting river water from the Himalayas (Nepal Climate Summary 2023). Good variety of natural water areas provides a sufficient amount of water supply but the challenge of clean water supply in the country comes from the challenging topography and seasonality of rains due to monsoon and dry season (Rautanen et al 2014). Nepal gets on average 80% of its annual rainfall during the monsoon whereas the winter months can have a very limited rainfall (Dahal 2012:3). Precipitation around Devchuli area is about the average of Nepal but still reached to 1500mm during only the four months of monsoon season in June-September 2023 (Preliminary Precipitation… 2023). Heat waves are becoming more common in Nepal and some Provinces have experienced decline in precipitation during the monsoon season. In the future this could become more common and impact the water reservoirs.

Even with generous quantity in freshwater, the uneven distribution of water sources has led to some areas suffering from unreliable water availability (Gurung et al 2019). Low-land areas of Terai in the southern border of Nepal have many river basins and most of Nepal's agriculture is concentrated on this area (Bhattarai 2010). On some areas of Nepal, it is possible that water sources are not sufficient to provide water for both irrigation and drinking (Bhattarai et al 2010:199). The issue can strengthen through population growth, progressive climate change and increase in agriculture (DHM 2017). On highly populated areas such as Kathmandu or areas with high need for irrigation exists a high risk of unsustainable extraction of ground water where depletion is faster than the reservoir gets recharged (Bhattarai et al 2010:280).

Poor water quality impacts the health of Nepali, but arsenic also poses a risk of unsafe drinking water (Bhattarai et al 2010:15). Nawalparasi district (current Nawalpur), in which Devchuli belongs to, has had the highest risk of population getting exposed to arsenic through drinking water (Thakur et al 2011). The arsenic in Nepal's groundwaters is originated from the erosion of Himalayan arsenic-rich rocks when eroded rock material forms deposits to Terai lowland regions and cause arsenic to accumulate in groundwater. Long-term exposure to carcinogenic arsenic can cause skin lesions, cardiovascular diseases, and various types of cancer (Arsenic in drinking-water 2003). There are various ways to reduce arsenic in drinking water such as adsorption by iron oxyhydroxide (e.g. iron nails) or biosand filtration but this is only short term and long term water safety from arsenic comes from identifying safe wells and other water sources such as rainwater harvesting (Thakur et al 2011).

The United Nations has for long classified Nepal to the category of Least Developed Countries (LDC) (List of… 2020; Geographical Regions 2021). Regardless of this Nepal is steadily developing and has committed to meet the Sustainable Development Goals by

2030. The development in terms of water and sanitation sector has been very successful according to the National Review of Sustainable Development Goals (2020). Water supply coverage in the country increased from 73% to over 83% between the years 2000 and 2015 (Sector status report 2016; National Review of Sustainable Development Goals 2017). Furthermore, during this research process, the UN informed that Nepal was moved to the category of lower middle-income countries (World Bank list of economies (June 2020)).

Nepal has a population of approximately 30 million people. In 2015 the Constitution of Nepal was formed which was followed by the first local level elections in 2017. (National Review… 2020). There are a vast number of different languages and ethnic groups such as Dalits, Janajatis and Chhetris. The most spoken language is Nepali (Table 2.4 Population by mother tongue and sex 2018). Even though discrimination based on caste is forbidden (Constitution of Nepal, 2027 (2015)), there are still knowledge of the poor position of some castes and ethnic groups (Bennett et al 2008; Status of Women… 2017).

Devchuli is part of Nawalpur district (previously Nawalparasi district) and belongs to Province 4: Gandaki Province in Central Nepal. It is located close to the Indian border, around 150 kilometers west from the capital Kathmandu (Figure 2). The municipality then is further divided into 17 wards (Figure 3.) According to 2018 data by the Central Bureau of Statistics, there are around 42 600 citizens in Devchuli municipality (Table 2.1. Households, population and average household size 2018). The number of households is important when managing a water supply service. According to the same statistics (Table 2.1 Households... 2018) Devchuli had a record of 9256 households but as the municipality is growing, the number of today is likely to be higher.

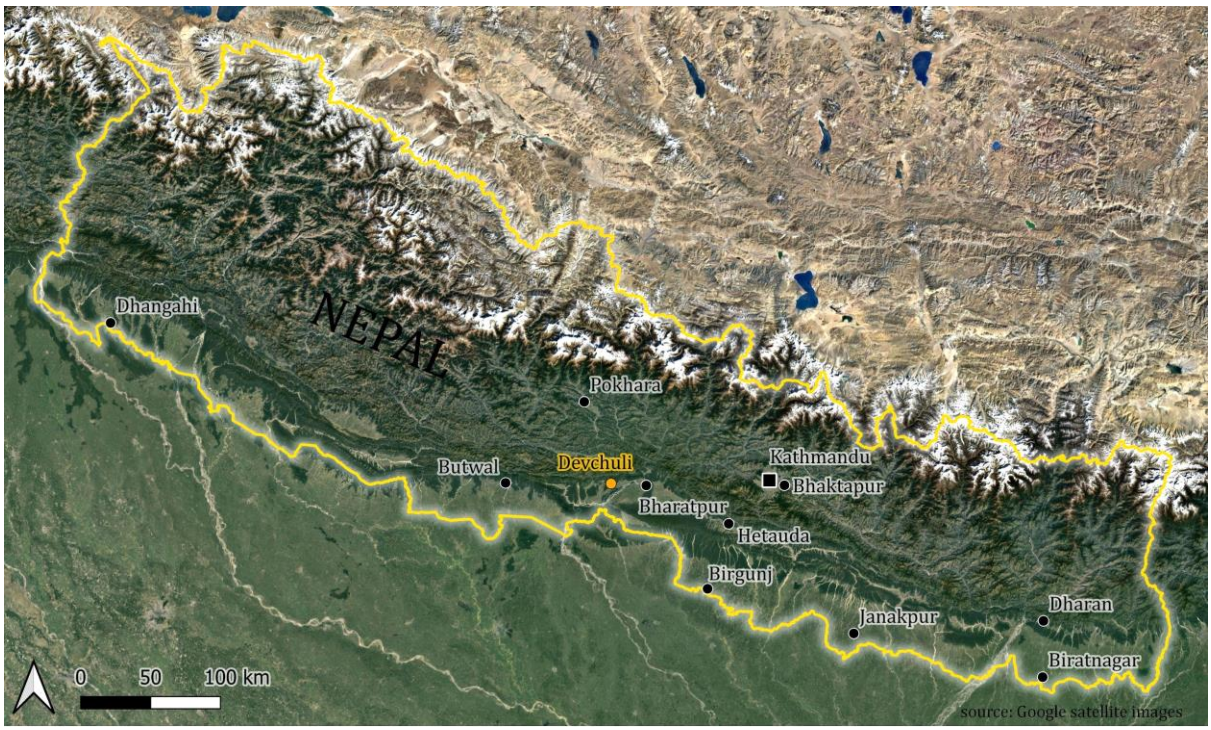

Figure 2. Map of Nepal with the largest cities including capital Kathmandu. Devchuli municipality is marked with orange colour.

Figure 3. Devchuli municipality with the borders and ward numbers. Source: Esri Imagery Hybrid satellite image.

Many of the households in Devchuli have access to tap water (Table 1). A smaller number of households rely on various wells and streams as water sources. There was no specification in the data of which sources the tap water is sourced from. According to the same statistics (Table 1), Devchuli has developed water management over the years to the level in which almost 6800 households out of the 9256 have water coming through pipes either to a public or private tap which equals to 73%. Even though a pipeline does not yet mean safe and clean drinking water, it is still easier to monitor than for example a stream. Also, the distance to water source will be significantly shorter.

Table 1. Devchuli municipality households by the main source of drinking water. (Table 1.5. Central Bureau of Statistics 2018).

Province 4 , Nawalparasi District:	**Total household**	**Main source of drinking water**							
		Tap/piped water	Tubewell / handpump	Covered well/kuwa	Uncovered well/kuwa	Spout water	River /stream	Others	Not Stated
Devchuli Municipality	9 256	6 796	411	845	704	408	16	22	54

Source: General Bureau of Statistics (2018)

Due to high yearly precipitation and melting ice on the Himalayas, many water sources in Devchuli also are groundwater and stream water. One of the large rivers in Gandaki province flows past the municipality (Figure 3) and many smaller rivers flow through the municipality and are used as intake points for the pipe network. As an example of the pipe network and areas of water intake to the system, Figure 4 shows the NAPA WASH 2 project schemes and overview of their water management infrastructure. Both ward 4

and Devchuli A WUSC were represented in the interviews of this research (Figure 4).

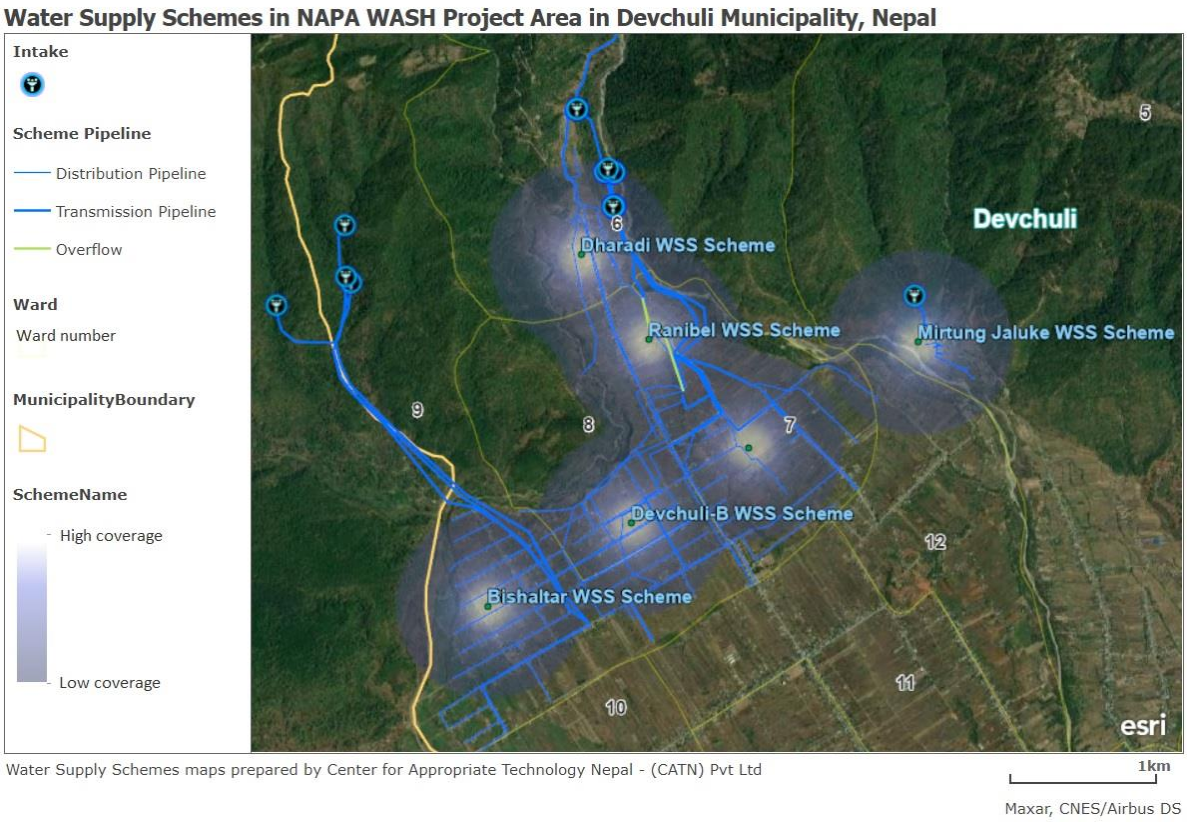

Figure 4. NAPA WASH project schemes with pipelines and intake areas. Source: Esri Imagery Hybrid satellite image and CATN data.

According to the new policy by the Federal Government of Nepal, every tap built should be only in the use of one household. This is called “one house, one tap” policy and it can be found for example from the Federal Policy and Program of this municipality for 2077/78. In Nepal the calendar is different and years 2077 and 2078 in the *Bikram Sambhat* calendar are equivalent to years 2020 and 2021 in the wester Gregorian calendar.

5 Material and methods

The material of this study was mostly collected through semi-structured interviews from Nepal, and from Finnish water experts in development and water management who earlier lived in Nepal. In a time of Covid-19 global pandemic, when field visit during the summer 2020 was not possible, the interviews were done online between November and January. Interviewees represented a wide range of water management actors: from specialists and municipality officers to operators who use and monitor the local sources. Interviewing people from such versatile posts revealed many of the different perspectives people had on the functionality and future of Devchuli water management. Interviews were conducted both in Finnish, English and Nepali so language barrier

influenced as little as possible to the quality of given answers. All interviewees had the possibility to stay anonymous if the interviewee so wanted.

Questions of the interview were constructed to give information about different sustainable development Targets, from the SDGs 5: Gender equality, 6: Clean water and sanitation, 10: Reduced inequalities, 11: Sustainable cities and communities and also 13: Climate action. On average, every interview had 10 questions, but the number varied based on interview group and interview discussion. Even though some of the interview questions were the same for many of the interviewees, the analysis intended not to be quantitative. By analyzing the interviews this way, it was possible to find out how different operators in Devchuli water management received information about the National level Guides and SDGs. The interviews also revealed whether the common problems in Devchuli water management were also represented as part of the SDG's. The interviews were also conducted to find out which perceptions various operators had on the available guidance and implementation of it.

Interview groups and number of interviewees:

- Finnish Nepal WASH experts (2)
- International WASH organization expert (WaterAid) (1)
- Nepal national WASH specialists (2)
- Devchuli municipality representatives (1)
- Ward leaders in water management (1)
- WUSC leaders in the villages (2)

The interview groups were selected to represent the whole water management system. This was done as widely as possible in the time of Covid-19 pandemic when visiting the local households and WUSCs was not possible. Finnish Nepal WASH experts, as well as the International WASH organization expert, were chosen to represent the international and bilateral collaboration and give the author a wider understanding of the functions of water management. The national WASH specialists represented the federal and provincial offices and also the actors who direct international guidance to the local level. When interviewing the municipality representative, the focus was on Devchuli and the local collaboration and implementation. The ward and WUSC leaders both represented the local level of action and could specify which guidance had been implemented. Also, all of the groups were asked questions related to hazard preparation.

In total, 9 interviews were conducted. Two of them were in Finnish, one in English and six in Nepali. The author created questions for all the interviews and conducted the Finnish and English language interviews through an online platform such as Skype or Zoom. All the interviewees were briefed about the background and purpose of the interviews and asked for permission to record the discussion. After acceptance the interviews were recorded with at least one device in order to make a transcript of the

interview. Recording with two devices made sure no answers were missed due to possible low quality of the record.

Six of the interviews were done in Nepali. Those were conducted by two employees of CATN (Center for Appropriate Technology Nepal) or one Nepalese native who is part of WaterFinns. CATN also works as WaterFinns project implementation partner in Nepal. The questions for these interviews were also created by the author but then translated by a native in Nepali language. After receiving the Nepali translation, the questions were analyzed again with another Nepali speaking person to make sure no meanings had been changed or lost in translation. Because of weak Internet connection there was no possibility to use video calls for observing the interview, therefore the author did not participate in the calls made in Nepali language. Moreover, translating all the answers for the author's involvement would have made the call excessively long.

Nine interviews were successfully recorded and transcribed. In six of the nine interviews the transcription was standard language form. This means transcription almost exactly from word to word but without the spoken language. In three of the Nepali language interviews a less formal, reference form of transcription was used due to the lack of time. In these cases, the perspective of transcription was extremely crucial and needed to be analyzed as part of the results.

After translation to English the texts were imported to a qualitative data analysis software NVivo where content analysis was done. In the analysis the answers were divided into different themes about water management structure and cooperation, guidance, implementation, preparation for hazards and urgent targets of improvement. This method is called thematic analysis. The classification of different themes is done by thematic coding (Gibbs 2007). The code can also be referred to as index, category of theme.

This type of research inevitably includes many challenges and some biases. First of all, the cultural differences can impact the interviews and complicate the interviewee revealing some negative matters such as what parts of the water management system need developing the most and which things are not functional at the moment. Also, the translation from one language to another and having multiple transcribers might grow the margin of error. This study has tried to minimize the biases related to interview interpretation by recording all the answers to an audio that will be translated either by a professional translator or the same person who conducted the interview.

Another bias that is always present in the interviews is the interviewer itself as people of different age, expertise or cultural background can subconsciously affect the information sharing (Jentsch 1998: 277–278). Both forming the questions and the way of presenting the questions already alter the answers that can be received (Fowler & Mangione 1990). Also, different styles of interviewing might receive varying results. Therefore, the

interviewer needs to consider how, for example the type of style of interview or atmosphere they are creating for the interview, could affect the answers (Brinkmann & Kvale 2006).

In this study, some of the interview groups were presented by only one interviewee. As marked in the interview group list, these were a Devchuli municipality representative and a ward leader. Also, the international organization expert was the only representative of their group but since the focus of the interview was not solely on Devchuli, the possibility of bias is not as high. In a qualitative interview it is acceptable to have sampling of just one representative. Also, this research seeks to know different perspectives that people in certain positions might cause the answers to be unique regardless.

When conducting a process similar to this, it would be useful to have much more time for the interviews. The interviews could also be made more informative by translating during the interview when possible so that the interviewer can ask additional questions. This would reduce the bias caused by interpretation. Of course, it needs to be considered that this way of interviewing is much more time consuming.

6 Results

The results of this research were examined so that every interview group was first analyzed separately and then each group's answers were compared to their other groups. This enables better understanding of the possible differences between water management operator levels.

The content analysis through thematic coding provided eight main themes that appeared in all the interview answers (Figure 1). Those themes function as the main level of classification which is then divided into more detailed themes (Gibbs 2007). The main themes covered disaster preparedness, finance and future of water management, guidance and information sharing, inclusiveness and ownership of water management, and the SDGs as well as the structure of water management operators.

Some of these themes also needed subthemes to specify which areas of the main theme, such as information sharing, were mentioned. Unlike the main themes, not all the subthemes were mentioned in all of the conducted interviews.

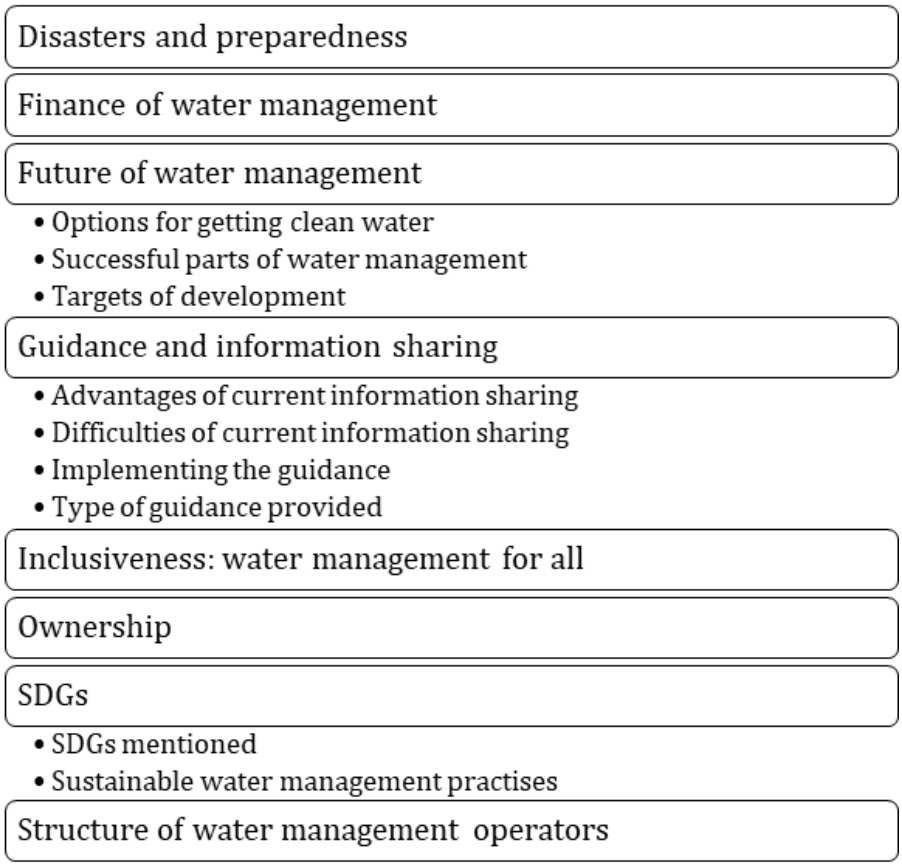

Figure 1. Thematic analysis coding of fundamental themes that emerged in all the interviews.

Next section presents answers from all the interview groups categorized according to the main themes so the different views of the operators can be detected and compared (Table 2). Using the main themes from thematic coding collects the acquired results under one context.

Table 2. Clearest and most significant results of the interview categorized under the main themes found in thematic coding.

Operators / Mentioned themes	Finnish Nepal WASH experts	International WASH organization expert	National WASH specialists	Devchuli municipality representatives	Ward representative	WUSC leaders
Disasters and preparedness	Natural hazards and climate change can deplete a water source. Beforehand there should be vulnerability assessments. If the area is likely to have landslides, then vegetation cover, gabion-boxes and protection of water source surroundings are important.	Hazard e.g. earthquake can decrease water availability in streams and springs. There is a real need to keep doing Vulnerability Capacity Assessments (VCA) for schemes before building them. Drone image and video can be used to plan pipelines.	Scheme plans should always evaluate the area characteristics to avoid areas prone to hazards. Major repairs due to e.g. disaster are solved and repaired inn collaboration with WUSCs, municipalities and districts.	Municipality works together with the federal government and NGOs to minimize the harm caused by natural hazards. Municipality shared this information forward to WUSCs. Municipality assists WUSCs in protecting the water source, building new water supply systems after a disaster.	Disaster is first assessed by the village maintenance worker on the field who will then figure out with the ward if the matter can be handled. If not, an engineer will assess the damages and cost. The ward will be granted money for repairs from emergency fund.	Monsoon floods destroy pipelines and landslides can affect different sections of network. No mentions on preparation but repairs are done by WUSCs and the municipality.
Finance of water management	Even though municipalities and province provide funding, the WUSC or ward could collect their own small tariff from the users to save, for repair and investments. If something urgent happens, then WUSC has already additional money.	In some WUSCs there are planned tariffs that ensure enough funds for the maintenance of water management. In best cases the tariff has been calculated and decided together by the WUSC and municipality.	WASH sector needs more national and international funding because water is a human right.	Budget allocated for implementation of annual strategic plan and program.	Ward is financed by the provincial government, municipality and NGOs. Ward has access to disaster fund.	Municipality finances the WUSCs but there were suggestions of yearly additional funding to cover repairs and invest in filtration unit.
Options for getting clean water	Slow sand filtration, boiling, purification with chlorine. The most important thing would be to find a good quality water source and protect it.	Chlorine added to water. Rainwater harvesting for remote households that are not easily accessible. Rainwater harvesting also works as a good backup water source.	Chlorination and slow sand filtration were brought up by the national WASH specialists.	Growing population in Devchuli has resulted many of the wards and WUSCs to use river water. For the purification of that, slow sand filtration is currently the best.	Provincial government has funded for continuing the slow sand filtration project. Water is also boiled, filtered, and cleaned with UV-rays. Better water purification needed for monsoon time.	Adding chlorine to water was the only mentioned method.
Successful parts of water management	Inclusion of all in terms of water management by surveying how many people are still without water supply.	Training the WUSCs and also other water management operators to understand how a scheme can be planned and built. This includes building and water safety training.	The focus of WASH sector is on water quality, households without water management, public participation, and community ownership.	Embankment of rivers during rainy season to keep the area from flooding.	Better water quality has improved social development in the ward.	Municipality has assisted and funded the WUSC in a situation where water quantity was too small. New pipelines combine both river and spring source.

Operators / Mentioned themes	Finnish Nepal WASH experts	International WASH organization expert	National WASH specialists	Devchuli municipality representatives	Ward representative	WUSC leaders
Targets of development	Maintenance of the schemes needs to be improved. Also, planning and implementation needs to be done with long-term vision so that activity in schemes is able to continue even when the project end and funding WASH leaves.	According to WaterAid representative, on Nepal scale, out of tens of thousands water schemes a majority (around 70%) were not functional or needed repairing. To create sustainable schemes there needs to be continuity in thinking, exceedingly just the projects.	Good water quality for all is challenging due to insufficient funds. Water safety plan for scheme should be done for every project already in the planning phase. Transparency of the governance need to be better. More focus on the quality and monitoring of water management. Local, regional, and national level sustainable water management strategy is needed. Maintenance of water management needs to be improved.	Municipality needs to start water testing very soon. Also, municipality needs assistance from the federal government to create a short and long-term action plan for the SDG implementation. Representative stated that due to lack of expertise, workers, and financial capacity, they have not been able to provide drinking water for all in the municipality but needs federal, district and NO assistance. Capacity building programs needed in all the wards.	Water testing on larger area, Increasing scheme resilience during monsoon time, more technical training	Chlorine purification was challenging to maintain when chlorine was used elsewhere for disinfection and therefore water management lacked it.
Advantages of current information sharing	Sometimes Finland has produced national and local guidance in collaboration with the Nepal government and municipalities.	"One house, one tap" includes both sustainability and also business plan for the tariff. Information sharing is easier in a more enabling environment. In this type of atmosphere, it is also easy to role model operators or municipalities.	WUSCs have a representative organization. New WASH Act that will replace many old ones is being processed in the parliament.	Close collaboration with wards in terms of planning, implementation as well as technical and social matters.	Positive feedback on past trainings. Spreading information on how clean-looking water also may contain bacteria.	CATN assists the WUSCs in many matters.
Difficulties of current information sharing	Lack of data makes the implementation and monitoring challenging. The plans might not be visionary or take account enough matters.	Many people in rural municipalities might not know that water is their constitutional right and human right. Earlier, there was a Ministry of Water Supply Department of Supply and Sewage office in every district. Nowadays those are only about 2-3 per province which makes collaboration challenging.	There are too many guidelines and unclear jurisdictions. Formulation of federal laws and acts has been delayed which causes difficulties on forming provincial guidance and regulations. Also, the three levels of government need clarification in the jurisdictions.	Municipality has not got good enough standards for water management from the regional level actors. Seemingly little collaboration with the WUSCs. This might be a bias caused by interviewing just a few people.	Municipality does not have policy section in charge of water. Ward lacks own water management guidance to implement on their area specifically.	Too little training from the municipality.

Operators / Mentioned themes	Finnish Nepal WASH experts	International WASH organization expert	National WASH specialists	Devchuli municipality representatives	Ward representative	WUSC leaders
Implementing the guidance	In 2021 Nepal will have a new country strategy of development provided by the Finnish. Public participation and hearing are organized.	Planning and building have become easier since with federalization the atmosphere of WASH sector is very enabling. When it comes to water schemes, there should be a government unit that works as the technical assistance. The same unit should do monitoring of the rural municipalities.	FEDWASUN works to localize the SDGs by engage in activities like joint monitoring, independent monitoring, capacity building. WUSCs could be trained for new technology such as e-payments to make the action more user friendly and transparent.	Wide collaboration in implementation. Planning made especially together with wards so that joint implementation is also easy.	Community discussions on water management. Ward officers check the condition of water facilities around their area, monitor and regulate the activities in water management and also make plans of improvement for areas.	Water source protection, pipeline repairs and regular maintenance and monitoring.
Type of guidance provided	SDCs, Finnish program of development policy, country strategy of development, areas of priority and the result frame for the development which is formed to be in line with the SDGs and also a practical step-by-step implementation process.	WaterAid listed many articles of constitution where information on SDGs were considered: 18)water to marginalized groups, 24)against discrimination, 27)water and environment, mostly 35)section 4:right to clean drinking water and sanitation. WaterAid trainings are offered to national actors of water management for example. All municipalities should be able to get consultation from WASH experts.	Water safety planning should be done for each project already in the planning stage. In addition, there should be functionality index and physical structure index. There is at least 4 different pieces of legislation being processed in the parliament.	Federal Government and the Provincial Government have provided various guidelines and policies to the municipality. Federal policy and program 2077/78 (years 2021/22). Federal government has instructed the municipalities to follow the guidelines so that SDGs are reached 2030. Annual strategic plan and program. Capacity building program for wards 6,7,8,9.	Guidelines come from all sectors of governance and the NGOs. No other guidelines were specifically mentioned than SDGs. Province government and NGOs provide training to wards.	Water safety guidelines during trainings. Water management programs. CATN trainings on bookkeeping, purchase, and capacity building. Devchuli A has their own guideline based on WUSC learning experience.
Inclusiveness; water management for all	Surveying how many households lack basic water supply and why? Women, minorities, and disadvantaged people can sometimes get left outside of the planning and implementation. They should be included to create water management for all.	Supervising unit to make sure the rural municipalities would get a certain, good budget every year for the water management.	Water management has been considered as the fundamental right of everyone. The unreached population of water management has been considered on the national level.	Inclusiveness and public participation were considered highly important, but no ways of action were mentioned. Municipality follows Policy and Program 2077/78 (years 2021/22) which seeks to make water management infrastructure inclusive for, gender, children and disabled.	Only public participation was mentioned.	Woman inclusiveness is well maintained through the WUSC chairman and many active s in the water management activity are women. Also, collaboration with women committee.

Operators / Mentioned themes	Finnish Nepal WASH experts	International WASH organization expert	National WASH specialists	Devchuli municipality representatives	Ward representative	WUSC leaders
Ownership	Ownership is formed when the public can participate in planning, building, or operating the water scheme. Poor ownership can be one of the largest reasons for lack in monitoring and repairing. An existing network of support increases ownership.	Improving ownership requires active public participation and less projects that are just handed over to the ward or WUSC. Ownership is partly formed in the trainings of how scheme can be planned and build but mostly in the daily work of building, operating, and maintaining.	Over the recent 10 years the ownership of the locals has increased which results in better project participation and engagement. Ownership was mentioned as one of the most important aspects of sustainable WASH.	Public has been participating in preparing annual budgets, policies, and programs every year.	Ownership is built through capacity building trainings.	Ownership was not directly mentioned but in an active WUSC with interest to many different types of trainings, there is ownership.
SDGs mentioned	6.1 and 6.2. In addition, the SDGs related to livelihoods, energy production and equality were considered in the context of WASH. Finland and Nepal have both committed to achieving SDGs.	SDG 6.1 specified as the most central target of water management.	Target 6.1 was mentioned indirectly through Nepal constitution. FEDWASUN leads the WASH matters in a civil society SDG Forum and focuses on 6.1 and 6.2	SDG 6.1	SDG 6.1	NO SDGs were mentioned.
Sustainable water management practices	Reaching areas that are not yet served. Creating support network for operators. Understanding what locals wish to have for their scheme. Letting WUSC members run the schemes with proper training.	With federalization, operators are liable for their work. Local government needs to commit to the projects and development process.	Water supply for all, including the rural areas is considered. Also, energy and cost efficiency are being developed.	Water quality testing laboratory is in the municipality. Municipality has tight collaboration with wards. Municipality is preparing an annual strategic plan and program where wards have also participated.	Ward constantly monitors their area water management and makes plans for improvement. Emergency fund is available in case of disaster and major repairs.	Water source protection, water quality testing, filtration tanks and pipeline leakage repairs.
Structure of water management	Ministry of Foreign Affairs of Finland makes yearly plans with Nepal's government and takes part in the planning on the municipality level. Bilateral projects support the preparation of municipality policies. Finland works with the WUSCs and wards through NGOs.	WaterAid is closely collaborating with municipalities, WUSCs and the Ministry of Water Supply.	Collaboration with federal government and ministries, Provincial Planning Commission, international donors, and water user committees.	The municipality gets support and funding from the federal government. In addition to that, there is collaboration with WUSCs, wards, provincial government, and NGOs.	Collaboration with provincial government, municipality, NGOs and WUSCs.	Collaboration happens with ward office, the municipality, CATN and municipality Disaster Management Committee. Also, Devchuli B works with Women Community.

6. 1 Finnish Nepal WASH experts

Water management operators:

Finnish WASH experts represented the fields of technical advising and development politics. During the years of collaboration, Finland-Nepal bilateral projects have also supported the preparation of municipality policies. Collaboration between all the actors of water management needs to be clear and profound enough so no projects are overlapping when there is no desired. Rural municipalities can have smaller resources and less technical know-how and perhaps trouble in getting long term staff. Municipalities and especially municipality leaders have more power in decision making and therefore their activity will make a large difference in functionality.

Targets of development:

The WASH experts highlighted that maintenance should be improved in many schemes of the municipality. The technical advisor stated that when maintenance is done well there are no problems and therefore the result is not very visible. But in many schemes the maintenance is lacking, and this can be seen in the operation and functionality of the water management. WUSCs could even have different people who are responsible for the scheme during construction and during maintenance when the project is ready. According to the technical advisor this could be because the dynamic people who are used to seeing the result of their work might not be the best leaders during monotonous operation and maintenance.

Some of the everyday targets of development in water management are training and data-based decision making. In the operation level most, training is needed in technical and financial matters. In fact, Nepal has a water management specialized training center (National Water Supply & Sanitation Training Center) where training capacity is high. Also, more data should be collected on water management because currently it causes difficulty on planning and monitoring.

SDG and information sharing:

SDGs were mentioned comprehensively. Mainly the Goal 6 with Targets 6.1 and 6.2 but also energy production, water efficiency, livelihoods and equality. In general, SDGs work as a general level guidance in water management. Sometimes it is difficult to monitor and express the development in SDGs because there is not enough suitable data available to examine the SDG indicators.

The Ministry of Foreign Affairs of Finland makes yearly plans with the government of Nepal and also takes part in planning on the municipality level. Finland has a program of development policy which also includes country strategies of development as the overall guidance for any collaboration. The Ministry of Foreign Affairs of Finland has areas of priority and result frames for monitoring the development of those. The indicators used for monitoring are in line with the SDGs. In addition, the ministry follows a practical step-by-step process in water management implementation.

Ownership:

Ownership is formed when the public can participate in planning, building or operating the water scheme. Poor ownership can be one reasons for lack of monitoring and repairing. Ownership is more likely to form when the activity has an existing network of support. "One house, one tap" model has seen to increase ownership of the people though the cost and required capital is higher. WUSCs members should be in charge of their scheme so that proper ownership can form. Then, at the end of the project WUSC members should have enough knowledge and ownership to continue operation and maintenance of the scheme.

Disasters and preparedness:

One challenge is caused by water sources that can dry up either due to natural hazard or climate change. Earthquakes, landslides and floods affect water availability and can sometimes deplete water sources for years. Landslides and earthquakes cause harm to pipes which is why proper planning and assessment of the scheme location must be done. To protect water management infrastructure, it has to be made steady and strong. Also, humans can sometimes ruin water bodies and pipelines while constructing roads for example.

6.2 International WASH organization expert (WaterAid)

SDGs and guidance:

The Constitution has named the right for water and sanitation. It has article 18: special water provision for marginalized groups, article 24: under disability and against discrimination, article 27: water and environment and also article 35 section 4: right to clean drinking water and sanitation. The Constitution can be implemented on the local scale also through acts, guidelines and plans. In addition to these, there are many water management related guidance documents in the legal reviewing process. 1) drinking water and sanitation bill, 2) the national water policy, 3) national water use master plan and 4) Nepal WASH sector development plan 2015-2030, which also includes an estimate of how much safe and clean water management for all the people in Nepal would cost. WaterAid specialists have been involved in creating the Drinking Water and Sanitation Bill and some other acts as well. Rural areas have their own model for supply and sanitation development.

Nepal is a UN signature country, so it has agreed to reach sustainable development goals by 2030 and take the targets as part of their planning. WaterAid representative named Target 6.1 as the most central target of water management.

Water management operators:

WaterAid is closely working with municipalities and WUSCs. One of the main collaboration operators is also the Ministry of Water Supply, that is responsible for all the

work on WASH sector in Nepal. Outside of rural municipalities, in urban areas there is Nepal Water Supply Corporation that works outside of Kathmandu valley. Earlier on, Devchuli belonged to the section of areas that had small town projects supported by the World Bank and many organizations. After the federalization municipalities have a great role in the safe and clean water supply and management for their citizens. Local government needs to commit to the projects and development process. Registered WUSCs can get help from any other operators by request.

Successful practices and sustainable parts of water management:

New form of governance is more stable and demands more accountability from the local governance because the leaders of also rural municipalities are elected. This has been seen to provide a good environment for collaboration and commitment. This enabling environment provides better possibilities for collaboration and practical work with local leaders. For example, getting permits for water infrastructure building on the municipality owned land has become easier. WaterAid Nepal is working with one of the Nepal Water Supply Corporation branches to make it a role model for other branches and operators.

In some schools the water supply is provided through rainwater harvesting. In this method the water can go through a bio sand filter. Using rainwater harvesting requires a plan for the infiltration of the water too because the land and nature need it too. When people in their community contribute their time and work to the scheme being built, they get to know and understand it better. This way ownership is built. In some WUSCs there are also planned tariffs that ensure enough funds for the maintenance of water management. In best cases the tariff has been calculated and decided together by the WUSC and municipality.

International WASH organization representative gave a great example of successful project, collaboration and ownership. In the type of settings where ownership and monitoring is already very active, hand-out projects can be considered unless it is decreasing the ownership. A mountain district called Dolakha is a rural municipality where the users have exceptionally good ownership and participation. Instead of building the ownership entirely from the beginning by involving the locals into planning, building and operating, all the designs and estimates could be brought directly because there was knowledge that the users of the scheme will keep up operation and monitoring. With this commitment the municipality was able to offer “one house, one tap” provision for almost all.

Targets of development:

Previously there was a Ministry of Water Supply’s Department of Supply and Sewage office in every district. Nowadays some districts share an office. The dispersion and low funds of the offices was considered an issue in collaboration. Clear statement from the WaterAid representative was that there should be more collaboration between

Department of Water Supply offices and the municipalities.

The representative stated that a 2014 NMIP (National Management Information Project) survey revealed that out of the 40 000 water schemes created, 70% were not functional or needed repair. These figures are from all of Nepal and do not directly represent Devchuli municipality, but they reveal unsustainable development in managing and repairing the built schemes. To make water management more sustainable there needs to be more than individual projects. Planning, building and management needs to be consistent and ensure the continuous supply of water. In terms of financial sustainability of a scheme, it was urged that regular income for daily operation and maintenance is very important. The "one house, one tap" model includes thinking for sustainability and also a business plan for the tariffs. When creating sustainable water management there should be a governmental unit that helps with technical aspects and water related problems. But they would also monitor that rural municipalities will be annually getting enough money for providing WASH services. Water Safety Planning should be done in all the schemes and it should be consistent no matter the size of the scheme.

One of the targets of development is also ownership of the water users. Improving it requires more public participation and less hand-over projects. A common problem that can come up is the lack of motivation to pay the tariffs. This is also a matter of felt ownership.

Education:

In some rural municipalities there might be a lack of knowledge that safe water supply is a constitutional right but also a human right. WaterAid provides very practical training to the community where a scheme is planned to be built. This includes building training and water safety training. Users should understand how their water management works to form ownership towards it. This way they are also able to act on it if something unusual happens with the system. In trainings, users will be educated to work in specific teams that are in responsible of water source for example. Trained WUSC team can also make decisions related to disaster risk reduction (DRR) and actions to do after the disaster.

Disasters and preparedness:

Hazard such as earthquakes can decrease the water available in streams and springs for some time. For every scheme there is a Vulnerability Capacity Assessment (VCA) done before the building process. When planning and evaluating a certain area for vulnerability or maybe for possible routes for the pipelines, a drone image or video can be used in the assessment.

Options for getting clean water:

Rainwater harvesting is a great option for remote communities with difficult access and small number of beneficiaries. In areas with wells or water pipes, rainwater harvesting also works as a second option in some houses and will add resilience to the community.

Also, chlorine is added to water on some areas.

6.3 National WASH specialists

Water management operators:

National WASH specialists in these interviews represented the provincial governance ministry representative and FEDWASUN (representative of WUSCs in Nepal).

Provincial governance collaborates closely with the different levels of ministries, Provincial Planning Commission and WUSCs. The ministries work with WUSCs through Water and Sanitation divisions allocated in different districts. FEDWASUN collaborates and communicates between the federal government and WUSCs in Nepal. National and international operators should allocate more budget to WASH sector because water is a human right and there is still a lot of work to do with water quality and sanitation. Ministry representative stated that in the future ministry there is interest in private water management and international collaboration on water management.

Implementing the guidance:

FEDWASUN has worked to localize the SDGs by engaging in activities like joint monitoring, independent monitoring, capacity building. FEDWASUN representative suggested that the Department of Water Supply should be responsible for monitoring the implementation on a general level. Another suggestion was that capacity building of the WUSCs could be done by training the members to use newer, user friendlier technology such as e-payments. This will increase the transparency of finance. Last idea was that there needs to be training and help for WUSCs in all the aspects of their work.

Successful parts of water management:

The province government has considered the unreached population and focused actions towards them. Cost and energy efficiency has been developed through experimentations on solar power. FEDWASUN stated that good water quality, public participation and community ownership are one of the most important aspects of sustainable water management.

Targets of development:

According to the ministry representative, the transparency of governance needs improving, and more funds need to be allocated for the water infrastructure. Province level operators hand over water management projects to WUSCs when they are completed but are not responsible for the operation and maintenance. They assist financially if need be. FEDWASUN representative stated that the Ministry of Water Supply should be in charge of policy supervision, new policies and sharing roles and responsibilities because it currently has a lot of power compared to the local governance.

Targets of development in daily activities were related to adding training of WUSCs to,

for example more training on transparency of the WUSC finance. Also, a water safety plan should be done for every project already in the planning phase and not later. FEDWASUN representative named 5 things to improve water management: 1) WUSC capacity building, 2) improvement of water quality, 3) improvement and clarification of WASH governance 4) Monitoring should be done by a third party or jointly, 5) improving sectoral coordination so that issues of drinking water would be connected to health, education and gender, too.

To make water management more sustainable, the ministry representative stated that training is needed on many levels: In the ministries for planning, understanding on water sources and also on creating policies and regulations. On the project level there is need for training in WUSC formation, fund collection and responsible contribution of the project. Construction related training to the building phase. Through the scheme building process there should be training on how people can contribute and participate in the process. And as well trainings to wards and WUSCs on how to effectively manage the participation.

The Ministry representative stated that in its Fifth Year Plan 76/77 Gandaki Province, aims to ensure 100% access to basic drinking water, medium and high-quality access to 50%, and complete sanitation services to 30% households. In terms of sanitation the percentage seems all too low but perhaps it was an error of thought or problem in the audio record.

Information sharing and SDGs:

Ministry representative mentions the SDG Target 6.1 indirectly through the focus of Nepal constitution which the ministries follow. Whereas, FEDWASUN representative expresses the organization's interest in all of the 17 SDGs and specifies that they lead the work with SDG 6 in the civil society SDG Forum. The representative mentioned that they especially focus on 6.1 and 6.2. FEDWASUN representative states that government agencies and development partners have worked well to incorporate the SDGs as part of national guidance. The National Planning Commission has also created a roadmap for Nepal to reach the SDGs.

According to the ministry representative, the jurisdictions of the three levels of governance need clarification because it negatively affects the decision-making process and purchasing processes. Also, the FEDWASUN representative states that there is sometimes unclarity in which level of government is supposed to handle water management projects. This unclarity has even led to a court case.

Sustainable water management strategy should be created to local, regional and national levels of governance. Another legislation the national WASH specialists follow is Water Act 2055 which states that the water sources should not be spoiled, and the environment should be protected. FEDWASUN follows a various set of guidelines such as the Water

Resources Act 2049, Water Resource Regulation in 2050, Water and Sanitation Directive and also Sanitation and Hygiene Master Plan. The representative states that there are too many guidelines to follow which makes work difficult. They have asked for only one WASH Act to cover water management and it is being processed in the parliament.

Ministry representative suggested that indicators of success in WUSCs could be, for example, registration of user committees, the situation of repair work, staffing, fund availability, water tariff collection plan and implementation, record keeping, tools and fitting availability, whether the safety plan is functional and whether it is provides water 12 months a year as well as accessibility matters. Another way of measuring is physical structure index, which is a tool used to monitor the water source and water management infrastructure. Different water purification methods such as slow sand filter and chlorination are monitored under this index. The success of the index is discussed with the WUSCs according to the ministry representative.

Disasters and preparedness:

In the beginning of scheme planning, the natural aspects such as topography is evaluated to avoid areas prone to hazards. Then, in case of hazard, the executive WUSC committee meets and handles the matter if damage is small. In larger cases outside consultation will be done and decisions to for example ask for government or donor funding will be done based on the meeting. Minor repairs can in this setting mean leakage of water and replacing single pipes close to the land surface. According to the ministry representative, the minor repairs are done by the service delivery organization. Then on the other hand, major repairs are too large for WUSC or ward and disasters need additional budgeting. Help for repairs is first sought from the municipality and after that from the District Division office.

6.4 Devchuli municipality representatives

Water management operators:

Devchuli municipality gets support and guidance from the Federal Government and the Provincial Government. The municipality also works with the Water User Group Committees, wards, state government and non-governmental organizations in planning and implementation. Some of the water management tasks have been assigned to the Water User Committees. Still there seems to be much less collaboration with WUSCs than with wards. The municipality's technical, social and administrative branches are guided to assist the wards in water management matters. Furthermore, collaborating with the WaterFinns on different water supply and capacity building projects and also building a water quality testing laboratory.

Successful and sustainable practices in water management:

Executive branch of the municipality is preparing an annual strategic plan and program for drinking water and sanitation in which also the ward committees have had a big

influence. There is also a specific budget allocated for the implementation. Collaboration and information sharing between the wards and municipality seems to have a good base. Municipality stated that they consider public participation to be highly important. Public has been participating in preparing annual budgets, policies and programs every year. Another good step in development is Devchuli municipality is getting a laboratory for water quality testing and monitoring.

Targets of development:

Water quality testing, which the municipality is responsible for, needs to start as soon as possible. The problem has been the lack of proper standards for clean and safe water. Also, the municipality representative stated that a comprehensive long- and short-term plan of action for reaching SDGs is still missing due to time restrictions. Municipality needs assistance for this from the federal level. Due to limited expertise, workers and financial capacity there has not been possibility to provide safe and clean water supply for all the citizens of the municipality. For this there needs to be more collaboration with the federal government, districts and NGOs.

SDGs and guidance:

The Federal Government and the Provincial Government have provided various guidelines and policies to the municipality. This was said to help them reach the provincial targets but there was no mention of what this target was. Devchuli municipality mentions the Government's policy and program for fiscal year 2077/78 (years 2020/21) as one of the important guidelines. The Federal Government has also instructed the municipalities to work so that the sustainable development goals would be met by 2030. The policy and program are aligned to the SDGs. In terms of water management, the policy makes the "one house, one tap" model official, redirects water management programs to WUSCs and initiates to set water quality monitoring laboratories in the municipalities. The policy and program also seek to make the water management infrastructure building environment friendly, gender friendly, child friendly and disability friendly.

The municipality said to follow SDGs in the water management planning but there was no specification on how this is done. Although, municipality aims to provide safe and accessible drinking water for all citizens by 2030, which is equivalent to the SDG Target 6.1. Yet, the municipality has not been able to create a comprehensive short- or long-term plan of action to make this happen.

Options for water purification:

The municipality has installed four slow sand filtration systems to the Devchuli area and those are functioning, but the water quality is not tested yet. Population growth has increased the water demand leading many of the projects to get the water into their pipelines from the rivers. This especially requires the slow sand filtration to work properly. There are now drinking water capacity building programs in the wards 6, 7, 8

and 9 of the Devchuli municipality. In order to provide safe water for all the citizen, those programs should be established in all the wards.

Disasters and Preparedness:

The municipality works together with the government and NGOs to minimize the harm caused by natural hazards. With this knowledge the municipality assists WUSCs in protecting the water source, building new water supply systems after a disaster and increasing the capacity of water collection tanks. There has been embankment of the Baulaha river and some others to keep the area from flooding. The municipality representative stated that in cases of harm caused by natural hazard, the WUSC is responsible for repairing the water management system as part of normal operation and maintenance. If the damage is too great, the municipality assists in repairing with high priority. At this point it is possible to receive help from the ward office, governmental bodies and NGOs

6.5 Ward leaders in water management

Water management operators:

Wards cooperate with the provincial government, municipality, WaterFinns, and WUSCs. Provincial government provides wards with most of the funding. Wards and municipality collaborate in planning and implementation. The municipality's technical, social and administrative branches are guided to assist the wards in water management matters. Technical assistance also comes from INGOs and NGOs such as WaterFinns. WaterFinns has earlier organized capacity building trainings which ward representative was very happy with. UNICEF guidelines reach wards through NGOs. Guidelines come from all sectors of governance and the NGOs. There were no other guidelines specifically mentioned than SDGs.

Ward officers check the condition of water facilities around their area, monitor and regulate the activities in water management and also make plans of improvement for areas. Wards submit a proposal based on their activity to the federal or provincial level. Based on this proposal the wards also get their budget. To solve problems, the ward can collaborate with the municipality, province and the federal government. Currently, the provincial level provides ward 9 with the most financial assistance. According to the ward representative, the municipality does not have a policy section in charge of water even though it is a great issue and the public is willing to work hard on the solutions.

Ward representative stated that NGOs have provided the ward with systematic and thorough technical guidance even when the budget is little. This is said to be the difference between provincial or federal operators and the NGOs. NGOs have already considered community meetings and public participation to be important. Federal and provincial level allocated budget for the investments but does not support the ward work very comprehensively in other ways. In ward 9, public participation is good when it

comes to water management.

Disasters and preparedness:

At the time of disaster, the first step is the assessment of the damage. In ward 9 for example, it is done by the ward's local committee. The problem is reported to village maintenance workers (VMW) who will find out if they are able to solve the problems. Next, if the VMW cannot fix the water system, the local committee will present the ward with a report on the damages. Ward will assign an engineer to evaluate costs for fixing the damages and grant an equal amount from the emergency fund for instance for buying and installing new pipes. More technical and financial collaboration with NGOs is needed so the wards can sustain their continuous water supply with minimum interruptions also during hazards such as monsoon. In case of a broken water scheme, the wards do not receive any guidelines on the repairing. They collaborate with the municipality and receive funding on the repairing from the municipality. In a situation where the water system needs urgent repairs because of a disaster for example, the emergency fund is used for repairs and maintenance.

Successful and sustainable practices in water management:

The ward leader identifies safe and clean water management for all to be his responsibility. Therefore, he highlights community discussions to identify problems that even individual households have. Ward representative expressed that the NAPA WASH 2 project had provided them with very useful policies, guidance and cooperation. NGOs have brought education on proper hand washing technique to the ward and Hand Washing Day is celebrated annually. Ward representative has noticed many great changes in the social state of the ward citizens through better water management.

Ward water management has lately been improved with investments from the provincial government and NAPA WASH project. Devchuli municipality recently got a few Slow Sand Filtration systems constructed by the provincial government. Ward leader was pleased with the improvement in water quality through this activity. Also, a water quality testing facility has recently been constructed in the municipality and the ward representative hoped there could be one in every ward soon. Current water testing was funded 50% by Devchuli municipality and 50% by WaterFinns project.

SDGs and information sharing:

According to the ward representative, all the levels of governance plan and implement water management are based on SDGs. Target 6.1 on safe drinking water was mentioned.

Ward representative stated that water purification training to households is necessary from time to time. Also spreading knowledge about proper ways to clean and store the water at home. People in the wards have gained more knowledge on how clean-looking water can also include bacteria and be harmful. Training for capacity building organized by WaterFinns has received positive feedback from ward 9 representative. The challenge

of training has been that educated people might leave abroad which leads to communities having many untrained people.

Options for getting clean water:

Earlier, the ward 9 drinking water was filtered from a small canal using scarves and caps to try and filter the water. Nowadays water supply is safer and cleaner when the ward uses cleaned river water. After the 2015 earthquake the ward's earlier water source dried up and stopped providing and they started fully using the river water. The river water must always be purified for drinking and many poor households use wood to burn to boil the drinking water. Households with more money can afford water filtration. Some households also use SODIS-technique (cleaning water with UV-rays). A developing method in Devchuli municipality is slow sand filtration. In addition to water purification, safe drinking water provision also requires that the water source should be protected with for example fencing.

Disasters and preparedness:

Nearby Deusat river floods every year during monsoon. This hazard destroys 100-150 meters of water pipes every year because the water mass relocates and flushes the pipes away. Ward 9 has a disaster management fund to cover the repairs in unexpected situations. During monsoon another problem is that very little clean water is available and most of the accessible water is brown and undrinkable. Also, during the dry season the water sources can dry up and the locals must get their water from a canal made from the river.

Targets of development:

For general development, ward representative stated that more trainings need to be organized, especially related to technology of water management. Village maintenance workers (VMW) should also be offered more technical training. In addition to the training, the VMWs need to have better gears for repair work such as enough protection from the rain when repairing schemes. A jurisdictional challenge is that wards do not have their own strategies or guidance papers on implementing the water management in their area. For clear action, this kind of guidance should be created.

6.6 WUSC leaders in the villages

Water management operators:

The interviewed WUSC leaders represented Devchuli A and Devchuli B wards. Both of their WUSCs support around 500 households.

WUSCs are the ones that act fastest to hazards and problems in water management. WUSC representatives state that they are most involved in operation and maintenance because they do not have the skills for planning which is done by the municipality.

The most important guidelines they use are for example safety guidelines provided from

trainings. Devchuli A also has their own guideline based on what has been learned in the past.

WUSCs are currently funded by wards, the municipality and also province office. For financial sustainability they suggested that every household should financially contribute to repairing damages in case of a hazard. Also, a good model would be that municipality provided the WUSCs extra funding for repairs and hazards each year. With this money the WUSC could get a filtration unit to their water network.

Options for clean water and preparedness:

Chlorine dozing is used as a systematic way of water purification because the water quality is bad. Even after chlorine, locals boil or filtrate their water. During Covid-19 however, the chlorine storages were needed for sanitation of different areas which led to lack of chlorine for water. The WUSC needs more people to have the chlorine dosing training because currently only one person went through it.

After moving to "one house, one tap" provision model, the WUSC experienced a lack in the water quantity but the situation was solved with municipal assistance and funding. The water quantity of the original spring source was increased with adding a river source to the pipelines. During monsoon the water quality of WUSC is better than during the dry season. In monsoon season the river water cannot be used due to turbidity and bad quality so water is not enough and therefore the supply sometimes needs to be interrupted.

During the monsoon, river floods affect pipelines, and landslides can damage different sections of the water network. In large repairs, municipality and CATN assist WUSCs technically and financially. During normal times too, the water source protection and quality should be improved, and cattle grazing should stop on the area. To bind soil, afforestation should be done.

Targets of development:

For sustainable water management the WUSC representatives suggested a detailed study of what areas lack water management. Also, WUSC representative says the Committee would need different subgroups that could focus on their own tasks such as fixing and office management. They required better technical support in terms of system documents for example. More support should also be provided through training on bookkeeping, purchase and financial activities.

Successful parts of water management:

Devchuli B representative highlighted that their WUSC collaborates with the Women Committee. Also, Devchuli A has a lot of women participating in the work for example through WUSC and chairperson being a woman.

7 Discussion

This section will further open up the interview results based on comparison of the different interview groups as well as reflection to scientific knowledge. To give context for the Devchuli case study, discussion also brings information on Nepal's national success in reaching the SDG's. The discussed topics are divided into subtopics based on the thematic coding of the interviews. Also, one chapter is dedicated to all the prominent needs of improvement that exist in the water management of both Devchuli municipality and Nepal.

7.1 Inclusiveness and water management for all

Nepal experts, international WASH organization experts and national WASH specialists expressed the urgency of also reaching the areas that do not yet have basic water management provision. This UN's equity-based *Leave no one behind* ideology is also named by the government of Nepal (Bennett et al 2008; Status of Women… 2017). Devchuli municipality also considered the importance of providing water to all. Based on the interview, the execution plan for this is to follow the "one house, one tap" model. This refers to the ideology of bringing water supply to every house through a non-shared tap. This is seen to create ownership and motivate households to maintain the water management system (Ambuehl et al. 2021).

To reach all the rural areas that are currently lacking safe water management, there were propositions for alternative ways of water supply. One of the ways is rainwater harvesting which is a good source of water on areas with challenging topography but sufficient rainfall (Dos Anjos 1998). It can also help areas that lack sufficient supply of groundwater nearby through pipeline transporting harvested rainwater to areas that experience depleting of water sources (Parajuli 2018). Wide use of rainwater harvesting requires also balancing activity which is groundwater recharge in the premises (Report - Rainwater harvesting for recharging shallow groundwater 2011). This keeps the groundwater at a sustainable level by saturating the soil again with water that will end up in groundwater. Recharge is crucial at combating against the possible impacts of climate change when the land could become more arid on some areas. Another way of providing the rural areas with water supply is upgrading the technology and using gravity assisted water pumping methods. This can be used for example on areas with steep hills but available water sources nearby. Of course, this method is more challenging in rural areas where building the system can be more difficult due to topography and the expertise for maintaining the system is more likely to be low. Neither the municipality representative nor ministry representative suggested any details on how to provide water supply for the areas that are not easily accessible.

The primary challenge of providing safe water management to all in Devchuli is water quality. Especially WUSC representatives explained how there can be various problems in water provision due to the quantity and quality both during both monsoon and dry

season. This highlights the challenges of poor water quality and contaminations that come with intensive rainfall as well as depleted water source which Rantanen at al (2014), Shrestha et al (2014), Safieh et al (2020), Mishra et al (2017) and Panth et al (2022) discussed. In Devchuli this has been solved through various purification methods by boiling the water, adding chlorine and by slow sand filtration system. The slow sand filtration is quite a recent purchase and roughly around the same time with it, a water quality testing laboratory was built in Devchuli. Water quality testing is especially important because it tells about the amount of possible bacteria and makes it possible to compare water sources very fluently before the drilling of a well for example.

Regarding the inequalities, promoting WASH especially for women, minorities and people in vulnerable situations is a key practice for sustainability. Especially Dalit women and women in vulnerable situations are not properly included in the WASH services. FEDWASUN representative also expressed that this can be seen in the planning process where these groups are only present by around 50%. Low participation is also considered in a study on *Status of Women and Youth Leadership in Nepal* (2017) where a severe lack of participation by women, Dalits and illiterates was found. The situation could be improved through safe hearings or interviews of the disadvantaged groups. This way their view could be considered as part of the planning and operation. Collaboration between women's groups and water management planning could be enhanced. (Status of Women and Youth Leadership in Nepal 2017). In addition to this, the public hearings that are already forming a habit should be continued with emphasis on everyone being welcome and getting heard. In general though, low participation among women derives from the weaker position in the society which can be seen in education, work positions and politics (The power of parity 2018: 10).

Interesting part of the national WASH specialist interview was that the ministry representative stated that in its Five Year Plan 2076/77 (years 2019/20) Gandaki Province, aims to ensure 100% access to basic drinking water, medium and high-quality access to 50%, and complete sanitation services to 30% households. In terms of sanitation the percentage seems all too low to be true. But perhaps it was an error of thought or problem in the audio record since after all, the interview was done through internet call. Also, the 100% access to basic water management seems like a high percentage in comparison to the 84% of the whole Nepal (National Review of Sustainable Development Goals 2017). According to Gandaki province data, around 72% of households have access to safe drinking water (Gandaki Province: A Data Overview 2020). The information on access to water supply and sanitation could not be found from the Annual Progress Report of 2076/77 even though Gandaki province was mentioned in many different statistics (Annual Progress Report 2020).

Devchuli municipality expressed high importance to public participation in the platforms of financial, political and program planning. The municipality representative also mentioned that acting by the Policy and Program of the municipality for 2077/78 (years

2020/21) included consideration of the environmental impacts and equal access. But there was no mention about when and where different groups such as women, minorities or disabled could be part of the planning process. Without concrete plans of participating the public, the water management is not equally inclusive for all and serve the purpose of all citizens. With participation plan and collaboration with the women's groups for example, Devchuli municipality could increase participation and felt ownership.

7.2 Ownership

Ownership is known to be a very important factor regarding long-term success in sustainable water management (Ambuehl et al. 2021). Based on the interviews, it is promoted by many different operators from both the international and local sector. International and Finnish Nepal WASH experts, municipality representatives explained that some INGOs and organizations involved in water supply projects, have held at least one public hearing about the entire plan including its finance and heard out comments from the locals. This was said to increase transparency of the project and early on reveal matters that might decrease ownership towards the planned water system. The municipality representative also emphasized the importance of public participation even though the participation was more about WUSC reporting on improvements to the higher level. The WUSC representatives did not highlight the importance of public participation and the reason can be that the active locals are already working with the Committee. Also, the lack of training on how to take action in public involving can be a reason.

Still the interviewees expressed their concerns that there is not enough ownership. Without community ownership, there is no sustainability, stated a national WASH expert. The interviewees revealed that some of the main reasons behind the lack of felt ownership are related to lack of public participation in water management. In some cases this could mean projects that are planned by a higher authority and then handed over to the WUSCs to take care of with no felt ownership. Also, lacking responsibilities, which the WUSC members could be in charge of during the building process, lessened the feeling of co-ownership and accountability. When even a public hearing has not been made to support the planning, the finished water scheme might even be unequally planned to meet the needs of some of the users. Overall, the handout projects were not considered sustainable for a WUSC or ward to manage and maintain which does not require the community to get involved. Moreover, the current model of "one house, one tap" model was regarded as a possibility to increase the ownership of the water system.

To increase public participation and felt ownership through it, different actors of water management could plan the scheme together. This way the process can utilize both local knowledge of the area and water users, and knowledge on possible technologies and policy (Ambuehl et al 2021). Participation could be increased with multiple public hearings during the project and also reaching out to the groups of minorities, women and disadvantaged people who might not otherwise get involved. Also, financial contribution

to water management has been noted to improve ownership (Ambuehl et al. 2021) which further supports the collection of reasonable water tariffs.

7.3 Sustainable development goals

Many of the problems and their solutions that SDGs present were mentioned during the interviews. Therefore, it can be said that many of the problems Devchuli is facing are similar to those problems identified in the global goals. For example, SDG target 6.1, which demands for safe and affordable drinking water, was the most recognized in the interviews. Also target 6.2 advocating access to adequate and equitable sanitation and hygiene. The fact that these two targets were named in the interviews, represent the familiarity of SDGs but perhaps not the entire understanding of them. These two targets are specifically linked to the provision of WASH services which makes it easy for a water management professional or operator to set them as meters of sustainability. Indicators under targets 6.1 and 6.2 are indeed the most used ones of water management when it comes to quantitative data and statistics. But sustainable management is also about the involvement and ownership which are soft values and harder to count. Table 2. shows based on these interviews, how Devchuli has managed to work towards the selected SDG Targets of this research.

Table 2. The realization of selected SDGs in Devchuli municipality water management.

Target:	**Progress:**
5.5 Women participation	• Women participation is still small especially within the minorities. But a growing number of women work in all the levels from ministries to WUSCs • Still women are rarely the chairpersons in WUSCs but vice-chairpersons of treasurers
6.1 Safe drinking water for all	• Water management is still not accessible for all but the overall rate has raised significantly over the years • Water testing laboratory in the municipality to monitor water quality • On the other hand, Devchuli municipality does not yet have a short or long-term plan of action to meet the SDGs
6.3 Water source protection and quality	• Water source quality has been maintained well through legislation and practice • Water Act 2055: water sources kept unspoiled, and the environment protected
6.A Internal cooperation and capacity building	• International collaboration in Nepal-Finland bilateral projects • Sanitation, hygiene as well as energy and water efficiency have been developed
6.B Local participation	• Public participation in water management has been raised as one of the priorities in Nepal and in Devchuli municipality
10.2 Social, economic and political inclusion of all	• Inclusiveness is considered through public participation • Equal inclusion is promoted through a share of women in WUSCs for example

11.5 Disaster loss	• Risks are evaluated when building schemes but with climate change the economic losses do not seem to get smaller without big changes. • Water Safety Plan does exist, but it could be included already in the planning stage • Minorities and disadvantaged people are not considered especially in relation to hazards
13.1 Building resilience	• Building resilience has been done through disaster fund • Disaster risk evaluation and reduction has been done through planning (using drone images and topography data in planning)

No other SDGs targets were specifically named but also women participation, livelihoods and reduced inequalities as well as partnership were mentioned by the Finnish Nepal WASH experts and ward representative. They considered all the SDGs highly important to water management operation because as a basic need in life, water impacts many things around. On behalf of the other actors, this could indicate that perhaps there was little knowledge on the SDGs or that some of the SDGs might have been integrated into everyday life and development but not as SDG goals.

Municipality was clearly aware of the SDG goals, and they were advised by the Federal and State Government to work in order of achieving the goals by 2030. The Government's Policy and Program for fiscal year 2077/78 (years 2020/21), that Devchuli municipality also sees as an important guideline, is said to be in line with the SDG Targets. The municipality recognized public participation, social inclusion and capacity building as matters which need to be included in sustainable water management. However, the municipality representative stated that the municipality has not been able to create a comprehensive short- or long-term plan of action to reach the SDGs. This can result in more delays of action and development in Devchuli and make it challenging to reach the target 6.1.

During the interview, the ward and WUSC representatives mentioned that collaboration with NGOs and the federal government operators was needed for Devchuli to be able to provide water management for all the citizens. During interviews, there were mentions of equal access to water management and environmental sustainability but no concrete ways of action on the side of the municipality. The municipality representative also stated that the municipality has not been able to create a comprehensive enough action plan to reach the SDGs by 2030. Therefore, it can be presumed that some of the SDGs related to water management can be achieved in the municipality but perhaps not all. For example, Nepal has shown good progress in the SDG Targets 6.1 and 6.2. (National Review… 2017). In terms of sanitation, the population using basic sanitation has risen from 30% to 81% in 15 years during 2000 and 2015 Millennium Goals (National Review… 2017: 5). According to an expert in development politics, also Devchuli has developed greatly in sanitation and this Target could be expected to be fulfilled by 2030.

In relation to cultural sustainability, there was a statement during the interviews by Finnish WASH expert, that women on their periods or Dalits in some places are not allowed to use the public tap. They need water regardless of this and might move to a more private area to make a hole into the pipe. After use, the hole can be blocked with a branch for example. The activity might seem like violation of the property but is generated and maintained by culture. This kind of activity may cause contamination of the water system, create scarcity of water, and affect the system pressure. As long as social or cultural matters restrict equal access to water supply, then sustainability is not entirely achieved. This weakens the participation possibilities of women, disadvantaged people and ethnic minorities (Status of Women… 2017). Reaching SDG Target 5.5 also means providing women equal opportunities in use of water supply.

What still needs more work is especially resilience. This can be done through adapting better to the phenomenon climate change might bring (DHM 2017). In addition to the solar powering of water management which the ministry representative mentioned, there could also be efficiency in water use especially during the dry season. This way water and energy could be saved which decreases the cost of water to households. Also, disaster risk reduction still needs more work so that Devchuli could be more resilient towards the natural hazards that can destroy water management infrastructure.

Resilience is challenging in a situation where all areas do not have water management. In the SDGs, resilience is more focused on being climate resilient but with the current development of climate change, water management will also need resilience. Ward 9 was a good example of how natural hazards can flood the pipeline many times during one monsoon season. The cost of this disaster is very high for the ward, and it might be able to repair some of the damage with their own funding but since on the second time NGOs, municipality or even federal government might have to provide the ward with exceeding funding because functional water supply is a fundamental right.

Assessment on vulnerability and water safety planning training should be part of all the scheme plans. This would increase the resilience of finished schemes and water management infrastructure and therefore can decrease the cost of repairing the scheme after a disaster. Aerial footage with for example a drone, can be used in assessing the vulnerability of certain areas and evaluating possible routes for the pipelines.

In terms of scheme area resilience, many households burn wood available in the nearby areas to boil the drinking water. If the wood consumption is high in the area, it can harmfully contribute to deforestation resulting in landslides near water sources and water management infrastructure (Chaudhary et al 2016).

In relation to Nepal's national roadmap, many of the SDG have been noted and implemented by the national and local legislation and practices. Women participation in water management has been a challenge for a long time but there has been promising

evidence that women participation is all the time on the rise in WUSCs, wards, municipalities and even in the national sector. This is good development towards achieving the Target 5.5 (Global indicator… 2017). But still in 2017 women had a 0,24 in 1 ratio compared to men when it comes to professional and technical workers (Nepal's Sustainable Development Goals Status and Roadmap: 2016-2030: 29).

Development on WASH has been slow and steady so that 87% of the population has access to basic water supply 82% to sanitation in 2017. Still, it is questionable if SDG 6.1 will be reached when around 82% of the households also have water contaminated by bacteria (Nepal's Sustainable Development Goals Status and Roadmap: 2016-2030: 31). The roadmap created by the National Planning Commission did not specify factors related to source protection, capacity building and local participation. In relation to Target 10.2 the reduction of social inclusion seems promising, but Covid-19 might cause a temporary setback to social, political and economic inclusion. Preparedness to disasters is mentioned as part of SDG 11.5 but water management infrastructure is not even mentioned in the roadmap although in addition to housing, a lot of water management infrastructure was destroyed.

Nepal's national success in achieving the SDG Targets and Indicators:

Most of the data on Nepal's national progress on the SDGs is from 2019 (National Review… 2020) and the selected Targets and relevant Indicators show promising results on some aspects such as basic water supply and proportion of women in decision making (Table 3 and 4) but reveals needs of improvement on others such as access to safe drinking water and wastewater treatment (Table 4). Nepal participated in a Voluntary National Review of the SDG progress with statistics of 2022 where we can see that for example the access to basic drinking water has improved to average of 96% and even in the furthest behind groups in most vulnerable Provinces with percentage of households that have less income and lower educational background reached to 93% (Voluntary National… 2023).

5.5 Women's effective participation and equal opportunities for leadership

Proportion of women in national parliaments and local governments has been almost achieved already (Figure x). On the other hand, the proportion of women in managerial positions is too low and Nepal's National Review of Sustainable Development Goals (2020) expresses a concern that the goal might not be reached by 2030.

Table 3. Review on how the SDG Target 5.5 has been achieved in Nepal nationally based on statistics of 2019 and compared to what is needed to reach the SDG by 2030. (Source: National Review… 2020).

TABLE 5.5.2: SDG 5 - Ensure women's full and effective participation and equal opportunities

	Targets and Indicators	Baseline 2015*	Target 2019*	Progress 2019**	Target 2030*
5.5.1	Proportion of seats held by women in (a) national parliaments and (b) local governments				
1	(a) National parliament (%)	29.5	33	33.5	40
	(b) Provincial parliament (%)	-	33	34.4	40
	(c) Local government bodies (%)	-	40.5	40.8	42
5.5.2	Proportion of women in managerial positions				
1	Women's participation in decision-making level in the private sector (%)	25	30.3	29.61	45
2	Women's participation in the cooperative sector (%)	50	50	51	50
3	Women in public service decision-making positions (% of total employees)	11	17	13.6	33
4	Ratio of women to men in professional and technical workers (%)	24	28	25	40

In addition to improvements in the share of women in leadership roles, the RVWRMP project also established some indicators for the success of the project and managed to increase the number of females in Water User Committees where many local water management decisions are made. (Action on… 2020). During the project menstrual hygiene management, which is a vital part of sanitation, was also improved through information sharing and trainings.

6.1 Achieve universal and equitable access to safe and affordable drinking water for all

Nepal's basic water supply coverage is on a good state even though the percentage has not risen greatly during the past years (National Review… 2020). Whereas the access to safe drinking water (25% out of 90%) and piped water supply (49,5% out of 90%) is not on a sustainable state and still over halfway from the goal (Table 4).

In Devchuli, one of the key improvements to meeting the Target 6.1 have been adoption of "one house, one tap" model and building of a testing laboratory to monitor the municipality's water quality (Action on… 2020).

6.3 Improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater

Nepal is still very far away from sufficient improving of water quality through wastewater treatment (Table 4) and would need to invest in treatment facilities and create a functioning system of wastewater management.

Table 4. Review on how the SDG Targets 6.1 and 6.3 have been achieved in Nepal nationally based on statistics of 2019 and compared to what is needed to reach the SDG by 2030. (Source: National Review… 2020).

TABLE 5.6: SDG 6 - Ensure availability and sustainable management of water and sanitation for all

Targets and Indicators		Baseline 2015*	Target 2019*	Progress 2019**	Target 2030*
Target 6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all					
6.1.1	Proportion of population using safely managed drinking water services				
1	Population using safe drinking water (%)	15	35	25	90
2	Households with access to piped water supply (%)	49.5	60.3	49.6	90
3	Basic water supply coverage (%)	87	90.2	88	99
Target 6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all					
6.2.1	Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water				
1	Households using improved sanitation facilities which are not shared (%)	60	69.3	62	95
2	Proportion of population using latrines (%)	67.6	75.7	85	98
3	Sanitation coverage (%)	82	86.5	99	99
Target 6.3 By 2030, improve water quality					
6.3.1	Proportion of safely treated waste water				
1	Proportion of untreated industrial waste water (%)	99	75.3	95	10

Source: *SDGs Status and Roadmap: 2016-2030; **SDGs Progress Report (2016-2019).

Based on the RVWRMP project indicators, many water supply schemes have also created and started to apply a water safety plan with some RRC components (Action on… 2020). This is a critical way to protect the water supply and aid meeting the SDG Target 13.1 by improving resilience against hazards. To reach Target 6.3 there needs to be more emphasis on source protection as well as accessible sanitation facilities located away from the water source and closed off from rainfall during the monsoon season to reduce the contamination risk of water sources (Shrestha et al 2014).

6.A Expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes

International cooperation and capacity-building has been very active and successful throughout the years both on national level as well as with local level grass-root lever projects.

6.B Support and strengthen the participation of local communities in improving water and sanitation management

Nepal has still some work to be done with the equal participation of all stakeholders such as women, vulnerable communities, and individuals with disabilities. Regardless of cast discrimination being illegal, some casts are still being hindered from participation,

10.2 Promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status

Equal political empowerment has been successful because of the national guidelines and quota of representation. Social and economic empowerment both still need more work (Table 5).

Table 5. Review on how the SDG Target 10.2 has been achieved in Nepal nationally based on statistics of 2019 and compared to what is needed to reach the SDG by 2030. (Source:

National Review… 2020).

TABLE 5.10: SDG 10- Reduce inequality within and among countries

Targets and indicators		Baseline 2015*	Target 2019*	Progress 2019**	Target 2030*
Target 10.2 By 2030, empower and promote the social, economic and political inclusion of all					
10.2.1	Proportion of people living below 50 per cent of median income, by sex, age and persons with disabilities				
1	Social Empowerment Index	0.41	0.48	0.50	0.7
2	Economic Empowerment Index	0.34	0.43	0.45	0.7
3	Political Empowerment Index	0.65	0.7	0.71	0.85

11.5 Significantly reduce the number of deaths and the number of people affected. Decrease the direct economic losses caused by disasters

Target was not compiled to the statistics of Nepal Review of Sustainable Development Goals (2020), but Indicator 1.5.1 reveals that there has been a promising decrease in the number of deaths by disasters (Table 6).

Table 6. Review on how the SDG Target 11.5 has been achieved in Nepal nationally through Indicator 1.5.1 based on statistics of 2019 and compared to what is needed to reach the SDG by 2030. (Source: National Review… 2020).

TABLE 5.1: SDG 1 - End poverty in all its forms everywhere

Targets and Indicators		Baseline2015*	Target2019*	Progress2019**	Target2030*
Target 1.5 By 2030, build the resilience of the poor and those in vulnerable situations					
1.5.1	Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population				
1	Loss of lives from disaster (number)	8891	331	968	205

Source: *SDGs Status and Roadmap: 2016-2030; **SDGs Progress Report (2016-2019).

13.1 Strengthen resilience and adaptive capacity to climate related hazards and natural disasters in all countries

One of the main ways of climate adaptation and fulfilling Target 13.1 is to create and implement Disaster Risk Reduction strategies both nationally and in local governments (Global indicator… 2017). Nepal is aiming for low-carbon economic growth to mitigate climate change (National Review… 2020). They are doing this nationally by budgeting money and creating tax incentives to shift towards more carbon-low vehicles as well as invest more in renewable energy production. (Climate transparency report 2020). Also scaling up of community-based forest management and strengthening forest ecosystem resilience was mentioned, which could help increase carbon sinks and decrease land erosion and the damage to WASH infrastructure.

Climate change makes disasters and extreme weather events more common (Mirza 2003; National Climate Change… 2016) and this causes numerous challenges to especially groups of people already in disadvantageous positions. Climate mitigation is also important for the protection of WASH infrastructure, water sources and inhabitants' access to safe water supply.

7.4 Structure of water management operators

Bilateral collaboration is information sharing between the government of Nepal and the Ministry of Foreign Affairs of Finland. It has been effective due to planning collaboration both on the federal and local level all the way to municipality policies. The Ministry of Foreign Affairs of Finland also promotes SDGs in the projects during their work.

Collaboration with different levels of governance and also international operators was considered positive because it provides variety in technical knowledge, financial capital and local understanding. Then again, both Finnish Nepal WASH experts also found that too large working fields of single operator or too many operators in one project also poses the threat that collaboration might not be profound enough. Also, providing projects that are planned elsewhere in terms of budgeting, construction, functionality, was considered problematic because the method provides no base for future operation and maintenance. To these, interviewees referred to as hand out -projects, which can tell about the steady position of this type of scheme planning. not on the responsibility of the locals and where participation and ownership might not be a part of.

Collaboration is the key in the situation that Devchuli is in. Especially the municipalities need assistance from the federal level operator to be able to create both short- and long-term plans of action for water management. Bottom-up approach in planning and participation is useful in this type of transition situation (Thrift & Bizikova 2016). The action plans can be done through collaboration with the WUSCs and wards as has been done currently with some of the municipality policies. The WUSCs have reported their actions and propositions which have impacted the planning on municipality level. Public participation can be included into the process so that WUSCs or wards have public hearings and gatherings where everyone can equally express their ideas on water management. This way the water management would really develop from the grassroot level upwards and participation of different groups could be promoted (Status of Women and Youth Leadership in Nepal 2017).

7.5 Information sharing and collaboration in implementation

According to the municipality representative, Devchuli municipality can get advice in water management related matters from the federal government, districts and various NGOs. On behalf of the municipality, there is said to be a lot of collaboration also with the wards and WUSCs in planning and implementation. The municipality provides technical, financial and administrative support on the water management matters to the ward and water user committees. Ward representative stated that collaboration with the municipality, province and the federal government is available for problem solving at the community level. Even though by constitution, municipalities have a mandate to provide water management for the citizens, it does not have to manage the water supply. In many situations the Water User Committees have been assigned to produce water supply for inhabitants of their area.

WUSCs need to report about their process yearly in detail and based on this information the municipality formulates annual policies, programs and budgets. Therefore, the development can be considered as a bottom-up process where the lower level of hierarchy can impact the policy and decisions of the higher level (Wallner et al. 1996). According to Thrift & Bizikova (2016) it would be important to align the local governance policies with the SDGs to make the development monitoring more practical and unified.

Ward representative mentioned SDGs to be important guidelines which all the levels of governance implement in water management. Other guidelines were not directly named. This can present a difficulty in information sharing between the local governance and ward level. But it can also be due to interview conditions. For example, the interviewee might have assumed that the guidelines were already commonly known and therefore did not specifically mention them as part of the question.

Information sharing in case of disaster is rather clear and objective in the wards and WUSCs. But there are many operators in the process that all need to do their work extremely quickly for the water system to work as normally Regardless of this, the ward representative evaluated that it could take as little as 3 hours to fix the problems caused by a hazard. But depending on the hazard quality and scale, it can take days to fix larger problems. For example, replacing pipes can take longer because during the monsoon the demand can be higher and therefore delivery from other parts of Nepal can take long.

7.6 Development of water management

Currently there are various ways of water purification used in Devchuli from boiling the drinking water in households to adding chlorine to the WUSC water tanks. Very recently Devchuli municipality established the first water purification that is supposed to work beyond wards or WUSCs. It consists of four slow sand filtration systems on different areas of the municipality. Only the system's official use had a delay due to lack of suitable standards for water quality, but system was later put to operation. This is critical advancement towards safe water provision in the municipality based on Target 6.1 (Global indicator… 2017).

Monitoring the water quality is extremely important so that changes in water quality can be reacted to. When it comes to water purification, the water quality can degrade due to poor system maintenance or lack of disinfection. Naturally water quality can also degrade in areas that have no purification system, yet which is why also those sources need to be tested for quality. In nowadays Devchuli this can be solved by building more slow sand filtration facilities on areas where the standards for good quality water are not met. Also, it can mean purification of the water only during the monsoon season when water quality can decrease significantly due to erosion and surface runoff (Sudarshan et al. 2019).

Finally, the ministry representative stated that there is interest in private water management and international collaboration on water management. Private water management can bring many troubles into the situation where all citizens still have no basic water management and some of the population live under the poverty line. Private water supply can weaken the felt ownership of the water management system and can lead to higher tariffs than the users can afford (Suarez-Varela et al 2016). Both Finnish Nepal experts that were interviewed stated that privatization of water management is one aspect that would not be functional.

7.7 Things to consider and improve in the future

Using a water source that is protected sets better possibilities for good water quality. Water source protection is both written into the SDG Targets and Nepal legislation. Good management of the water source also includes sustainable use of the water. This means that when a groundwater source starts to deplete, the use must be stopped, or water quality is ruined, and the source can dry up. Furthermore, testing the water quality is important so large anomalies can be detected and reacted to, which prevents problems of health and increases water management reliability. The best possibility is that when a water source is well protected and tested for water quality, it could be used as drinking water without any treatment.

Another key target of development in many interviews was that the unreached areas must be served. The SDGs require water management to be a service of all and therefore also the rural areas that are hard to reach, need to be considered as well. The constitution of Nepal has followed the SDG lead and set a mandate to municipalities to provide water management for all the citizens. Even though these unreached households represent only a small portion of all the Devchuli municipality citizens, still water management is a human right that everyone is entitled to. In addition, new water supply techniques that are created in challenging conditions, can lead into more sustainable water management in the future.

During the past years public participation has become more usual in the planning process of water schemes. Community participation has been done in building of water infrastructure for a long time but public hearings and involvement of different stakeholders in the planning process is very new. Most of the WUSC members are volunteering to work on their position and therefore they have no expected training on their tasks. Training is done by multiple different water management actors and is vital so the Committee can take care of finance, operation and maintenance and decision making in the scheme. Especially trainings on accounting, capacity building and technical knowledge were considered very important on the level of local governance. Through this training and public participation, the ownership is hopefully formed both for the scheme operators and users.

Preparedness on the grass roots level of water management requires anticipatory budgeting. In wards, WUSCs and communities there is often very little money saved for unexpected maintenance such as fixing water infrastructure right after a hazard when people are reliant on safe drinking water. If the funds for possible disaster are not saved from the water use fees such as tariffs, the entire system might rely on receiving funding from municipality or district. This could result in delay of the infrastructure rebuilding while people might have to use contaminated water and are more prone to disease. Anticipating this type of event can be done by adding for example a certain percentage amount to the collected tariff that will be saved for a time of hazard. In terms of reconstruction time and quality this can make a significant difference. Financial preparedness will also significantly increase the loyalty of the water supplier and scheme and make a disaster-prone area more self-reliant in terms of Disaster Risk Reduction. Most importantly, it can help the disaster area to get back to safe drinking water supply which may reduce the need for excessive health care.

One of the most important aspects of water management is information sharing. WASH sector has various different actors that all cooperate through each other. If information sharing from the international and federal level fails, then without guidelines and laws the work of implementation operators becomes challenging. Also, if the contribution of the public in wards will not reach the local or regional governance, their water management might even get interrupted because of lacking assistance. For overall sustainability, it is important to have sectoral collaboration so the linkages between water and health for example can be taught in schools and awareness will rise.

Creating role model operators on every level of governance is important. This was stated by WUSC representatives, a municipality official and nationally and internationally operating WASH specialists. In Devchuli case WUSCs and wards could be the most operational role models. This way others may learn from the example and adopt practices they find useful for their own area. This is one of the successful parts of water management in Devchuli nowadays but long term capacity-building of the WUSCs and wards would still be needed in order to make the water management sustainable.

With federalization, Devchuli municipality could be the role model of financial sustainability. Municipality has a mandate to provide water supply to citizens and therefore the municipality could also process the funding of water management by authorizing the ward committees and WUSCs to collect a certain percentage of the water management costs as part of tariff. Creating a funding buffer through tariffs can be seen as an investment to the future of the scheme which will support and accumulate the disaster funds. This way the citizens would pay equal tariffs to the wards and WUSCs and participate in planning and maintenance of the scheme. This type of funding system requires impartial distribution of the funds and monitoring of the resources so that the planned funding goes to a right place.

To add resilience, it is important to work on the grass root level but based on the national guidance so that all actors could receive the same information. This top-down guidance should also include information on how to respond to various disasters and prepare for those. Functional information sharing between different sectors, institutions and projects makes sure all operators follow the same strategies and are up to date should something happen, that would threaten the resilience.

In the future, more quantitative research could be conducted to examine for example the Human-Water Harmony Index (HWHI) of Devchuli municipality (Ding et al 2014). This numeric data analysis might provide more idea of the sustainability aspect related to how much water use the area is able to endure. Also, an end-to-end approach is a tool that can be used to evaluate the threats that can produce multiple hazards and lead to a disaster. Climate change can affect the water reservoirs also in Devchuli, so preparing for the possibly changing water quantities of the future is reasonable (National climate change impact survey 2016). Furthermore, to achieve sustainability in the field of water, there needs to be research and development of non-household factors (Nhamo et al. 2019) such as good condition of water pipes and how much water will be lost from pipe cracks. With population growth, there should also be consideration towards water-use efficiency in the future (Progress on water-use efficiency 2018). Optimal solution would be to already make the water system built today efficient in water saving, to tackle the challenges of tomorrow.

8 Conclusions

1.What advantages and difficulties result from the current guidance and information sharing in relation to sustainable water management in Devchuli?

One of the main advantages of current information sharing in municipal water management is the amount of guidance available from different sectors of WASH operation. These include for example Devchuli municipality program and policy as well as the national roadmap to track achievements regarding SDGs. Nepal's constitution gives a profound guidance on who is responsible for water provision and there is a national strategy of development which the municipalities can follow. The wide range of collaboration has enabled sharing positive experiences and information between WASH operators on how to improve ownership.

The current difficulties are that there is no guidance or mandate to collect water tariff from the water users or inhabitants. Sometimes information sharing and communication between different WASH operators fails which results in occasional overlap in planned water management projects.

2.Which practices have been used to implement the given guidance in Devchuli water management?

Adopting the "one house, one tap" model and conducting frequent surveys on the percentage of households with access to basic water supply and safe drinking water are some of the fundamental ways to implement given guidance. Devchuli has created a municipality policy to improve equal participation of all genders, all ages, individuals with disabilities and environment friendliness while building infrastructure. Wards and WUSCs have also received trainings on different matters of the WASH sector. Local WASH operators in Devchuli should have access to top-down guidance and support if needed.

The Nawalpur District has set themselves time bound goals to reach 100% access to water supply and 50% access to medium or high quality water supply for the inhabitants. Devchuli has been developing drinking water infrastructure with the support of the federal government and the state government.

3.How well has the Devchuli water management succeeded in meeting the SDG targets to be implemented by 2030?

There is still a need to include equal public participation of women and vulnerable communities even though different woman groups have increased activity in WUSCs. Devchuli has improved the percentage of basic water supply. Slow sand filtration systems were built to improve the quality of stream water to provide safe drinking water. In order to provide clean and safe drinking water to everyone, Devchuli has a water testing laboratory in the municipality. Successful international collaboration and capacity-building has been prominent in both Nepal and Devchuli for years. Local resilience against hazards and disasters has been increased by collaboration between the municipality and WUSCs and wards as well as through disaster fund.

4.What are the key aspects and actions of sustainable water management in Devchuli municipality?

Measurable and steady development towards "one house, one tap" model is one of the most important actions to basic water provision for all. Adaptation of different water treatment methods and the use of water testing laboratory in the municipality. Further maintenance of the emergency fund for disasters and major repairs will aid in financial sustainability. Equal public participation to all stages of water management planning and supply provision can help build the water management scheme ownership further. Building visions and policies on the responsibility of water scheme management also after the time of a collaboration project ends is critical and some emphasis has already been put to this in Devchuli.

The key findings of this research, derived from the interviews, in order of importance:

1. Ensuring the good condition and efficient water quantity of the source is vital. It is critical to include information on source protection to all the planning and maintenance guidance provided to and created by wards and WUSCs. Through this, the possibilities for good quality water will increase. Water quality monitoring and testing should be done in every ward and WUSC regularly.

2. Promoting the execution of "Leave no one behind" policy by reporting which areas of Devchuli are still missing basic water supply and making sure that also the most remote households have water supply by for example using rainwater harvesting. In addition to basic water supply, the emphasis must be put on everyone having access to safe and affordable drinking water.
3. To increase the public participation and community ownership, WUSCs should be allowed to run the local projects with needed training to run the water scheme. WUSCs should be assisted by a municipality technical advisor. Wide scale monitoring of the implementation and water quality should be done in joint effort or by a third-party.
4. Affordable tariff + additional % of cost to water which will be saved for preparing for the future hazards will increase the financial sustainability. Also, the municipality budget should be prepared for large repairs and future investments because water management should be offered to all and kept continuous.
5. Good information sharing between WASH operators and levels of governance so that the same projects will not be planned at the same time by different operators. The legislation of WASH governance needs to be clarified so it will not make working on the sector more difficult. WASH matters could also be connected to health, education and gender on the sectoral level.

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Attachments

Annex 1: List of the used SDG targets

5.5 Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision making in political, economic and public life

6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all

6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

6.A By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies

6.B Support and strengthen the participation of local communities in improving water and sanitation management

10.2 By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status

11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations

13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Annex 2: Interview 1: Technical advisor for Far West water management projects

[…The interviewer briefs about the aim, objectives and the scope of the study, and requests the respondent to answer on the basis of his knowledge and experiences….]

First of all, nice to have you here. I already earlier briefed you about the scope of this research which focuses only on household water supply, not on sanitation and hygiene or wastewater management. So, please explain your position on water management in Nepalese municipalities.

Yeah sure. I worked in Nepal, Lumbini province already in 2002–2004 as a junior researcher. At that time Devchuli was also our area of work. After that two years I was part of the Far West RVWRMP project, which was a water resource project but also included a lot of activity with the municipality officials. I worked there around 4 years and after that six years in Pokhara. So, I lived in Nepal continuously for 10 years. Devchuli was not part of the Pokhara project but we drove through Devchuli all the time. I have a very good idea of the thematic and recent changes of the municipalities around the East West highway

and Terai area. Currently I'm working as a temporary team leader and technical advisor for the Far West project.

Alright! Then have you used the sustainable development goals in your work or as part of some projects for example? If yes, which of the goals especially?

We have actually written a document about how the Far West project contributes for the SDGs. Water management does not only affect the SDG 6 but many others too. In the Far West project there are also livelihood, income, food security, education and more. And this is the same case in Devchuli of course.

[internet connection was lost]

So, in the document we evaluated the effect based on actions and quantitative data. But when it comes to municipalities, there is a less considered indicator under the SDG 6 which is 6B. It is related to municipalities and which operator is responsible for providing water management.

Also, before the SDGs in our projects the matter of sustainability has always been considered. It has been important to generate something that will last and has good possibilities to continue.

Okay good. It would be great to read the document. Then, can you describe the collaboration works in rural municipality context in Nepal? Which operators and levels are connected to each other and which ones co-operate?

The situation related to this has drastically changed during the last years after the 2015 federalization and first elections. Earlier, the problem was lack of democratically elected operators for different levels. Also, the control was assigned for a higher level in hierarchy, which was the districts. Therefore, the accountability towards the more rural areas was lower and only solution was seen to be change of district. Our project also worked with some of the more remote areas and the commitment was sometimes very low.

Now they also have elected representatives and as an operator the municipalities are closer to people than districts. On water management there is of course the Ministry of Water and Sanitation which works from Kathmandu. And earlier under the Ministry was the Department of Water Supply and Sewage, that took care of all the water schemes with over 1000 residents. The schemes that were smaller than that, were cooperating with various other operators and projects. There were different operators from NGOs and INGOs to also large multilateral operators. There were too many operators and too many ways to create water management which made cohesion more difficult to achieve. Water management was also often involved in other programs than just water management programs.

There are many different kinds of NGOs and INGOs in Nepal which has sometimes made collaboration on water management more challenging due to the fragmentation. Also, the legislation was earlier more disorganized when water quality was under the management of the Ministry of Health and sanitation on the other hand belonged to someone else and building belonged to infrastructure.

Now we are hoping that this new model would improve matters of management and legislation at least on the municipality level so that practices would be more uniform and coherent. When it isn't coherent but fragmented, then operators are stepping on each other's territories and similar work in one location might be done double. I the worst case many operators want to work in the easy-access-locations and there is no contribution to the most rural areas.

We are hoping that with smaller, more manageable areas the municipalities could now take a look at which areas and communities don't yet have the basic water management. In Nepal and Devchuli too, there are many areas that have received a completely new water scheme more often than once. And there

are also areas that have never got a water scheme. When there are many operators on an easy access area, then sadly it's possible to not maintain the scheme and then ask for a new one when the former is in too bad shape.

Okay. And are the NGOs the ones that represent international collaboration on many areas or are there other such operators?

Many operators in general work through NGOs. Often they are local, not international. There are probably 50 000 NGOs in Nepal because they are established when needed for a project or financial management of a cause. International INGOs, but also UNICEF and other UN associations. They have a bit varying funding, for example UNICEF finances partly the Department of Water Supply and Sewage. On the other hand UNICEF too, hires NGOs to act on the village level for example.

So they are also from Nepal, not just abroad.

Yes and foreign operators often hire the local NGOs. In Far West for example, there are now local NGOs living in the communities that they are helping and working with Water User Committees. Personally, I find if challenging sometimes especially if we are working with the municipality on a project. I prefer workers who are hired by the municipality and are liable to the municipality. And when the project is over, they are hopefully hired as permanent workers and keep managing the target of the program. If the project is reliant too NGOs then when the project is over and the NGO must leave, all that relies on that operator, will be lost. I don't consider that very sustainable.

Okay. And as providing the water services are nowadays mandatory to the municipality, then maybe it would be reasonable to have this type of workers hired at the municipality.

Yes. And if a municipality has a champagne or a project then they can ask an NGO for the services. But an arrangement that the NGO will take care of all the investments and financial management is not necessarily functional. There might be challenges with situations where there is a contract, but the work is not proceeding in a desired way. Of course, there are many good NGOs with well educated people. In our projects it has been important to give the money straight to Water User Committees, that do their own investments and accounting. In some cases, the account might still be shared with an assisting NGO and in fact they operate everything. In these situations, the Water User Committee will miss out on important financial skills. And therefore also the possibility for malpractice can rise.

Alright, thank you for the answer. Perhaps it is important to have education for these matters and to keep it continuous with the same cooperators.

Yes, it is especially about learning by doing so that skills and knowledge is accumulated in a real context and project, not only through workshops and seminars. This practical learning is meaningful way to learn various things, weather they are related to good governance, equality, or transparency. It is important to learn these through real work in the water scheme. In the result, it shows how well the things have been learned.

There are also programs that just organize trainings and do not for example invest in planning or constructing. The people do come to the courses and they are educated but what happens after that? It created a motivational challenge to the participants when there is no real scheme building situation where to implement the learned things.

When talking about this collaboration between the different operators and the implementation, is there difference in implementation practices, the quality or collaboration with the locals?

Yes, they do. For example, the surveillance of public participation varies a lot. The core of sustainability comes from building ownership in the making of the scheme. When the users feel that the scheme is their own, it serves their purposes and they have been able to decide what it will be like. Then there is a higher possibility that the scheme will be maintained. But there are many versions of implementation and sometimes the Department of Water Supply plans it all in Kathmandu and hands over the finished project.

Alright, so in addition to written guidance, do they also provide materials for the construction?

No, they will have a constructor that will do everything.

Alright, that doesn't seem to include very much participation of the public.

Yes, that's right and it is one of the big challenges nowadays that the municipalities have a lot more power also when it comes to investments. Nowadays it is not as accepted anymore that someone from Kathmandu prepares the scheme and it is just handed over. But still the problem is that things related to local water management are prioritized somewhere else than in the municipalities. Currently the World Bank has made a study of suggestions on where in the hierarchy Ministry of Water Supply and Department should be located. Right now, the place could be in the Provinces, but the Provinces also have their own Ministries. But it is still not decided who is responsible for reporting what to which operator. All three of these levels are in transformation.

Yes. If you think about the guidance that might come from an operator working from Kathmandu. When the implementation is starting in the municipalities, what do you think are the least functional parts about it in small municipalities like Devchuli. What could be improved and what is less functional than other parts?

Well the biggest issue is the fragmentation of the whole. That some are only working on certain kind of areas and work might be done in Kathmandu, not locally. And then another level of governance might have their own development projects and plans going on where implementation can be a little different. The municipalities, NGOs and multilateral actors might also be working on the same areas at the same time. In the part projects I have worked in, we have tried to solve this so that every municipality would have their own water management plan where each household is considered. This would require a base study on which household already have water management and what is the status of it. This way the water supply system would become municipality-lead. And thinking of the human-right approach, the municipality also has a mandate to take care of it that every citizen has access to water management. The municipality doesn't have to build and operate it but their responsibility is to see that every citizen has water supply and sufficient sanitation.

Municipality has a lot of responsibilities in this and they must take the lead on it. A whole different thing is, which operator will monitor the water quality and fulfilling of the standards and good practices of use. This includes functioning of all the pipelines, correct pressures and so on. There is no solution on it yet, what level of an operator would be working as this type of authority and hold the municipalities in responsible if the water quality is not sufficient or there are not enough actions towards water supply provision. After all, this kind of regulatory agent is needed to monitor the success.

Yes, alright. And what about the most functional parts of guideline implementation, based on your experience?

Yes, this will again be in the point of view of small and rural municipalities. In the bigger water networks the situation is entirely different even though in the small cities there are also schemes that function like larger cities. Next to Devchuli for example, is Amarapuri, which is very famous for their good water supply service and professionality, even on a national level. They are running a local office and water laboratory.

They are still operating and maintaining the 15-year old laboratory equipment. They also have a slow sand filter that is still functional, it has really been well maintained. They have repaired damages caused by the flooding. In my opinion, this type of combination is extremely functional: there are committee members that are ordinary people and represent both the customer and service area. In addition, there are hired people who take care of the water management as their job and they have proper training for the position. These kind of small-scale units of water management are useful and easily manageable, they should be supported more. We actually wrote an article to the Water Policy magazine about Amarapuri and the peer review thought that the text was highly optimistic. We answered to them that exactly because of the great qualities, we wanted to bring it up as an example.

This type of hybrid model is the most functional because if water management was just business, then I think the water pricing would no longer be affordable for the users. In some rural areas there are people who live in poverty and I don't think private, commercial water management could work.

Even though Amarapuri is much like Devchuli and both areas are growing fast which increases the need for expansions, still the Water User Committee has managed to develop the process further by themselves.

Okay, we already talked a little bit about participation. How would you rate a municipality which is the type and size of Devchuli in participation, on scale from 1 to 5? So that 1 would be no participation at all and 5 would be excellent participation of the public. What is your experience on this?

I cannot give just one number because the scale is so wide. There are so different schemes and User Committees just in Devchuli that both the ends can be detected. When there are many kinds of operators, some might mention for example participation of the women but the reality can be that the women were only participating in the building process. Someone else is doing the planning work and decision-making. Of course, the women should be allowed to take part in the building process but their involvement in planning is also important. Our projects have had guidance that there should be women in key tasks also in the Water User Committees such as chairpersons, secretaries or similar.

I see. But would you say then that the locals participate more in building than planning work?

Yes. A community contribution is expected in Nepal and often it is in the form of physical work.

Alright. Then how about the operation and maintenance, is it being done much or less on average by the locals?

On average, I would say less than the average because typically the systems are in rather bad shape. The conditions in Nepal are already challenging due to the natural environment, floods, earthquakes, and landslides and also the harsh weather. So, the infrastructure will wear out fast even when it's well built. Therefore, everything should be maintained actively, and this is not on a good state. Maintenance of the water management infrastructure is a bit like nature conservation – when action is successful, there is no problem and the result might not be very visible. Only when the maintenance is failing, there starts to be contaminated water, unfunctional pipelines and then the result is very noticeable. The maintenance is not about actively achieving something, and it is not especially visible after the scheme is already built. This is why there might not be a lot of involved and then the process starts to slip, and problems can follow.

We have spoked about the re-arrangement of the Water User Committee at the point when water scheme is ready because the active, productive types of people might not have the patience to run a scheme where nothing is really happening except for the collection of tariffs and daily operation and maintenance. When there is no longer a lot going on and the creation process in over, then it could be

useful to have another type of person as the scheme leader who would keep up with the daily work but also react fast when needed, in cases of disaster for example.

Yes. And this brings us to the next. Which are the most important key points of preparation for hazards and natural disasters?

I think the starting point is planning, usually about the water source. Typical ones are springs or streams on this area. In Nepal the topography is very steep and inevitably sometimes the land slides. In these cases, there must be preparedness related to what is happening around the water source. Also, are there wild animals or landslides even on a daily basis that can cause contamination of the source? There is also a possibility that the source will dry out or there is too much competition of the water. If the water amount is not sufficient in the first place, then the bad quality of water can ruin the machinery of water management and investment is wasted.

But then other things are about how the pipelines have been made. Is there road construction on the area because that can cause big risk of damage to the pipelines underground. There might be broken pipelines, landslides or loss of water sources because of the construction. The planning needs some orientation towards the future. Taking roads, forests, households and population into account during the planning and evaluation. I think this is where the base for sustainability could be found.

On government or municipality land there is also a possibility to do water infiltration to the ground to keep the water sources in sustainable condition. Or a good measure would be to convince the landowners to not cut down all of their trees, which would protect the water infrastructure from landslides.

Do the municipalities have some kind of document or plan in store for various hazards?

There have been many disaster risk management and early warning system related projects. And then there has been Local Plans of Adaptation and National Plan of Action. Those have quite well answered the questions related to climate change, water availability and water quality changes.

In Devchuli there are big rivers that can cause a risk of flooding on the area. When it rains in Nepal, the amount of water is really large. And when that amount of water comes down the hills rapidly, it creates flash floods and landslides. This can contaminate the wells, rip water infrastructure off its place and even make the water pipes flood into the houses. When the hazards are typical to the area, then the municipality usually has good preparation for them.

Okay. Then, apparently adding chlorine to water is a popular method of water purification in Nepal, but what other options there could be for it.

Yes but the chlorine is not a very liked method because the dozing is very precise and causes a bad smell or taste to the water. In Amarapuri for example, chlorine was one option but there was also this slow sand filter that I mentioned. Many projects promote purification that can be used in household themselves for water that will not be boiled. There is promotion on the UV-purification if the water which happens for example in transparent bottles that are left in the sun. The method is a bit unprecise and includes the basic idea that the bottle needs to be clean in the first place. Also, the bottle needs to be indirect sunlight for a certain amount of time and if the weather happens to turn cloudy, the time can cause a lot of uncertainty. One more problem with this is that people do not like drinking warm water.

Then there has been promotion of arsenic filters. But those need to be maintained and used correctly for it to be safe. Arsenic can also be filtered with the help of sand and nails.

Furthermore, there are a lot of various filters available in the stores that are used in many households and schools. The filter might be the best possibility because there is no dozing of a chemical which can go

wrong. Chlorine can also be used in the form of drops which is what our projects have also used on the field as a spare option. The drop dozing is easy.

Okay. Then based on your experience, what are the most functional parts of the entire municipality water supply system. What are the best parts of the whole water management?

The most successful parts are the right kind of people working. There are many good practices, tools, and guidelines but the group and working dynamic of the management team is in key role. Their skills and attitudes are everything. The most critical part of the water management system are the people that operate the system but also the users. Sometimes the system is just deliberately not maintained or somehow violated. Sometimes it happens that people on the mountain areas make holes in the pipes to get water for drinking and for their animals. And also, sometimes for women on their periods to take care of their personal hygiene even though touching water taps at that time is not socially acceptable. Then after unofficial use of the hole might be blocked for example, with a branch. This can be seen as vandalization, but the reality is a matter of equality. Everyone, at all times should have access to a tap. And also, should be allowed to use the toilet which is more related to sanitation.

Yes. This I suppose is strongly connected to behavioral change.

Yes. I'm an engineer but most of the time it's the challenges I face with human rather than the technical problems. And behind the technical problems there are sometimes human problem at the background. For example, I have experience about our own project where another engineer left a negative pressure on the water pipes. I remember it well because people had built the pipeline onto the hill area for half a year and eventually this would have been the reason why it was not functional. After 13 kilometers of building pipeline, there would have been no water coming out. So, in this technical challenge it was about the attitude and work of the single person and not so much of the whole.

Yes. Then could you name 3 to 5 things that are the most important ones for a rural municipality like Devchuli to get water management that provides clean water for all?

Well, for a municipality like Devchuli that is clearly a relocation gain area, there would be a need for future orientated visionary thinking for the municipality leaders. To make it clear which areas still need water management and what kind of. There needs to be urban planning on how the citizen want the municipality to develop over the next 10 years for example. Sometimes when the visions and actions for future are not good, I wonder why people do it even though they have to live in the middle of it. There needs to be comprehensive and holistic visions that include, water management, sanitation and also livelihoods and other factors on the area. Water management must be part of the planning to keep the are inhabitable.

In Amarapuri and Murgiya for example, these things have been considered well even though the areas are growing fast. There are still gardens, forests and other things that create a sustainable and comfortable areas to live. There is a good chance to succeed in this kind of planning that also considers water and sanitation, when the area is still growing like Devchuli.

So lastly, what are the kinds of themes related to water management where there is the biggest need for education and training?

There are many levels in this, and I think municipalities would be one of the executive operators. Probably the trainings should be focused on some target groups. For example, in schools the entirety of water, sanitation and hygiene including the importance of hand washing. And why not manifest this even in the municipality offices. Also, if there are any challenges at all in the water availability, then people need to learn now to save it. Regarding planning perspective, the municipality decision-makers could

learn about long term visionary planning. Of course there should be more people with technical skills and knowledge who can work on themes related to infrastructure and environment. In the Water User Committees there could be some a need for retraining whenever new members get involved.

Okay thank you for the comprehensive answers and thank you for the interview!

Annex 3: Interview 2: Expert in development politics, Ministry of Foreign Affairs of Finland

[…The interviewer briefs about the aim, objectives and the scope of the study, and requests the respondent to answer on the basis of his knowledge and experiences about municipalities that are similar to Devchuli in terms of size and type…]

In the beginning, could you shortly explain your position related to water management in Nepal municipalities.

At the moment I work for the embassy as an expert in development politics. WASH is one of the sections we have had bilateral development collaboration with Nepal for years. In the embassy representative office, we participate in the project steering groups in monitoring and guiding the projects and also preparing them in the first place.

For the project implementation in bilateral projects we also have the operators such as nation of Nepal and a technical consultant provided by the Finnish government.

Alright. Have you used the Sustainable Development Goals in your own work? If you have, can you especially name some that have been typically used.

Of course, SDGs are something that the government of Finland has committed to and the same goas for the government of Nepal. The most essential one in relation to the water management is the Goal number 6 which is about comprehensive water management and sanitation. This is something we use as a guideline but sometimes the indicators are challenging because there is not enough data available. It depends on the sector, which SDGs are the most important ones.

Alright so the main SDG is straight related to water. Which else could there be? Something related to city development or inclusiveness or similar ones?

Yes, we do have the country strategies for development cooperation in Nepal. It includes three main sectors which are water and related to that livelihoods and rural development. But then there are also education as second and equality as the third which is about women's rights, participation and economic empowering.

Also related to this water area of it, we have a water resource management project in Far West which also involves the themes of irrigation. nutrition, livelihoods, and other similar questions. The follow SDGs related to those topics.

This provides a good idea of how interconnected water is to so many other SDGs.

In the foreign ministry of Finland, we have these areas of priority and result frames that have also the SDG indicators represented in them. Currently we are on the last year of country strategy and 2021 will be the beginning of a new one, which will include new indicators. Therefore it offers us a chance to better monitor through SDG indicators. The availability of data for this monitoring depends on whether the project is nation-wide or local. There is not specific data available on every matter.

Okay. And in Nepal the availability of data can be quite a challenge sometimes.

Yes, it's a great challenge overall and challenge also only on the WASH sector. It is a challenge on the municipality level, not to mention the national level.

Okay. Then, if we think about work done on the field and the guidance given for that. What are the most important guidelines you use in your work related to Nepal and who provides that guidance?

Of course, we are guided by the Finnish program of development policy and the focus points of it. Those are the thematic high level. Below that is the country strategies for development cooperation in Nepal with its objectives. The projects are chosen based on those objectives. Also, SDGs are of course common guidelines for all the abettors but especially when it comes to water management, those work as the general level guidance, not detailed ones.

On the municipality level, after 30 years of collaboration, we have a lot of institutional know-how and experience on the field work which can be implemented. Sometimes we have produced guidance in collaboration with the Nepal government and municipalities.

Of course, the government of Nepal has their own laws and constitution and different policies. Through federalization, politics are transforming. Then again, there is the Ministry of Water Supply and their department that have technical guidance which we are also utilizing.

In the implementation process Finnish government has guided us to use step-by-step process. This is also based on the principles that government of Nepal has in public participation and hearing. In water management, we do year plans together when it also becomes a planning process of the local governance. In fact, we are participating in the same planning process which is integrated to the municipality level.

What is your perspective on the fact that municipalities have gained more power and responsibility with the federalization? I have got to the conclusion that municipalities have quite a lot of room for decision making but is this true or is most of the guidance coming from the government?

I suppose the whole of it is still under development. The constitution mandate municipalities to do certain things such as provide water supply for the citizen. But the challenge has been the various development stages of the municipalities. Rural municipalities have smaller resources and less technical know-how and perhaps trouble in getting long term staff. This makes responsibility difficult and define how the municipalities function. Federal level ministries have standards and technical guidance that the municipalities follow.

I have understood that the new sectoral program and new water and sanitation law are yet to be confirmed but on the level of examination. Understandably, the municipalities want to receive the laws and develop. Hopefully the situation will get clearer in the coming year or two so it will be clearer in the structure, which is the federal, provincial and municipality level responsibility.

Yes, and currently the success seems to be more about the municipality's own activity.

Yes, it is about the own activity and also nowadays about the elected representatives. So, their actions on taking responsibility and prioritizing the municipality funds is important when there are many things needing investments. We have also supported the preparing of municipality politics through the bilateral projects. The municipality has modified the model to fit their needs.

Okay. Now, there have been some mentions about the operators of water management. Could you shortly explain which of those are connected and collaborate?

Of course, the ministry of finance has a strong position in this in Nepal as well as other countries because they provide the municipalities and provinces with funds. On the municipality level it is highly important how the fuds then get distributed. Then there are sector ministries as Ministry of Water Supply. But municipalities are independent operators that are not under any ministry. Earlier there were districts and those still exist in some way, but the role is not as crucial as before. In my understanding, the collaboration between provinces and municipalities is still under development. Provinces have tasks that combine more than one municipality, such as in cases where the same water network goes through two or more municipalities. Technical support is available from the Ministry of Water Supply and its Department. Earlier and still now, the Department has had their own province level offices that take care of their own projects. In terms of water management, it is really important that the provincial level and municipality level do not plan the same projects and for example budget water management projects on two different levels. There should be no longer similar projects on work plans and year plans of different level operators. This is the target of development for the transition time.

So, how will capacity building be done in the future on WASH sector? Currently it is much about how the municipality level is doing capacity building. It is important that the groups get enough training for example related to implementation. Nepal has a water management specialized training center that works under the Ministry of Water Supply or its Department. The role of the training center in the future is still under development and solutions are needed to bring education and training to the rural areas.

Good that you mentioned the trainings. Would you tell based on your own experience, which are the matters that need most education and training? You can name levels or matters.

Definitely technical and financial matters. The technical questions are also largely related to the SDGs and water quality. Water quality is a challenge for many municipalities and monitoring to mention especially. In the rural settings the challenge is to have continuous water management with enough know-how. Socially, it is important to check if all the citizen have access to water supply and if the most vulnerable people have been notified in the process. There should be transparency and comprehensive perspective on the matter. Financial side has the challenge that the collection of tariffs is likely very low which results to lack of funds for repairs. There might also not be enough know-how or interest for fixing. There is a need to get out of the loop where something completely new is always built in stead of repairing. One more technical challenge can be drying up of water source, the changes climate change brings.

In your opinion, what is the main reason that maintenance is perhaps not done as much which results to the bed condition of the scheme and might result in rebuilding?

I would say that one reason is ownership. Ownership is formed when people are allowed to participate from the beginning, the project serves the needs of the people and finance is handled responsibly. So, there aren't things provided from the outside, but the activity is planned with the community. There also needs to be an existing water committee in responsible for activity. The committee should be supported by the municipality so that an existing network of support would prevent the constant maintenance from ending. On the other hand, the dependance to outside help might easily become problematic.

I am sure that what would solve it is a mixture of different practices. Partly, it is about public participation, partly about municipality collaboration and also about financial sustainability with some safety net. There also has to be enough time for the process, it cannot be hurried of there will be weak ownership.

In your opinion, are the locals allowed to participate enough in the planning of water management on the municipality level?

Well, they should be able to but of course it depends on the planning process and how intensively they have done the hearing process. Compared to earlier, the municipalities are bigger now and so are the districts but they are still manageable compared to the earlier provinces where there was no possibility to have effective information sharing through out the water management chain.

Now Nepal has begun making the municipality WASH plans. Of course, there has also been the WUPM plans for example before where the hearing has been done on the cluster level and even on the level of households. I think that is where is should be done. It is related to planning local governance whether there is enough discussion with the people in the wards and also different ethnical or social groups. Also, it is about whether the ward representative is taking the discussed matters to the municipality level discussion and decision making. In addition to that, it is still a challenge that the Dalits might not be included well enough or are they willing to participate. At least for Finland it has been important to hear the needs of disabled and take into consideration their rights. That is still a challenging target of development.

If we think about the operators in water management, is there differences in between the hearing process?

Yes, it has always been very important for Finland to be able to include everyone. There are numerous operators in Nepal, so it is really impossible to say. But all the NGOs must work together with the local governance, nowadays there is no option to work without collaboration with them. Earlier the districts were responsible for almost everything but now with the municipalities there are better possibilities for hearing everyone. Also, with the constitution, there has been much more attention towards this and there has been more discussion about the functionality of WASH sector, now that municipality has the mandate for water supply.

Then if we think about the guidance give on paper and compare the implementation of it, does it differ by the operator?

I have mainly worked in Finnish projects but also gotten to know some others. When comparing Finland to others, we do have quite a comprehensive step-by-step system. I cannot say for sure, but I suppose it is one of the most comprehensive models in the projects here in Nepal.

One important thing is that WUSCs work in collaboration with the municipality and technical consultants. WUSC will set up a bank account where all the funding is directed, and they also control all the funds. Whatever will be purchased, pipes or something else, it will be done by the WUSC. This is something not all operators are used to which makes it a key activity. This was ownership and power over the process is turned into the financial side. When a project is designed from the higher level of governance, a WUSC might be established though which people get to participate in planning and building but they are not in control of the finance.

Yes, there will be important skills left unlearned.

Yes, and also the transparency of the activity will suffer, and community is left with no understanding on how the water management functions as a whole. This will inevitably impact the ownership, accountability, and transparency. I have heard that on the Far West region, there have been hearings 3 times during a process which go through the technical and financial details of the project. Everyone will hear about the process and through this activity, the WUSCs have started to demand this from the other operators as well.

Okay. In your opinion, what are the most functional parts of implementation? What are the best parts and most successful implementations?

The most important thing is to build what people want to have. The motivation and need to work together already exists. In places where there are a lot of trouble, there is usually will to work for the better and the scheme is being taken care of. It is also important that the choosing of WUSC is done in agreement, is comprehensive and representative of the people. The social dynamic is especially important in the rural municipalities where there are less beneficiaries and households. If everyone gets to participate, the result is usually good. Also, women participation is important.

Related to sustainability, the household specific taps have been under discussion during the past years. The goal is to no longer build taps that are shared by many households but that every household would have their own one. Of course, this requires more capital and funds, but it is seen to motivate people.

Also having technical planning that has the right, sufficient dimension which makes it functional but not overscaled compared to the needs. Also, a system that is sustainably planned in case of disasters such as monsoon rains.

And when all is ready with the water management system, then the last part of the project makes sure that the community can independently continue operation and maintenance of the scheme. In this matter, especially the added preparedness and continuity of skills development within WUSC is important, whether it is about financial training or bookkeeping or water safety planning. If the implementation period for these is very short, then it is important to continue skills development after the time. The starting stage needs to be evaluated and also to understand how many new models and ways of action can be adopted during a certain period of time.

And related to this thematic, which in your opinion are the most important things a Devchuli sized water supply system could be doing better to provide everyone with clean water. Which are the most important targets of improvement?

I don't know the latest data of Devchuli but I have understood that Devchuli has quite a lot of water management already but there are households that have been left outside of the supply system. This is important to take into consideration right on the stage of planning. Another is, are there any water schemes that are not functioning well enough because of broken pipes or tap or some branch or even the water source has dried up.

Also, in the future there might be some new households that also need the water. So, the water source needs to be efficient for also the growing number of people. There are more about the technical fixes to water coming off the pipe and people actually having a water tap. Then there needs to be capable WUSCs that are able to control the system, understand the financial side of it and make long term maintenance possible.

And the as the 4th point are the water quality questions. If the scheme is functional and is taken care of, then in principle the water should be clean because there should not be much contamination from broken pipes and from the water source for example. So it is important that the water sources are protected. In addition, there should be sufficient testing capacity of the water. With the combination of new water management systems and repairing the existing ones, the SDG 6 of everyone having safe drinking water, starts to be reachable. But after this there should be the consistent maintenance. Also the municipality has to be involved in taking care of water quality maintenance and everyone on the area being served with water supply. The basic principle is that water is a human right, and everyone needs to be eligible for the basic water management. After that the improvement of basic level can be started to work on.

Okay that was a good order of importance. Then about water management. I have understood that in Devchuli, chlorine is largely used in water purification. What other options there are for water purification in small municipalities?

In many water management systems the starting point is having clean enough water from a good area that is protected enough so there is no possibility for bacteria of fecal origin to contaminate the water. In that situation the water can be used as it is. When ever there is some type of technical component added to the process, the maintenance can get more challenging.

Also, in agriculture there needs to be understanding on sustainable and proper use of fertilizers and pesticides. On the countryside the evaluation of technical understanding is important when a new water management facility is being planned. In the Finnish projects there is not much focus on the purification, rather on the preventative methods so that the naturally clean water could be used.

In households, boiling water is a typical way of purification.

Yes, there was good mentions about watershed protection. Then about the typical hazards of Nepal. Could you name some key points on what preparation there can be to different hazards? What are the most important things in preparation for hazards?

In water management we have different type of risks. Some are long term changes such as water quantity. And then there are sudden accidents such as earthquakes, mudslides and floods. The technical infrastructure needs to be sustainable enough and properly located. The pipes need to be placed deep enough underground so those will not get revealed and vulnerable to hazards but also stay in better condition. The challenge is that water is gathered especially in the places of water sources which cause powerful surface runoff and landslides. Those can erode the base of water management structures, so it is extremely important that the infrastructure has been made long-lasting. Related to that, there could also be thoughts on resilience against earthquakes with for example concrete calk. Also, the location of water management infrastructure is important so that there is no large rocks or large risk for land sliding above the structures. If the place is like this, then there is a possibility to build structures such as gabion boxes to the hills to prevent the eroding material from sliding down the hill. And these challenges need to be considered both above and below the water infrastructure located in a hill. Of course, vegetation is a very important way to bind soil at place so the risk for landslide is smaller. And unnecessary moving around the water management structures is key.

Also, as simple thig as the lids of the water tanks. Those are planned to prevent any surface runoff from entering the water tank while the runoff might flow on top of the tank. Sometimes the lids are not functional because they simply are not the original ones for the tank and therefore do not fit or that the tank lid is in an inset and the water resting on top of the tank could enter if the lid is not closed properly or is incompatible. This is an example about how small changes can have big meaning. It just requires an engineer who will plan and build the system together with the locals with clear vision in mind.

You named really important things. The to the last question: In your opinion, what are the most functional things in Nepalese water management? Which things are well taken care of and there is good know-how in?

In Nepal, much of the population has always lived and still live on the countryside even though there is a lot of urbanization happening. People have always lived with the reality there is a yearly circulation in the water process with the monsoons for example. 1) The communities possess a lot of local knowledge about water sources and of the means of survival in unusual situations. It is important to use this community led model in planning and development as it also teaches the collaboration partners a lot. Especially on the hill areas, people and communities are willing to collaborate and improve their circumstances. Of course, society and peoples' needs are changing which makes people want to have water supply closer to them and through that also lessen the workload of women.

2) In Nepal there is currently a constitution and many of the politics place high value on equality and participation of all, especially women and different ethnic groups. There is still a lot work to be done in terms of having this on a transformative change level so that it will be reflected in the values and everyday activities. But all the basic elements such as politics, laws and documents are aiming towards this goal.

3) Also, having technical know-how especially on the area of gravity operated water supply system to also reach the last households that are located in challenging areas. There the water needs to be pumped up upwards to hill and therefore the technique is more demanding.

Many of the basic elements for good water management are already there and through federalization there are good possibilities to move the ownership, operation and responsibility of water management to municipalities so that the people get to decide themselves what works best on the area. In my opinion there are good practices to build on already. And there has been constant development in Nepal water management over the years such as growth in basic coverage of water management. Also, sanitation has progressed greatly. The sanitation and hygiene master plan gave a lot of momentum for that change, but the water supply side would still need something similar. Maybe it will come through federalization.

Hopefully so! Thank you very much for the answers!

Annex 4: Interview 3: Water supply expert, WaterAid Nepal

[…The interviewer briefs about the aim, objectives and the scope of the study, and requests the respondent to answer on the basis of his knowledge and experiences….]

Could you explain your position in water management shortly?

I have been especially in water management and hygiene as this WASH professional for quite some years now, about 9 years not in this sector. I did my Master's degree in environmental engineering with a graduate degree in civil engineering. To be specific, I have been working both in urban and rural areas in Nepal promoting water safety plan and ensuring water quality. Also I have knowledge on rainwater harvesting and groundwater research. Now primarily I am working now for an organization called WaterAid. It is an international INGO working in 37 different countries all over the world. My core area is about program and project development, reporting and capacity development of the partners. I have been the technical manager of WaterAid Nepal now, technically leading one of the projects. I have knowledge on designing the water supply system and treatment units. Also I know GIS based mapping. It is a powerful tool to give people a view of the current situation

Then what are the most important guidelines or instructions you use in your work related to water management and are one of those guidelines maybe the sustainable development goals by the UN?

Absolutely, this is a very good question. Also I think your study will be very useful for other parts of the country as well. I hope you will be sharing it around the sector after you have completed the project. Going back to your question about the guidelines with what we can ensure safe drinking water for every household. Starting with the SDG 6.1 which is the major indicator. Nepal as being a UN signatory country so Nepal definitely has to align its own goals to SDGs. That is the broader goal that Nepal also follows. When we are talking only about water supply then there is actually… Before we go to that, when the constitution of Nepal was formulated, it constitutionalized the right to water and sanitation. This is like a foundation. It recognized clean water and sanitation as a fundamental right just like a right to healthcare. Constitution article 18: special water provision for marginalized groups. Also on the article 24: under

disability and against discrimination. At the same time article 27: water and environment. Also article 35 section 4: right to clean drinking water and sanitation. So there are mentions (mandate) about safe drinking water to the population. This is the major policy level document that Nepal has. After that you make it to the ground level with acts, guidelines and plans in place so those will be realized.
There are 4 different very high level water related development policies that are in a draft stage. To be specific, those are 1) Drinking Water and Sanitation Bill, it has been prepared with multiple consultations and along with stakeholders. It has already been drafted and devolved. It only needs to be endorsed by the ministers. The 2nd policy is the National Water Policy which is also a draft but not devolved yet. And the 3rd one is a plan from 2015 but it's still not approved. Nepal WASH Sector Development Plan 2015-2030. It exclusively mentions all the scenarios around Nepal about water rules and urban and it's focused on how much budget it requires to offer safe and clean drinking water to all the people in Nepal. And another one 4) national water use master plan. This was recently developed as a draft in 2019. You may have heard about far western project supported by Finnish government so with their team they came up with the water use master plan but it's also in a draft stage, not endorsed yet. It will be a very useful guideline to you later on.
These are the main guidelines and policies especially when talking about WASH. Then just briefly (the policies) that are in place. Who is accountable for providing safe and clean drinking water to the citizens? The Ministry of water supply is a major ministry in Nepal who is responsible for work on WASH sector. If we talk about the current practices in Nepal in regard of this water delivery model, those are under the ministry's department of water supply and severs. Previously each district of Nepal had their office and they were technically supporting the entire district for accessing clean water. Now it is about 30 to 35 such and they take care of 2-3 districts after federalization and they have very limited budget. Another model takes specific care of rural water supply systems just like Devchuli. Urban areas have their own, just like Kathmandu valley has Kejukiel Kathmandu Unlimited. Also there is Nepal Water Supply Corporation which is also focused on urban areas outside Kathmandu valley. RWNNC which is a government own utility, takes care of other apart from small town projects supported by the World Bank and many organizations. So the small town model is there but there is another model for working in rural areas: Rural Water Supply and Sanitation for development... This is also another model. After this federalization especially the municipalities and rural municipalities are the major key actor of who are responsible for their citizen for the safe drinking water.

Okay interesting, now I understand much better the broader picture too. So if you think about your WaterAid Nepal, who are the operators - from these for example that you mentioned - that you work with and how do you collaborate with them?

We at WaterAid, as an international organization, usually do not work directly with the people. We partner with the local organizations and work closely with the rural municipalities in the rural areas. We also work with urban municipalities and even the metropolitan cities. And we have coordination and partnership with the local partners, we work with the Water User Committees for the safe drinking water for the community people. In the urban areas, we partner even with the common organizations for example in Beacon project, which is supporting the government owned utilities just like the Nepal Water Supply Corporation. We are supporting one of their branches to role model it. We try to understand their rather old system. We work with the government and we work with the partners. Also we work with sector effectiveness in water and hygiene to make it more equipped with the policies. And the Drinking water and sanitation bill and those acts, WaterAid specialists have been part of it.
-rural, urban, metropolis. government, NGOs, government own utilities, local partners and water user committees

Okay so if you think of a municipality that is somewhat rural just like Devchuli, what are the most important operators you usually work with. Is it the Water user groups, is it the municipality or ...

Aa yes, actually just like I mentioned previously this Department of water supply. It has been for a very long time a functional type of an institution. They have accomplished many small to big water supply projects. Around 2014 there was a NMIP-survey carried out and it showed more than 40 000 projects that had been accomplished by the government and partners like the Water user committees. That survey revealed that out of those 40 000 schemes, around 70% were needing some kind of minor or major repair or were nonfunctional. That is quite alarming. So why are there so many projects that do not work? Because it has not been sustainable and the functionality is a user question. So going back to the question, during these years we have found out that an alone project does not make this system sustainable and functional. So definitely there needs to be an ownership and also in Nepal the water is taken as a free service, the consumers are not motivated to pay the tariff which creates a big problem. Once a government project or an NGO comes and builds and hands it over which results in sustainability being a huge question. People ought to make their own sustainability. They should be made to know their system very well and get their emotional attachment to it by time contribution for example. If you are providing all the external materials then the community people can volunteer with their work. That way the ownership will be there. From the financial sustainability as well - if you don't have that regular income, then even the minor operation and maintenance every day is a huge question in terms of sustainability. So how could a Water user committee be resilient in case of any repairs or maintenance? It involves both environmental, financial factors, their emotional attachment factors and also the commitment from the local government towards those projects.

How do you see the commitment from the municipality? Is it maybe funding or technical advising or…?

It may be both and they should be tied up with it. The different offices that are under the Department of water supply, they (municipalities) need to be tied up with them. For any government or private sector or NGOs to help any Water User Committees, they (WUSC) need to be registered first. Once they are registered, they (WUSC) are legal and can approach any operator for help. How can the local government be tied up to the project? We recently worked with a mountain district called Dolakha. We collaborated with the local rural municipality and provided them with a certain project and it's total technical support with design, estimates and all. That municipality already has the ownership, they are vigorously monitoring. Once they are involved in that way and liable for the work they allocated a certain amount of the budget for the water supply schemes in collaboration with our organization (WaterAid Nepal) and the Water User Committee. They have managed to get a provision of one house, one tap. They also have the metering system based on which the tariff. There was a business plan developed for the overall lifecycle costs and what would be the tariff to that and for minimum operation and maintenance, what would be the tariff? And based on that together with the Water User Committees, municipality the tariffs are determined which will ensure that it will be financially sustainable. Whenever there is a problem in their system, they can easily maintain it with their tariff. They can also deploy one of the community people for regular operation and maintenance work. This way the people will get regular water supply and safe drinking water.

So what do you think are the most important topics that there would be more need for training and education in water management?

I was actually coming to that point. Have you heard about the human rights based approach? We follow that approach as well. In rural municipalities - regardless of the constitutional rights - there might not be equally much information about the fact that safe drinking water is their human right. And not enough information that they can demand the water from local government. We have a certain package for human rights based approach on water supply, sanitation and hygiene that we follow. With this we empower the community but also make the governmental operators accountable enough. And moreover about the capacity building we try to find some of the key personnels within the community and provide

them with different on-the-job, hands-on training whenever any of the schemes is about to start. We provide different pre-construction training such as how a proper pipeline or welding should be done. We identify those key people and make them full-capacity so they can easily handle the repair and maintenance that is required in their system. At the same time regarding the water quality, we also provide a water safety planning training. We also try to institutionalize the activity within the Water User Committee. In Nepal water safety planning is quite popular in these Water User Committees and even in the bigger utilities as well. This water safety plan is a powerful tool because it has so many step by step systematic processing. It has 7+3 steps. Those 7 are the key points that we try to ensure. If I breaf just shortly, the 7 steps: 1st is about team formation, 2nd system understanding, 3rd water safety plan, 4th problem solving, 5th action plan, 6th monitoring plan, 7th health division surveils the process. This ensures that the action is more local and the users understand the overall system. There will be teams and different sub-teams. One of the sub-teams is for example the water source team which in Nepal is typically spring source. They are responsible about any contamination and any hazards. For example in case of a landslide they decide if any obstacle will be placed or will the water source need to be left and looked for something else. Their job is also to build the WUSC resilience. So we provide them with this type of training.

It's good you mentioned the hazards because the next question is about what are the most important factors when preparing for those hazards in water management.

Yes, in rural Nepal the springs are the typical water sources, in some instances also the streams. There is not any comprehensive study on this but as far as we went to different communities after the earthquake 2015, the water user groups were saying that in most of the cases lowered level. About the hazards that we usually look through when building a new scheme. Do you know VCA Vulnerability Capacity Assessment? It is a specific tool being used these days. It takes into account all the possible hazards that can come along, not only the source itself but along the route from where we bring the transmission lines or the treatment units. Recently with new technology, we use drone surveys to map out the overall picture. It helps us to identify the possible hazard points. From the designer's perspective, it gives a lot of confidence about the options for a route for example. Usually, the team that does the survey on the field might not be professionals of design and they might forget to mention some certain things on their field notes. And when the designer is designing the system they might not consider those overall hazards or the points. Later in implementation there can be a lot of trouble. The technology is one game changer because checking the area with a drone is very quick and easy and does not actually raise the overall financial costs.

Okay, it's good that you already talked about the implementation. So what are the most functional parts of implementation in Nepal water management. And especially if you think about a municipality that is the size and type of Devchuli, a rural and quite small one. What are the most functional parts?

You mean inside the overall system or?

Yes, you can also talk about the overall system and point out examples from implementation. I mean the kind of everyday actions that can be done with water management to make it more sustainable for example in building. What is already functional and good in the implementation. And the next question is what needs to be improved, so you can answer both of those.

Yes. The wonderful thing about Nepal currently is that we have a sustainable government. Stable government is the best point and as we went to the federal structure and there are local governments such as municipalities. So the elected mayors or the presidents of the rural municipalities are more accountable to their citizens. This makes the environment more enabling for actors like us (WaterAid) to

work in the water supply and sanitation sector. This kind of environment brings a lot of hope to work collaboratively. Also the commitment from them can be a key factor. This is quite a difficult question. I think there is not right and wrong but the answer is more contextual to different localities, different mindset of the people and different mindset of the local government. Just like I generalized, we have that enabling environment and the local governments that are elected by the people which makes the governments more accountable. And based on my experience, on urban sites most of the water sources are bore wells. Those are the major water sources. When you need to do any drilling you need access to lands. Now with these local governments that are more accountable, finding this land has become much easier. Example of Lahan from the southern part of Nepal and uses bore wells as their water sources. Recently the Water Corporation of Nepal which is a government own utility needed to drill more holes. We got in touch with the mayor of Lahan and within no time he provided us with options of land in many different locations. Encouraging progress for the whole WASH sector.

When in day to day context, if there are people with skills and they have good relationship with the municipalities, they can lobby and advise what kind of models to focus on and make certain things institutionalized in their system as well. So that water systems are functioning well. As a backup maybe, in Devchuli specifically if there isn't any water, sanitation and hygiene unit, which is currently taken under the social development part I guess. One special unit to help when there are for example technical questions and water related problems. And this unit would make sure the rural municipalities would get a certain, good budget every year for the water management.

Okay, very nice. So you talked about some of the functional parts. So what are the things that still need a little bit of repairing or improvement?

That is a very big question, you know. Two weeks back there was one 5-days training organized by this national water supply and sanitation training center which is under the ministry of water supply. There were different development organizations and government utilities present. The training was about overall sustainable development goals and of what they have achieved in Nepal. After that this was exactly the question we raised on that platform. There are more than 40 000 systems out of which 75% are nonfunctional, and need some kind of repair and maintenance. So to make those systems functional, what does the government plan to do? Previously it came along with a hand-over project but not even with the government things are about sustainability and also business plan with tariffs. This is why one house, one tap model came along. Previously there was public tap provision. As the name suggests, it's not liable to anybody and still everybody can get the water. It is not owned properly, a lot of non-functionalities are there. They come up with an idea that who ever (operator) is doing the water supply projects will now go under one house, one tap model, not anymore public tap concept. So this is good progress from the government. That is the area of sustainability I think everybody should focus on when working on their water projects.
Also the capacity just like we mentioned earlier both with the rural government and water users committee and tying them up with like-minded organizations, make them more sustainable and resilient

Yeah, okay. And also I suppose the one house, one tap model increases the ownership of the water system. Like the will to actually take care of the water source.

Yes.

So I have taken a lot of your time already but if you would have time for one last question.

Yes, I think the conversation went quite well.

You said that you are also expert in rain water harvesting related matters. So I would have a question about what other kind of ways there would be to collect clean water? Is rain harvesting maybe one of the possibilities to get more clean water?

Yes, very nice question. In a country like Nepal we receive a lot of rain depending on which location. Devchuli is in the western part, where you receive quite good rain. If comparing rain water with other sources of water, after the very first bit of it you get very nice quality water. And it can be a very good, sustainable source for the areas that have scarcity of their spring source of water and also to the areas where there is source but it's about 20 kilometers far and only a few households cluster or beneficiaries. No organization would be interested really and even the government because the level of investment required would be high and the number of beneficiaries is very low. In this kind of circumstances rainwater can be very good and even game changing.

We did one project related to this earlier in WaterAid. There was one community, located on the top of a hill. There was no sustainable source anywhere nearby but around 15 kilometers away. The pipes would have passed through a very dense forest. So the good point was that they had very big rooftops which were excellent for catching rain. So we modified some of those rooftop areas and built a separate, underground tank with a provision of slush?? and filter. This was a drinking water source for hard times and it became quite good. Talking about sustainability, we need to insure some things such as recharge. In Kathmandu for example there is a lot of extraction but no one does the recharge. The city will get a loss of water if not. In 2018 we worked in one Katmandu park and we developed a recharge area inside that small forest area. The nearby area was successfully saturated with recharge water. So I think rainwater is an equally possible option.

There is some research done by Isimuld regarding the spring recharge in Lalitpur district, Wadour/Hadour?? municipality. There are many springs in the area and they very comprehensively found out what could be the recharge areas within those catchment areas. In a water management perspective as the springs are groundwater and it feeds up on the rainwater. In Devchuli within your project with some technical support there could be methodology selected to find out those recharge areas and those springs. Could at least start with some of the models and what the options could be to recharge those springs. That would be the role model in the entire Nepal. Such practise in very rarely practised.

In schools in Nepal there have been mini units of water harvesting installed in some WASH projects. Also one biosand filter. It's a very good supply of drinking water for the children as well.

Rainwater harvesting, I think, will add a great resilience to the system.

This was very interesting! I'm very happy you agreed to have an interview with me, this has provided me a lot. Thank you very much!

Annex 5: Interview 4: Water User Committee Chairperson

Thank you for agreeing to take part in my Master's thesis study's interviews. This study is conducted in collaboration with WaterFinns and is part of the project called "Sustainable water supply and capacity building in Devchuli municipality, Nepal (2019-2020)". This study will only be restricted to households and their access to clean water. Therefore, this study does not focus for example on sanitation or waste water. The main objective of this thesis is to find out how sustainability is part of the water management in Devchuli municipality. Please answer the questions based on your own knowledge and experience. Thank you very much!

What is your position regarding water management in Devchuli?

Chairman of WUSC, Devchuli A. 560 households, this year 574 households (increased with 14 households). Chairman since past 2 years. She is responsible for WUSC management and finds her responsible for safe drinking water to public.

What is the operator your Water User Group/Committee works the most with?
The WUSC is supported by the User committee group, Ward Office, Municipality, CATN and Disaster Management Committee from the municipality.

User Committee is responsible for Human Resource management for Labour work in the field.
Ward/Municipality for Financial and technical support
CATN: Technical, training, Capacity building (Already many training workshop has been provided)

From Municipality (Disaster Risk) : Technical and Financial support but the have not been received yet any training workshop.

What are the most important guidelines/instructions you use in your work related to Devchuli water management? And where do the instructions come from? (*What operator gives them?*)
Water safety guidelines during training workshops. Guideline are provides from the municipality and ward office.
They also have developed their own guideline after learning from the past.
CATN suggestion and support are always supportive to them.

Aduit (Book keeping) support is provided from user committee member and CATN office.

The documents (information regarding the WUSC update) are not passed to municipality. The financial document is only transfer to the municipality. Other regular update is not available in the municipality. Budget information is passed to the WARD office and which is passed to municipality. But other O&M information is lacking in the municipality.

How do you prepare your water system for the hazards like earthquakes, floods and mudslides?
Major Disaster observed in the scheme is Landslide, Food and Drought
April/May, the dry period starts and there is not enough water in the spring source. Water Quantity is not enough. Due to this, river water is mixed to the spring source to meet the water demand.

A.What kind of damage those cause to the water system?
During the monsoon, river flood affects pipeline, and landslide affects different section of water network.

During the monsoon the, User Committee has to fully depend upon the spring source

B. If there will be damage who is responsible for fixing it?
User Committee is major responsible for O&M work. Major problem observed in the water scheme is pipe breakage due to disaster.

Economical support is done from the WARD And municipality office.
Even Province office of water management support the technical and financial support.

C. How long does it take, on average, for the damage to be fixed?
Due to disaster, short term effect have been observed. User Committee involve themself in fixing the problem.

Normal water disturbance is fixed with a single day. In case of emergency, complete User Committee takes responsible and fixes the water supply system.

During the dry season, mixing river water to spring water regulars the supply else water quantity would have an great issue.

Due to EARTHQUAKE 2015, the spring sources have dried. So they have started mixing the river water to the system.

D. During the coming year, do you wish for cooperation in the fixing? If yes, with what operator?
For future, they would think to form different sub User Committee group responsible for fixing different work like O&M, office management etc.
WUSC would prefer to have financial support yearly for fixing issue in water network from the municipality. Even filtration unit to water network would have been good.

To which one do the locals participate the most in Devchuli water management? -> planning, building, maintenance
The User Committee is mostly involved in the O&M work than planning and building work. The network and water supply system is present since 15 years ago. The major obstacle is operation and maintenance.
What kind of instructions/guidance were you given for either of those?
In case of planning the Municipality office takes care of the issue. The User Committee has Village management worker (VMM) who have knowledge about fixing the leakage not planning the network.

A. Does your household usually use the same water source during monsoon?
During the dry season, river source is mixed, and during the monsoon, the river water is avoided in the network due to the high turbidity of the water.

B. Does the amount of water available in wells or pipelines change during monsoon?
Yes, during the monsoon water quantity is less than dry season although there is enough water in the river, the water is not bought to water tank due to the turbidity.
Loadshedding also needs to be practiced during the monsoon. Water is not enough.
During the dry period, mixing of the water from river fulfills the water quantity but the quality is poor since river water is contaminated with biological organism. After the Chlorine dozing the system is safe.

C. Is the water quality in wells and taps similar during all seasons?
Quality of water varies based on season. During the monsoon the quality is better than dry period.
River water fulfills the quantity but effect the quality of the water.

In what matters related to water management, there would need to be more training/education?
CATN have already providing the chlorine dozing unit, but a training have been provided to a single person. If the training could be provided to few more people in th WUSC, during the absence of the person there can be continuity.
Training of book keeping would also be good and financial activities are monitored regularly by the public. Booking training for the chairman of WUSC chairman and other members can be helpful.
VMW training can also be useful. Having more than a single VMW can upgrade the O&M.

What are the 3-5 most important factors how Devchuli households could get cleaner and safer water?
In the past, the household were with public taps. (1 tap per 10 HH) long queues were observed in the early morning.

After going private from public tap, water quantity was not enough. Municipality played a major role in solving the problem. The financial support from the municipality helped for additional pipeline to connect river water to spring.
Good collaboration from the User Committee has been an effective solution for problem solving in the system. Women involvement is also another reason for success of Devchuli A.
Activities to be done for sustainable water management:
Proper Detail study of existing water system, the WUSC lacks technical document of their own system.
Every HH should contribute for financial support in case of emergency.
Due to Covid-19 the challenge is observed in maintaining Chorine dosing unit. There is scarcity of chemical for running the dosing unit.

What are the most functional parts of Devchuli water management/system?
Chlorine dosing was regular function part but because of Covid-19 there is some issues.
User Committee is the function part of the water management. User Committee dispatch themself in case of emergency.

Annex 6: Interview 5: Water User Committee manager

Thank you for agreeing to take part in my Master's thesis study's interviews. This study is conducted in collaboration with WaterFinns and is part of the project called "Sustainable water supply and capacity building in Devchuli municipality, Nepal (2019-2020)". This study will only be restricted to households and their access to clean water. Therefore, this study does not focus for example on sanitation or waste water. The main objective of this thesis is to find out how sustainability is part of the water management in Devchuli municipality.
Please answer the questions based on your own knowledge and experience.
Thank you very much!

What is your position regarding water management in Devchuli?
Office Management Staff in a WUSC of 480 HH (Private Connection). Involved continuously in management process. Book Keeping/ Internal and External management (Procurement)

What is the operator your Water User Group/Committee works the most with?
The WUSC is supported by Devchuli Municipality, CATN, Ward, Women Community, Forest User Group, Tole Bikash Group

Water User Committee is responsible for Yearly Management of WUSC
Financial Support is done from the municipality. Training work is not received/rarely from the municipality.

What are the most important guidelines/instructions you use in your work related to Devchuli water management? And where do the instructions come from? (What operator gives them?)
Labour Support is done by the User Committee. User Committee is not able for financial and technical support .

Support is received from the ward/municipality for guidelines.

Software support from CATN project. User Committee also provides information regularly. CATN: Technical, training, Capacity building (Already many training workshop has been provided)

No data is available to the ward or municipality. Audit is done for User Committee but data is not available to the municipality.

How do you prepare your water system for the hazards like earthquakes, floods and mudslides?
Disaster is regularly observed. Water source is river & spring, there is a problem with the water source as the upper catchment area is affected.

Forest fire is also observed and gully erosion is another issue observed in the catchment area affecting the water source.

In the water source/intake area, the sediment deposition is another issue for reducing the water demand. Due to the landslide, pipeline is affected and air value in the transmission line is affected yearly.

Major problem in the scheme is observed in the intake structure.

What kind of damage do those cause to the water system?
During the monsoon, river flood affects pipeline, and landslides affect different sections (pipe breakage) of water network.

If there will be damage who is responsible for fixing it?
Small problems like minor repair, User Committee take care of the problem themselves.

For bigger problem (financial problem for repair and maintenance) Disaster management (Municipality) is taking care of the problem.

Technical support and financial support is mostly provided from the municipaltiy and CATN.

All responsiblity for implementation of O&M is done by the User Committee . They have not formed any other group to address any problem within the User Committee. User Committee is responsible for addressing the issue.

How long does it take, on average, for the damage to be fixed?
Due to disaster, the water supply has broken in funtionabilty for maximun 24 hours. User Committee have provided their effort for operation and maintenance work. Long term disturbacne have not been observed in past year.

During the coming year, do you wish for cooperation in the fixing? If yes, with what operator?
Quality problem in the water system can be maintain with the improvement in the intake structure. Cattle grazing should be stopped. Spring protection work in the catchment should be carried out. Afforestation/river training with financial and technical support is important.

To which one do the locals participate the most in Devchuli water management? -> planning, building, maintenance
The User Committee is involved in all the activities mentioned.

The User Committee is mostly involven the O&M. O&M is the most important focus.
For new project, the financial problem is major issue.

Minor repair and maintenance work is taken by the User Committee themself. For the major problem like financial and technical support the support is seeked from the municipality.

During the monsoon period the dependency is totally on spring water due to the poor turbidity. During the dry period the river water is mixed to fulfill the water demand.

What kind of instructions/guidance were you given for either of those?
The User Committee has Village management worker (VMW) who have knowledge about fixing the leakage not planning the network. Financial and technical support is provide from the municipality.

Does your household usually use the same water source during monsoon?
During the monsoon, dependency is totally on spring water. And during the dry season river water is mixed to fulfill the water demand.

Does the amount of water available in wells or pipelines change during monsoon?
Water quality is not good, Water quality test result also mentions the quality of water is not good.
Chlorine dosing is done in the storage tank for biological treatment.
Boiling, filtration system is done even chlorine dosing is practiced in the network. People are very conscious toward the quality of water these days.

Is the water quality in wells and taps similar during all seasons?
During the dry season, water demand is higher and during the monsoon, supplying the quantity is another issue. Quality is better during the monsoon when the water source is only spring water.
During the dry season, water is clean but the lab test results present biological contamination. During the dry season the water quality is good in terms of the turbidity.

In what matters related to water management, there would need to be more training/education?
Management is another important issue for the sustainability of water management. Training is necessary, CATN supported training for capacity building is more necessary.

Kind of training necessary are book keeping.
Offical:
External management like purchase and other issues. Office management training. VMW training can also be useful for O&M work for WUSC.

What are the 3-5 most important factors how Devchuli households could get cleaner and safer water?
Intake protection work is necessary, pipe leakage work needs to be fixed, filtration tank/system is necessary.

Distribution and transmission pipeline needs to be repaired regularly.
Nagarpalika, ward should continuously provide financial support and CATN should provide suggestion work. Financial support is necessary for quality improvement.

Pipeline improvement with regular maintenance work, intake protection activities, fishing protection in the river catchment area. Regular pipeline leakage fixing is most important.

Regular protection work has been carried but with additional filtration tank system could be very effective. Pipeline change can be a solution to expanding/growing population.

In the past, for sustainability of the WUSC, regular monitoring and maintenance have been very effective.

What are the most functional parts of Devchuli water management/system?
For Smooth functionality of the WUSC, official management plays an important role. Management training work for external work plays an important role.

Internal office management is lacking in the existing User Committee. More field work should be focused.

Annex 7: Interview 6: Chief Administrative Officer of Devchuli Municipality

Thank you very much for agreeing to be interviewed in this master's degree thesis of mine (Veera Niemi's). The study is conducted in collaboration with WaterFinns, under the program of Sustainable Drinking Water and Capacity Building Project Devchuli (NAPAWASH). The study focuses on providing safe access to safe drinking water for the residents of Devchuli Municipality. Therefore, the study does not cover the issues of sanitation and waste management. The main objective of this study is to find out how the drinking water management system of the municipality (i.e. user group committees, the ward, drinking water coordination committees, municipality, provincial government, federal government, etc.) provides access to safe and clean drinking water facility for the residents of the municipality in a sustainable manner (or to explore how can it do so).

Please answer the questions based on your knowledge, expertise and experience. Thank you!

How are you involved with Devchuli water management?

I assist the executive branch of the municipality in preparing the annual strategic plan and program for drinking water and sanitation. Currently, there is no long-term strategy of Devchuli Municipality for drinking water and sanitation yet. So, my role is to prepare the annual development plan of drinking water and sanitation according to the programs that have been prioritized and selected by the wards. Such programs are discussed in the executive meeting of the municipality and passed unanimously. The budget is provided to implement approved annual programs. I have directed the staff of the technical branch, social branch and administrative branch from the municipality to provide assistance to the wards. I mainly carry out these activities in respect to the municipality's drinking water management area.

Which are the other operators you work with in Devchuli water management? (federal government, provincial government, other municipalities, NGOs, wards, water user committees).

In the drinking water management sector, the municipality has worked with the user group committees, state government and non-governmental organizations. The municipality has given the operational and minor maintenance tasks to the water user organizations. The ward offices work to identify the condition of water facilities, they also make plans for improvement, monitor and regulate [local activities].

The municipality staff provide technical, financial and administrative support to the ward and water user committees. The municipality has been assisting the water user committees especially in major maintenance tasks. Currently, the municipality, in collaboration with the NGO NAPAWASH, is constructing some new drinking water projects, capacity building programs for the water user committees, and setting up a water testing laboratory.

Within the municipality, large drinking water projects with a Slow Sand treatment system have been constructed and are under construction with the help of the provincial government. The Federal Government and the Provincial Government have issued guidelines, policies, directives and circulars to this municipality for improvement in the field of water access, and also to meet [the government's] target.

What are the most important instructions you use in your work related to Devchuli water management? Where do the instructions come from?

Global Sustainable Development Goals (SDGs) are one of the most important guidelines adopted by the Devchuli Municipality in managing drinking water services. The federal government and the state government have instructed the municipality to work towards achieving the Sustainable Development Goals (SDGs). The policy and program of this municipality for [the fiscal year] 2077/78 is an important guideline for the management of drinking water of this municipality. The program document was prepared in line with the guidelines, policies, directives and circulars received from the federal government and the provincial government, which emphasized on SDG attainment.

Are the Sustainable Development Goals (of the United Nations) one of the guidelines?

Yes, the SDGs are a major and important directive followed by this municipality for drinking water management.

If yes, what are the most important goals in your work on water management?

The SDGs serve as guiding principles for drinking water management of this municipality. By adopting the SDGs as guiding principles, the municipality aims to provide safe, reliable and adequate access to safe drinking water to the entire population of the municipality by 2030. The municipality has been guided to work towards this goal and has been making annual policies and programs accordingly. However, in order to achieve the SDGs, the municipality has not been able to formulate comprehensive short-term and long-term strategies and programs.

When it comes to drinking water management, primarily the following strategies have been included in the policy and program of this municipality for 2077/78.

- One house one tap/stream policy will be adopted

- Adequate drinking water in schools

- A policy to make user groups themselves responsible for the long term operation, management and maintenance of the projects completed and operated by the water user committees.

- Initiatives to set up labs in the municipality to maintain quality in infrastructure construction.

- Development of various drinking water infrastructure with the support of the federal government and the state government.

- A policy to be environment friendly, gender friendly, child friendly and disability friendly while building infrastructure.

How do you prepare the water system for hazards like earthquakes, floods and mudslides in Devchuli?

In order to minimize the damage to the drinking water system of the municipality due to natural calamities such as earthquakes, floods and landslides, the municipality has worked in collaboration with government and non-government actors. For example, we have been assisting water user committees in the protection of drinking water sources, construction of structures for the use of alternative sources in case of such calamities, increasing the capacity of water collection tanks, and so forth.

In addition, the municipality has been providing immediate financial and technical assistance to water user committees in case of damage to the structure of the drinking water system due to such disasters.

During this fiscal year (2077/2078), the municipality has adopted the following strategy to reduce the damage from floods and landslides:

- Embankment of Baulaha river under the President Chure Conservation Project, and continuation of embankment in other rivers as well.

If there is damage to the drinking water project due to such disasters, who is responsible for repairing it?

In case of a damage to a drinking water project due to natural calamity, it is the responsibility of the water user organization to carry out such repairs as per the technical and financial capacity of the water user committee. If the damage is so great that it cannot be repaired by the water user committee, the municipality has assisted, responsibly and with high priority, the water user committees to repair such damage.

In case of a major damage to the project and the water user organization is unable to repair it itself, there is an arrangement to request emergency assistance at the ward office. The municipality has also collaborated with governmental bodies and the non-governmental organization NAPAWASH for such assistance.

On scale from 1 to 5, what is the situation in Devchuli so that every household would have safe and clean drinking water? 1=very few, 5=everyone

We have started in this municipality, with the support of NAPAWASH project, an initiative for safe drinking water access for the residents of this municipality. The municipality has constructed four projects with the Slow Sand treatment system. They are in operation, but the municipality has not started testing the quality of water distributed from them.

Recently, a water testing laboratory has been set up at the municipal level in collaboration with the NAPAWASH project. The lab will start water testing soon. Currently, the municipality is unable to test water quality, so the status of safe water availability cannot be determined on the basis of statistics/[available data].

A Slow Sand drinking water scheme has been testing water quality on its own, but in the current situation, when the municipal lab is unable to certify water quality, it can be said that only a few households in the municipality have access to safe drinking water. In that sense, it can be said that the access to safe drinking water is at level is 2.

Is there a need for more cooperation in water management? With which operators? In what matters? (example: with NGOs in planning)

Yes, due to limited expertise, limited manpower and limited financial capacity of the municipality, it has not been possible to provide and manage access to safe drinking water services for the inhabitants of the municipality. It is necessary to cooperate more with the federal government, state government and non-governmental organizations for this. In addition, in order to upgrade the drinking water services in this municipality, it is necessary to cooperate with governmental and non-governmental bodies for financial and technical assistance to formulate drinking water strategy, prepare short-term and long-term plans.

In some of the wards of the municipality, there is still no drinking water structure or water structure only for community water use, so it is necessary to cooperate with government and non-government bodies to build a new ”one-house, one-tap” project in such settlements.

Due to population growth, most of the drinking water projects have started using river water, so it is necessary to cooperate with government and non-government bodies for the construction of Slow Sand treatment systems.

Currently, in wards 6, 7, 8 and 9 of the municipality, the NAPAWASH project is implementing a project with the aim of increasing the capacity of water user organizations in safe drinking water distribution and drinking water operation management. In order to increase the capacity of water user organizations in managing drinking and in operating the Slow Sand operating systems, such programs should be conducted in other wards as well.

On scale from 1 to 5 how important do you think it is that locals participate in water management planning? 1=not important, 5=very important

The municipality has given high importance to participation of the locals in the preparation of the drinking water service facility management plan. The municipality has been preparing annual budgets, policies and programs every year with the participation of the locals. I have given much importance to the participation of local people in the preparation of the drinking water management plan of this municipality, so for this, I have given 5 points.

What can locals do if they want to participate more?

In order to increase local participation in the drinking water management mechanism of the municipality, the water user organizations are required to submit details of the operational status of their projects and the improvement action plan to the ward office. They have to do so annually. Based on these documents and the data, the municipality would formulate annual policies, programs and budgets. This would be “data-based” local participation. However, currently, the requests that come from the water user committees is only for the maintenance of drinking water facilities.

How do Devchuli municipality operators currently work to improve the water quality? (for example, water quality testing laboratories to wards)

In collaboration with the federal government and the state government, we have constructed a Slow Sand treatment system in various drinking water projects in Devchuli municipality. The construction of one new project has started this year. The NAPAWASH Project has been implementing water security schemes in 6,7,8,9 wards of the municipality.

The idea is to increase the capacity of water user organizations and increase public awareness in providing safe water to the residents in the area. A drinking water testing laboratory has been set up in collaboration with NAPAWASH, which will test the water of all the drinking water schemes every month and monitor the effectiveness of the water security schemes and the quality of drinking water.

To which one do the locals usually participate the most in Devchuli water management? -> planning, building or maintenance

The participation of the local water user organizations has been generally in the "maintenance and repair work” of water projects.

What guidance/instructions is provided for them from the municipality? Or some other operator?

The municipality has directed the ward offices and water user organizations to use the policy and program of 2077/78 as the guiding document for drinking water management. Accordingly, the municipality has directed the wards to provide drinking water service facilities, prepare drinking water management plans and implement [already formulated] programs.

In addition, the ward offices of ward nos. 6, 7, 8 and 9, and water user organizations/committees have been directed to collaborate with the NAPAWASH project in order to manage the drinking water projects in their respective areas.

The municipality's health department and the water user organizations/committees have been directed to prepare guidelines for the operation and management of the municipal level water testing laboratory with the participation of all the drinking water water user organizations of the municipality.

We have also requested for technical and financial cooperation of the state government for the construction of Slow Sand treatment systems in drinking water projects. Such request has been made also for the construction of large structures and reconstruction of community stream projects.

What are the 3-5 most important factors how Devchuli households could get cleaner and safer water?

In order to provide safe and clean drinking water to all the households of Devchuli Municipality, the municipality should adopt the following management strategies:

- Since the households living in the rural settlements of the municipality still take drinking water from the community taps or temporary pipelines, a new drinking water project should be constructed in these settlements to ensure "one-home, one-tap" policy.

- As most of the drinking water projects use river water, it should be mandatory to add chlorine to the drinking water system (in the drinking water projects which do not use the Slow Sand treatment system at present).

- Implement and regulate a water security plan in drinking water projects.

- Cooperate with the state government and the federal government to construct Slow Sand systems in river-based drinking water projects.

- Increase the capacity of water user committees for the operation of drinking water projects based on the Slow Sand treatment system.

- Test all drinking water projects by the municipality's water testing laboratory.

- By adopting the above-mentioned strategies, develop and implement long term drinking water strategy and plan of the municipality to achieve the Sustainable Development Goals (SDGs).

What are the things in Devchuli water management/system that work best? (Or, what is the level of management structure currently working best in Devchuli Municipality's drinking water management system?)

Everyone's role, from water user organizations to wards, municipalities, state governments, federal government and the non-governmental organization NAPAWASH has been important in the management of drinking water in Devchuli Municipality.

Due to the role of all these stakeholders, the drinking water project has been constructed and managed to provide drinking water facility to all the households.

However, out of all these stakeholders, the best working body is the water user committee. Water user committees have been operating drinking water [facilities] and also do minor maintenance work themselves. Because of this, support has been mobilized from the ward and municipality for major repair works.

The water user committees have also taken initiatives and lobbied to the state government and the federal government to upgrade drinking water projects in their areas. The water user committees have also collected the cash and labor from the user groups to fulfill the requirement of their financial participation. The water user committees have been working with utmost responsibility to provide drinking water to the end user groups/households.

Translator's notes: I have used the term "user group committees" for Upavokta Samitis, and "user group organisations" for Upavokta Sanstha (because he uses both). Probably he uses these two phrases to indicate the same thing (i.e. user group committees), but you can check this issue with them.

Annex 8: Interview 7: Ward Chairperson, Ward no. 9, Devchuli Municipality

Namaste. Firstly, I would like to inform you why this interview is being conducted. This interview is taken on behalf of a Finnish student who is doing her master's thesis. She wanted to come herself, but, unfortunately, she couldn't come. The study which she is carrying out, i.e. Devchuli municipality's drinking water situation, is conducted in collaboration with NAPAWASH and WaterFinns. Studies like these are useful in making drinking water related policies of Devchuli Municipality in the future. This is also useful for the Finnish government when making policies related to drinking water.

From the local level, Meruwa, and then the Chief Administrative officer, and you have been [selected] for the interview. From the user committees, two chairpersons of two user committees (of Devchuli Municipality) have been interviewed.

We have 10-11 questions. Maybe we should start now.

Firstly, we could start from your introduction, sir.
Thank you, Pravin sir from NAPAWASH. Namaste. I live in Devchuli Municipality Ward no. 9. I'm the Ward Chairperson of Ward no. 9.

What's your responsibility as a Ward Chairperson in drinking water management of your ward?
When I have to say about my responsibility, we have many organisations here, and one of the most important ones is drinking water management organization. My responsibility is to provide, by all means, safe and clean drinking water to all the residents of my ward. For that what should be done, [I] can explain later.

As I explained already, to provide clean drinking water, firstly, we organize community discussions to identify problems. We listen to each community member and their problems. We identify problems from their answers and responses. Based on that, when a new fiscal year starts and when it's time to allocate

budget, we allocate budget accordingly. Not only that, we also cooperate with the federal government, the provincial government, and the municipality, to solve the problems we face.

Even that is not enough. We have INGOs, too. Out of those, you yourself (NAPAWASH) is an organization that aims to ensure the availability of safe and clean water globally. People like you, or I should rather say, by this age of 50, I haven't known people like you. That is why we have cooperated with NAPAWASH to make policies for ensuring the availability of safe and clean drinking water to our people.

Especially now, with whom you have been cooperating (NGOs, local bodies, etc.?)
Currently, the provincial government provides the largest budget to us. And when it comes to technical support, it's NAPAWASH.

Before we used to drink water from a small canal, by using caps and scarfs as water filters. Livestock used to drink the same water. Today with your help (NAPAWASH), Finnish government, and the policy guidance, direction and cooperation which you provide, we are able to drink clean water. I would say that's it. We have been doing it in cooperation with you.

You said you have been working with the provincial government and NGOs like NAPAWASH. What sort of differences have you noticed when it comes to their working methods and processes?
When proceeding with the government party, we submit a proposal, and that should be approved by the provincial or the federal government. And that's how we receive the budget.

While working with NGOs, in technical cooperation, the work is direct even though the monetary investment is little. The work in technical cooperation is very thorough. We are advised in a very detailed and systematic way. Even issues of how to wash hands properly is covered. We even celebrate a Hand Washing Day. I must say UNICEF's guidelines reach our communities through you.

The government gives the money, but doesn't do other work. But NGOs like you come and do all their best to ensure the access of safe drinking water to each household. There are community meetings, too, and the aim is to reach everyone. That's the difference.

When you manage drinking water services at the ward level, do you follow any external guidelines [or directions]? Or have you received any such guidelines or directions?
One of the guidelines is the Sustainable Development Goals, which aims at ensuring access to safe and clean drinking water to everyone by 2030. On that basis we all (province, municipality, and the ward) are working. We have planned that by that deadline our policy of "one home, one tap" should be completed.

So, you have been following the UN's SDGs in ensuring that by 2030 everyone has access to clean drinking water?
Yes.

Where do you get those guidelines from? Do you get them from the federal government, provincial government, municipality, or you work on them yourselves?
They come from all sides, from the federal government, the provincial government, and you have also given us such guidelines in NAPAWASH trainings. That's how they come.

Now I'd like to focus on natural disaster issues. In this ward, how do you prepare the water committees for hazards like earthquakes, floods and mudslides? Do you have any provision in place?
That's an excellent question! In the area of our water source, there is a river called Deusat. Every year, the flood in that river washes away around 100-150 meters of water pipes. To provide drinking water to our

residents in such cases, we have a ward-level disaster management fund. This [flooding] happens every year. It happened the year before, it happened last year, it happened this year and it will happen next year also.

When we had a different water source, we didn't have this problem, but that [old] water source dried up because of the earthquake. The earthquake diverted that water source, and we don't know where it went. After that, we have used a river as our water source, and we consume that water [from the river] after treating it. And in the rainy season, the water pipes are taken away by floods. So, in such a scenario, we use that emergency fund and mobilise user committees to provide drinking water to our people.

Who has the responsibility of fixing such damage caused by similar natural disasters? What's the exact process?
The process is, for instance, when the pipes are washed away by a flood, the first step is, a local committee, which we have set up, assesses the damage. That committee reports to VMW. If VMW is able to solve the problem, they do so, if not then the committee comes to the ward with an application. In the application, they give details of the damages. After that, the ward and the municipality assign an engineer for damage estimation. According to that estimation, the amount equivalent to the pipes' cost or [any other] necessary fund is released from the emergency fund. That's how new pipes are purchased and fitted.

How much time does it take to make such a repair?
It depends. Sometimes it takes 3-4 hours, and sometimes it might take up to 2 days. Sometimes why it takes longer is, this flooding problem in the rainy season can occur several times (not just once) as the season is 3-4 months long. Since we do not have pipe factories nearby, sometimes they are not available in nearby shops either. So, we might need to purchase pipes sometimes from the eastern part [of the country] and sometimes from the western part of the country, so it takes time.

In the coming years, do you think you need to have more cooperation with other agencies (e.g. provincial government, municipality) to manage such problems? Or do you think the ward itself is capable of managing it alone?
We aren't capable ourselves. As I already said, this problem occurs every year, and when a certain part of the pipeline is washed away, the remaining gets dirty water, and gets often jammed. And this is a technical matter. We don't and can't know where the pipeline is jammed. We might allocate 2 lakh budget [approx.1400€] and solve the problem once, but the problem might occur several times in the same season. So, we are looking for organisations like NAPAWASH to have more technical and financial cooperation with us.

What should be done to improve the quality of drinking water which has been distributed by the user committees in your ward?
That's a very important question. First, there should be a security fence in water tank areas. When it's open and easily accessible, anything might happen. From time to time, it is also necessary to provide water purification trainings to households. Now the provincial government has constructed a Slow Sand filter tank for us. I have the experience of drinking water from canals where animals defecated, so now we are able to drink this slow sand filtered water. There is a water [quality] testing machine in the municipality. The machine was brought in cooperation (50-50 investment) between Devchuli Municipality and NAPAWASH. It would be great to have a machine like that at the ward level, so that we could test water more frequently, once a week, once in two weeks or once a month.

You talked about what should be done. Currently, what are user groups doing to ensure that the water they are drinking is safe?

Everyone has no access to it, but now the technology makes it possible to get both warm and cold water. But our area is quite different [backward]. For instance, one might have had 10 kattha [i.e. 7200 square feet] of land in 1983, but that kept dividing between brothers and their descendants, and now each family might have just 10 dhur [i.e. 1822 sq. ft.] of land. And there are no industries and employment opportunities in this area. There are no rich people here. It's a settlement of poor people.

We get firewood from the forest, so if someone feels a bit sick, they boil water and drink it. And those who have employment or receive money from foreign employment, can afford to have a water filter at home. Some also use the SODIS technology. They place water bottles at their roofs, heat the water in the sun, and use it. But now we've got the Slow Sand filter tank constructed with the help of the provincial government, and that has helped a lot.

But that's only from this year. Before, when we tried to get water in the rainy season from the water taps, the water looked like the milk tea without sugar.

Today's situation is certainly better, but it is said that there might be bacteria in clean-looking water also. Yes, we have a water testing machine at the municipality level. The machine, as I already said, was set up with a 50-50 investment of NAPAWASH and Devchuli Municipality. But that machine is intended for all the 17 wards of the municipality. Our ward is a big ward with 700-800 households where 5000 people live. So, it would be great to have a machine like that at the ward level, too.

I'm still in the question of drinking water quality. In the drinking water projects in your ward, do you encounter any drinking water quality issues in the rainy season? Also, any issues with available water volume?
In the rainy season, the situation is really bad. As I already said, the main problem is the brownish dirty water that looks like milk tea. The volume of clean water certainly decreases, but you get plenty of that dirty water.

So, the quality decreases, but the quantity doesn't.
Yes, that's right.

Do the people in your ward (or the user groups) drink from the same water source during the rainy and dry season? Or do they have to change water sources for the rainy and the dry season?
This is also a very important question. During the dry season, the water sources also dry up, so we have to use the river as a water source. You can't even simply use the river water also. You should first make a small canal and then use it. Whereas in the rainy season, there are more water sources (water origins), so we mostly use them.

So, in the rainy season, it's enough when you use only the water origins?
Yes, that's true.

You mentioned that the provincial government has helped in getting safe drinking water. Apart from that, do you think there is a need for training for user groups?
Yes, it is necessary. But (first) I would like to thank NAPAWASH. NAPAWASH has organized time and again capacity building trainings. This year also such trainings were organized and I myself was present as a guest. But more needs to be done, especially in the area of new technology. We still use very old technology, for instance when we have to join pipes. But there is already new, easier technology available. Trainings that address the use of new technology and new machines would be very beneficial. NGOs like that of yours and us as a government agency can collaborate on such issues.

There have also been problems because people were unable to identify the "height of water", meaning how far and to what elevation water could reach, and where the air outlet should be placed. Another problem is that people who received training might go for foreign employment, some might get retired because of old age, and the rest (untrained) can't do anything. So regular capacity-building trainings are very important. Trainings are also essential in the area of water storage. Even though the water that is provided is claimed as safe, it's also important that consumers also know how to store and clean water at home. It's also important to know how to clean taps properly, and so on.

As a ward chairperson, you must be naturally involved in making strategies and work plans for drinking water committees in your ward. How is the participation of committee members in such activities?
This, too, is a very good question. People in here are very proactive when it comes to drinking water issues.

We used to drink water that came from a canal and used caps and scarfs as water filters. It was probably in 2056 (year 1999) that FINIDA gave us first water pipes and constructed public taps. Then there were only 15-20 taps in the whole village, but now we have taps in every home, and strategies have been made accordingly. And people participate in all such activities with 100% dedication.

Is there a drinking water and sanitation strategy formulated in your ward?
The federal and provincial governments have their own guidelines, directives and strategies. But the ward hasn't made any such 'directive' or strategy per se.

What I would like to say is, in the municipality, there is an in-charge for health issues, there is an in-charge and section-head for infrastructure issues. There is a section-head for almost everything, but there is no section-head for water. And I have been debating about this there. Unfortunately, there is no section-head for an important issue like drinking water, but users themselves are very active in this issue. People leave all their other work behind and dedicate their time to drinking water issues, if such a need arose.

Do you receive any policy guidelines and directives from "above" when you have to, for instance, do the repair work.?
No, we don't receive anything like that. We do it through the municipal assembly. We do it ourselves.

As per the need of the ward and the user committee?
Yes. Every year as per the budget ceiling we arrange from 2 to 5 lakhs [€1,400 to 3500] and the municipality arranges from 10 lakhs to 30 lakhs [€7000 to 21,000].

So, as per the need?
Yes, as per the need of a specific ward.

What do you think should be done to provide safe drinking water to the residents living in your ward?
This also is a good question. Firstly, the water user groups must be activated or mobilized from time to time. When I say "activated", I mean that the responsibility should not always be given to only certain individuals whether they do their work or not. A user committee runs for three years, and after that a general assembly (GA) must be held. A GA can elect a new team or bestow its trust for another 3-year-term to the committee already serving. These things should be done on time as it helps mobilize the user committees more effectively.

Secondly, it is important to give relevant technical knowledge to VMWs. In addition, we should also think of the tools and perks that we give to VMWs. Imagine it's raining heavily, the river is flooding, and the

water pipes are broken. If we are unable to provide a decent raincoat to VMWs, how will they go there and fix it? They don't have a car, after all. So, these small things matter. We need to see the situation of the workers, too.

And, finally, the water should be checked from the water-testing machine. If we do these, I think, it would be better.

Which structure (out of many) works best in your ward when it comes to drinking water management?
Thanks for this question. The drinking water management in this ward is achieved through cooperation between the provincial government (which has provided heavy financial support), ward, NAPAWASH, and the user group committees.

The provincial government has again provided us 60 million NRS (approx.€4,20,000) for a new Slow Sand filter project. The ward office has mainly done supervision and facilitation. NPAWASH has provided technical assistance and capacity-building trainings. It has also provided equipment, from computers to tables. And the user group committees have also done an excellent work. So, it's a result of cooperation from all sides.

In addition, NAPAWASH and WATERFIN's young generation chairman, Jarkko, water God, came here and visited. I had the opportunity to talk to him. This cooperation has been long. It started around 1997-98, we were children then.

If we had continued drinking that dirty water which the cattle used to drink, I think we would have low level of wisdom. The new generation raised after 1997 have done master's degrees. Many have done it. We also just saw the chief administration officer…Some of them are high profile civil servants.

I want to thank you all, WaterFinns, Jarkko sir, Pravin Ghimire, you sir, and everyone who works in this organization.

And the student who is doing this thesis (covering policy, strategical and other issues of drinking water in our ward), I wish all the best for the success of her thesis.

Thank you, Mr. Chairperson, for your time. Veera Niemi, who is doing this thesis, has also thanked you for your time. We will send this to Veera. If she wants to know more than this, I would approach you again for a short meeting. And I hope you will be able to allocate some time for that. Namaste.
Namaste.

Annex 9: Interview 8: Chairperson of FEDWASUN

(Translator's note: Due to time restriction, I have mentioned the questions only briefly.)

Namaste.
Thanks, Bhim sir.

This interview is taken on behalf of a Finnish student, Veera Niemi, who is doing her master's thesis. She has thanked you for agreeing to be interviewed.

[…The interviewer briefs about the aim, objectives and the scope of the study, and requests the respondent to answer on the basis of his knowledge and experiences….]

We have 10 questions from her.

What's your role in the water management sector of Nepal?
Thanks. I want to thank Veera for this, for choosing Nepal, and Devchuli municipality. I want to thank you all my friends also who are part of it.

Federation of Drinking Water and Sanitation (FEDWASUN) is a civil society organization of the WASH sector.

In Nepal, we have government-run water projects, the second category is run by Nepal Khanepani Sasthan (Nepal Drinking Water Corporation), then it's also possible to give water projects on lease to companies through a management board, and the fourth model is of water user committees. Our organization is the national representative of user committees.

We promote good policies and good practices initiated by the government. We also coordinate with the government. When policies are not user group friendly, we encourage the government to change them or to make new ones. We do so through positive feedback. We also coordinate (as a bridge) with donor agencies that are active in the WASH sector. We also work for capacity building of user groups in the grassroots level.

Directives and guidelines you follow (important ones)
The first one is the Water Resources Act 2049, then we had Water Resource Regulation in 2050. Then there is also Water and Sanitation Directive. We also had Sanitation and Hygiene Master Plan, which also has some aspects related to drinking water. There are also several other guiding-rules and regulations. We are, however, mainly guided by the Water Resources Act 2049. Recently, we also had a new WASH Act in the parliament, and if there was parliament, it could have gone forward. We also have rural water policies, urban water policies and so on. There are many. They make it difficult to act. So, we had demanded a single WASH Act, that's still in draft (in the parliament). We were involved in these policy making acts, including in the drafting of the WASH Act.

Are SDGs one of the guiding-principles that you use?
Yes, absolutely. That's our main mantra. Government agencies prioritize SGDs in their work, but we have a civil society SDG Forum also, that works on all the 17 goals. That is led by the NGO federation in general, but we FEDWASUN lead the goal 6 (which is WASH related).

Within SDG 6, we specially focus on 6.1 and 6.2, which are about water and sanitation.
When it comes to policies, the National Planning Commission does the review work. And there is cooperation and coordination between different ministries, donor and development agencies, government and civil society for SDG implementation.

We focus on the localization of SDGs. The situation was that Nepal had to have its own indicators, and it has done so. We work with local and provincial governments to ensure that those goals and indicators are achieved in time.

Where did it come from (the idea that SDGs should be linked)?
We had MDGs till 2015 and Nepal's performance in achieving the MDGs was good. Then we had SDGs. We had worked in MDGs, so we were wondering what would follow. Then the SDGs were declared. So, we had that concept that they should be incorporated, but we have had development partners too, and government agencies also pushed forward for SDG incorporation. Let's call it a joint effort.

Nepal has a detailed plan (roadmap) for how to go forward to achieve these goals, and the National Planning Commission has taken a lead role in that.

What's most important under SDG goal 6?
Water quality improvement is very important. Communities' meaningful participation is another important aspect. If there is no community ownership, there is no sustainability. We have also prioritized gender balance. Without women's participation, it's hard to promote WASH. We are also talking about 50% participation of women. Within them, there is the issue of inclusion of Dalits, indigenous and ethnic groups.

The next step is to move towards sanitation. If there is no proper sanitation, water quality also suffers.

Cooperation with other stakeholders/partners
The main partner/stakeholder is the Ministry of Water Supply, which is involved in making policies and oversees other various issues. Then the Department of Water and Sewage Management, Provincial Governments, local governments, NGOs, and donor agencies. However, the main ones, the ones implementing are the water user groups. They take ownership, and we work in partnership with all these stakeholders.

Do you expect more cooperation from these agencies in coming years?
Nepal is in a federal system, and there are some pending issues related to distribution and sharing of power. There are accusations that the federal government hasn't given enough rights to provincial and local governments. But even if they get all the rights, we see that there is not enough capacity to use them at the local level. That's why the Ministry of Water Supply should do more of policy supervision, make new policies by sharing roles and responsibilities.

The Department of Water Supply, which is a government agency, should oversee the implementation part. There are division offices in the districts. They and the local governments carry out implementation work. INGOs and donor agencies should allocate more budget for the WASH sector, because WASH is a fundamental human right. Civil society organisations like us should engage in activities like joint monitoring, independent monitoring, capacity building and so forth.

Discrepancies between rules/regulations/policies and implementation. What's the case in your sector?
I'll share an example which will be useful here. The cabinet (i.e. the government) has categorized the WASH sector into three groups, on the basis of population size. It has been said that the responsibility lies in the federal, provincial and local governments. The constitution has also included drinking water issues in its index (within the common good list). However, the Local Government Act has given certain rights to local governments. When implementing these legislations, conflict has occurred between the provisions of the constitution and the rights ensured by the Local Government Act. Even though the cabinet has decided it in principle, during implementation, there are issues regarding the size of water projects and questions regarding which government is the right one to handle them.

For example, in Dhadhing, there is Dhadhingbesi Drinking Water Project (which is in the district headquarters). That water project is registered in the federal system. Federal government funds it and is funding a new project just now. But by using the Local Government Act, the mayor and the municipality dissolved the committee working for that project, by simply showing an administrative issue. Then the mayor formed a new care-taking committee, and when there was an attempt to organize elections for a new elected-committee, he stopped the election. So, we see this sort of conflict in WASH these days. As I said, the water project was with the federal government, but the local government intervened.

That dissolved committee went to the Supreme Court, and the court has said that the intervention of the municipality was illegal, and now there's a "stay order" for it. And the case is going on in the court.

It's not good that there is a court case going on in an issue like that, of drinking water, which is a fundamental human rights issue. It makes us feel bad also. But it's a rights issue of the users committee. We also supported them (the dissolved committee).

Drinking water management during disasters
The first thing is that from the moment we estimate a new water project, we need to take into account the geographical topography, and design the project accordingly (to minimize possible future damages from natural disasters). Despite precautions, damages do occur from time to time. In such cases, if the water project is of the federal government, the repair is done from the national treasury. But user groups also have reserved funds, and they make use of that. They stay stand-by and make necessary repairs.

Who is responsible for bigger repairs and reconstruction work (in case of such damages)?
As I said already, we have four types of water projects, and as the question focuses on community drinking water management, I can be more specific on that. As I said, out of four, one is community drinking water, whose management is overseen by water user groups. The government helps with the initial project funding, but after that the idea is that the community takes care of the management part. Within the community also, there is an organization and an executive committee. In case of a problem, that committee meets. If consultation with the broader community is needed, a community meeting is organized, and that meeting can take particular decisions, including asking for assistance from the government or donor agencies. So, it's collective decision-making.

Main problems and challenges faced by user groups in water management
The main one is water quality issue. In big water projects, there are treatment plants for maintaining water quality. But in small projects, especially in rural areas, that possibility is scarce. So, ensuring water quality everywhere is one issue. The next is capacity building of user groups (by using trainings etc.). The need is also to be tech-friendly, for example instead of the old billing system we can start e-payments (at user group level). This would help us be more managed and transparent.

The need for training etc. for water management
I think the first issue is that of office and organizational management. If an organization is managed well, a project that is run is also likely to be run well. Water user groups are working voluntarily, so there are no educational or any other qualifications required for them. They are selected from community meetings. So, they need assistance. For instance, they might need management training, they might need bookkeeping, record-keeping, computer, information management and retrieval training, and if there are employees, user groups need to know how to manage them.

The most active agent in managing water management in Nepal
When there is an issue, the first one to be active are the user groups. But being first doesn't mean that they are able to manage all problems themselves. They might lack technical or financial capacities. So, they need to seek financial or technical assistance from government agencies (e.g. Ministry of Water Resources). Help might also come from the private or civil society sectors. So, all these sectors – government, civil society, private sectors– need to be active, but the user committees must be at the forefront, if our concern is sustainability.

3-5 issues that need to be addressed/improved
First, the main thing is we need capacity building of user committees. Second, we need to pay attention to improve water quality. Third, WASH governance appears a bit weaker, we need to improve that. Fourth, we have the system that whoever implements a project, that monitors it. There are concerns that it hasn't

been very effective. So, a joint or third-party monitoring system would be better. Fifth is sectoral coordination. The Ministry of Water Supply is the lead ministry when it comes to WASH, but drinking water issues should be linked with issues of health, education, and gender, too. So, we need broader sectoral coordination.

Thank you very much sir, from us and from Veera.

Thanks.

Annex 10: Interview 9: Senior Engineer, Ministry of Infrastructure Development, Gandaki Province

Translator's notes:
- Though the interview clip was 47 minutes long, the dialogue was very slow, and as a result, the transcribed text is not very long.
- The interview was interrupted on several occasions due to bad Internet connection and some sections of the audio were simply blank.
- The questions have been shortened to save time and to finish the translation on time.

[Interview starts]

First, I'd like to welcome you. We are conducting this interview on behalf of a Finnish student who is doing her master's thesis. Her name is Veera Niemi. Her master's thesis focuses on rural water management of Nepal, and she has been talking to different stakeholders. She wanted to come herself, but, unfortunately, she couldn't come due to different reasons. And she has thanked you for being ready to do this. For your information, we are going to send this recorded audio to her.

What is your position regarding water management?
Ok, namaste. Happy New Year 2021! I work as a senior divisional engineer at the Ministry of Physical Infrastructure Development at Gandaki Province. I've nearly 25 years of experience in the water sector. For nearly 10 years, I travelled to different districts as a sub engineer and worked in designing and surveying.

I was also involved in implementation and supervision of water projects. For the next 10 years, I stayed in different districts as an engineer, and did almost the same things. For the last 5 years, I've been working as a senior divisional engineer at the Ministry of Physical Infrastructure Development, and I work at the WASH section of the ministry. Here, I'm mostly involved in planning, and also look at different phases of development and distribution, budgeting, quality assurance, as well as making different policies and strategies, and so forth.

Which stakeholders are in close cooperation with the provincial government? (What operators do you mostly work with?)
Thank you! We have different sections at the ministry. I mostly work with the Secretary and the Minister, and different sections at the ministry. However, we coordinate with other offices also. We need to cooperate with the Chief Minister and the office of the Chief Minister, as well as with the minister and the Ministry of Economic Affairs and Planning (normally for budget allocation issues). We also need to coordinate, as per the need, with the Provincial Planning Commission, different political bodies and different local members. We also go to the bottom, to the user groups and user committees. So, there is coordination from the ministries to the user groups.

Could you elaborate a bit more about your coordination with the user groups?
We have seven divisions under the department I work. There are different Water and Sanitation divisions in different districts, and we work through them. That's how we reach the user groups and help solve their problems, or any policy issues.

[…Chatter, interviewer says there is a problem with the Internet connection…]

How do you collect information and do so reliably? How do you ensure quality?
In order to receive and send information quickly, we use email, that's what's the latest and the best technology we have. But the government rule requires that we also need to send the hard copy [of a document]. So, hard copies are sent by post. Since hard copies take time to reach, work is mostly done by email, before hard copies arrive.

What about quality assurance? How would you grade it from the scale of 1-5?
My experience is that there is a lack of clarity regarding the jurisdiction of the three levels of governments. That has affected decision making processes, acquisition and purchasing processes, and we might need to change that. Also, there has been a delay in formulating federal acts, rules and laws. That has also had an impact at the province level because we have to rely on federal laws when we have to make regulations at the provincial level.

There are transparency issues, too. There is a lack of budget. We have to pay attention to quality issues also.

If I have to rank, it would be around 3.

When it comes to improvement, the most complex issue is coordination. And there has been a delay in formulating laws and regulations at the federal level, and that has negatively affected the work of provincial as well as local governments. In order to improve, there should be timely formulation of federal acts, strategies and guidelines; and so that the provincial governments can continue with formulating their strategies.

When it comes to budgeting, there needs to be more of it, enough of it. There are issues of monitoring systems also, and we need to pay special attention to that. If we go for monitoring from the province level, we have noticed, the overall quality and management of projects seem to be good. So, having a good and feasible monitoring system is very important, and I think we should focus on that.

And, yes, there are quality issues. And for ensuring quality, there should be the development of sustainable water management strategy at all levels, including the local, regional, and national.

Where is the weakness in maintaining transparency? (As we know transparency improvement is linked to sustainability in terms of ownership also.)
When it comes to transparency, we need to pay attention to the awareness of focus/user groups, by training them or by educating them. And if the groups themselves focus on transparency, then only it can be achieved.

On Repairing of infrastructure
Operation and maintenance are integral part of a project, without that any project can't be successful and sustainable. Operations are mainly the activities we carry out or the services we provide. However, maintenance is important for the continuity of a project.

In this, the first decision we have to take is we have to assess the type of repair required. The Water Act 2055 directs that in every project the water quality should be maintained, the water source should not be adulterated, no harm should be done to the environment, and that the projects should be repaired regularly. When it comes to repairing, we have to define between major and minor repairs. Among minor repairs, there could be, for instance, water leakages, and we need to fix them. We might need to place pipes below the surface, we need to repair chambers and taps, and these are minor repairs. These minor repairs are done by the service delivery organization.

When we say major repairs, we especially mean the sudden damages that cannot be solved by minor repair work, i.e. those repairs that need additional budget. In such cases, we seek support from the local government, and if that, too, is not able to solve, then we seek budget support from the District Division office. In such cases, the District Division office conducts a field visit and then makes a budget estimation. After that, the major repair work is done. So, there is this difference between minor and major repairs.

How does the province government support these activities?
When we hand over the projects, we don't normally take responsibility for the aftercare of completed projects. Completed projects are run by the user groups. But when difficult and complex repairs are required, we have a fund intended for completed projects also, and we allocate budget from that, as per the need.

What could be done to improve sustainability (of water projects)?
I work at the ministry level, and we, too, need training, especially in the field of planning, optimum use of water resources, policymaking, regulation etc. But at the project level, we see that a pre-construction training is needed, which is focused on the formation of user committees, fund collection, responsibility issues, and contribution. At the implementation phase, we need construction-related training. At this phase, the focus is on the construction of infrastructure, quality issues, community contribution in management, and so on. How to manage people's participation, and training are related to this.

It is also important to include a water safety plan already in the implementation phase. Normally, it is done after project handover, but in my opinion, it should be done already at the construction phase. This training normally includes 10 steps, where users and user committees understand about water safety issues. If we focus on this, a project can be sustainable.

In my opinion, water safety plan and functionality index are important. What are the indicators of success? Indicators could be, for instance, registration of user committees, the situation of repair work, staffing, fund availability, water tariff collection plan and implementation, record keeping, tools and fitting availability, whether the safety plan is functional, whether it is reliable (is water available for all 12 months?), accessibility issues. These indicators should be focused.

There is also the physical structure index. With that, we can look at the overall condition of the water source; we need to supervise that. There could be indexing for transmission line, grid chamber, treatment systems (eg. rough end filter, slow sand filter), chlorination chamber, reservoir tank, distribution line, private tap. How is the overall condition of these infrastructure? We need to focus on that. That is also important for sustainability. We can have for instance three indicators: Good, Satisfactory, and Bad, and discuss with user groups.

We might also need to arrange post-construction training where we need to focus on operation and maintenance.

(…Internet disconnects, no conversation…)

How a project can continue with operation maintenance. In this, there are also other management related issues, as I already discussed under the functionality index. These are issues, for example, repair funds, reliability issues, water safety plan, etc.

I would say that it is better to implement a water safety plan already at the construction phase, but it must continue in the post-construction phase also.

In which conditions do you need to provide written guidance to lower bodies?
Article 35 of Nepal's Constitution, under the sub-article (4) Right to Health, says that every citizen will have the right to have access to safe drinking water and sanitation. We take note of this very seriously. On the other hand, Gandaki Province, in its Fifth Year Plan Base Paper 76/77, it aims to ensure 100% access to basic drinking water, medium and high-quality access to 50%, and complete sanitation services to 30% households. (Translator's note: this sounds pretty confusing to me, why would the government aim for sanitation access only to 30% of the population? If necessary, you can check with your contacts or with the respondent). That's why, ensuring people's access to clean drinking water, is on one hand, a fundamental right enshrined in the Constitution of Nepal, and on the other hand, Gandaki Province has also prioritized it well.

In our province, we are also going to find out the "unreached population" and make district profiles on that basis. Basic drinking water has been a subject of high priority for all the three levels of governments. In the WASH sector, there is also an interest of the private sector, as well as of international actors, and that shows how important it is.

We have also noticed that, at the local level, the end users are more engaged and active than before. They are very proactive in demanding projects, participate actively in implementing and running the projects, and are equally interested in coordinating with different stakeholders. This all helps with project sustainability.

The use of modern technology is also being intensified (such as solar pumping) in order to ensure safe drinking water to everyone. The new technology has made things less expensive, and we have emphasized on these things also.

Three things that could be done to ensure safe and clean drinking water to all households?
I think I have already answered that. The main thing is that all three layers of governments have adopted the drinking water issue as a fundamental right of the people, and I think that is important. On the other hand, all three layers of governments have given a top priority to the water sector. Similarly, the interest of the private sector and different international actors/donors is high in the water sector. The heightened interest of users themselves is also significant. I think these all will contribute to ensure 100% access to drinking water.

Thank you sir, for your contribution. Thank you also on behalf of Veera, and we hope these inputs will immensely help her.
[Interview ends]