



Hydro-Social Mapping of Drinking Water Sources in Kavrebhanjyang, Dhulikhel Municipality

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Executive Summary

This hydro-social mapping report is a part of an ongoing research project 'Transforming Political Capabilities (PolCaps) for Equitable Resilience'. The PolCaps project is funded by the Economic and Social Research Council (ESRC) of the United Kingdom (UK) under the UKRI GCRF Collective Programme and led by the University of York, UK. The project aims to understand the urban marginality issues in collaboration with the local communities and authorities to transform the political capabilities of the marginalized group(s). Southasia Institute of Advanced Studies (SIAS), one of the project partners in Nepal, is undertaking this research project in Dhulikhel Municipality (DM) of Nepal with a focus on access to water supply services and decision-making of the marginalized community in Kavrebhanjyang, Ward No. 9 of DM. As a part of this study towards research-informed action for developing better water management initiatives, SIAS in collaboration with Dhulikhel Municipality explored and documented the status of existing drinking water sources (both tapped and unused) and the water supply systems adopted by different communities.

The study shows that spring are the primary sources of water supply in Kavrebhanjyang. Over the past several years, many governmental and non-governmental agencies supported the local communities to start, repair and extend spring-fed drinking water services in Kavrebhanjyang. However, the water demand there has grown with increasing urbanization, changing farming practices and rural-urban migration. Additionally, most of the water supply infrastructures of the existing drinking water supply systems are over two decades old, deteriorated and inadequate to cater to its increasing water demands.

Addressing the growing water demand-supply gaps in the municipality, DM accorded top priority to the water supply provision. In 2017, the municipality launched 'One-House-One-Tap' (1H1T) project- which also aligns with the (inter)national goal of universal access to water- aiming to provide household tap water supply service for all by 2022. In Kavrebhanjyang, the 1H1T project utilizes local natural spring water sources and three deep borewells installed under this initiative. While 1H1T service has started in most parts of Kavrebhanjyang, works are ongoing in Phaskot, Phusrethumka, and Thulitar area. The continuous efforts of the local government, including the commitment to 1H1T service, are commendable. Discussions with the communities of Kavrebhanjyang and the municipal authorities, however, revealed that technical challenges in a borewell led to some delays in the progress of the 1H1T supply in this ward. During these discussions, the local communities, the ward and the municipal governments emphasized that improvement in the management of the local spring sources was crucial for improving water management and expediting the progress of the 1H1T initiative in this urbanizing hilly ward.

Studies in the South Asia region also stress that effective management of springs is a prerequisite for effective water management in the Himalayan region. In this regard, inventory and revival of springs have gained an increasing priority in the neighboring countries, particularly India and Bhutan. For instance, the Niti Aayog of India has formed a Springshed Management Working Group and prompted systematic approaches to inventory and revival of springs in India.

In these contexts of growing needs and interest of generating knowledge on the local spring sources, SIAS, in collaboration with the local government and with support from the local communities, started mapping of the spring sources in Kavrebhanjyang. We have also mapped three deep borewells recently installed under the 1H1T initiatives. This report provides a detailed inventory of the various water sources, their present conditions and the users of different water supply systems. In consultation with the communities who have been using and managing the water sources, we also highlight the changes in the discharge and quality of spring sources over seasons and over the years, the social aspects including the community perspectives on the possibility and challenges to use of these sources, including the willingness or reluctance to share spring sources. This documentation of the state of local water sources can be useful, for the local communities, ward and municipality for co-developing sustainable water management strategies and to ensure inclusive decision making and equitable water access for all, including communities with poor water access.

Before identifying and mapping the drinking water sources in Kavrebhanjyang, we conducted Focus Group Discussions (FGDs) in nine different settlements with local communities including elected representatives. With the help of local resource persons, we visited each source identified during the FGDs, that are under use in current drinking water supply in ward no. 9 (piped water supply, traditional and deep bore system). We gathered essential information and data of the sources with the help of local resource persons, community people and the water users. The report follows qualitative methods, which are supplemented by the GIS tool. In multiple rounds of fieldwork, we used participatory mapping, Geographic Information System (GPS) survey and also captured the social aspects of all the water sources. The information was triangulated during various formal and informal workshops, interviews and discussions with the community water stakeholders and users.

Our findings show that the availability of the natural springs in Kavrebhanjyang is not the same in all settlements. While uphill settlements have limited sources, lower reaches (e.g., lower *Darimbote*, *Panityanki*, *Patlephant*/eastern part of *Phusrethumka*) have multiple sources and improved management which can be important for achieving equitable, sustainable, and affordable water supply in the area. Despite discharge fluctuation between the seasons, most of them are perennial, offering the community with year-round potable water in addition to serving additional domestic water needs. A study on spring water sources assessment in Roshi and Melamchi watersheds also shows that ward no. 9 (i.e., Kavrebhanjyang) and 10 of DM is rich in water sources.¹ The primary choice of the community for drinking water is traditional spring sources (*muldhara* and *kuwas*) that they perceived as potable compared to the larger piped water. However, piped water supplies are considered easy with improved water services but they have various problems, such as increasing contamination of water sources, irregular and insufficient water supply and unfair/unequal access, etc. Many emphasized that rather than the availability of water sources, weak management of existing supply systems with an appropriation of many sources by the local elites and lack of maintenance have challenged improved spring-fed systems in Kavrebhanjyang. Although some communities (either individually or collectively) occasionally self-organized and cleaned their water supply systems, the community stressed that a lack of active and

¹ Chaudhary et al., 2021.

organized user committee was a major cause of weak and ineffective functioning of the existing water supply systems there.

Therefore, we suggest that reformation/activation of water users committee is crucial. At many sources, water has not been tapped to its potential while others are free flowing. There is higher potential of tapping local spring sources to increase the coverage of spring-fed system and improve water supply services by adding new infrastructure, modifying and reconstructing the aging structures (such as, repairing storage tanks, making water chamber, blocking the leakages). There are many other sources located on private lands reported to be potable but the right to use water (i.e., water right) has traditionally been linked to the land tenure rights. The land owners often claim their traditional right to the sources. This, however, will need constructive dialogues and discussions with the communities/individual who owned the sources (either by formal registration or by long-term practices of water use) and are against sharing those water sources with other communities. Gaining trust of the communities, convincing them through a clear strategy to ensure water for all and the importance of integrating sources in conjunction with the deep borewell fed system to improve water supply is crucial given its dispersed settlements and water sources. Municipal efforts to encourage inter-community and inter-ward/water sharing and collective efforts for source conservation will be crucial for a sustainable and equitable water supply.

1. Introduction

Nepal is rich in water resources and has high annual rainfall (about 1500 mm)². It is estimated that about 2.27 percent of the total freshwater in the world is in Nepal (WECS, 2011). However, the country faces problems related to drinking water such as low per capita water availability, poor water quality and poor water management (Gurung et al., 2019, Sharma et al., 2016). Article 35 (4) of the Constitution of Nepal stipulates that every citizen has the right to access clean drinking water (Constitution of Nepal, 2015). A report published by the Department of Water Supply and Sewerage Management (DWSSM) shows that about 87.9 percent of households have a basic level³ of water access but this figure does not mean all people have piped water supply. About 33.4 percent of households use deep tube well and 2.7 percent use natural springs (*mul*). The report shows about 51.7 percent of households have piped water supply and the rest (more than 12 percent) still do not have basic drinking water facilities (DWSSM, 2018). It indicates that a large number of households lack basic drinking water facilities and the piped water supply system. The available piped water supply frequently suffers from multiple problems such as external damage to supply infrastructure (by natural and anthropogenic factors), distribution defects, lack of timely maintenance (Adhikari, 2019). As per the record of UNICEF, only 25 percent of the water supply is fully functioning and more than 40 percent needs major maintenance⁴. Well-functioning piped supply does not always mean that the water supply is safe, regular and distributed equally to all the households (Shaheed et al., 2014).

The issues of water access and management are primarily associated with water governance practices. In Nepal, the Ministry of Water Supply⁵ is the federal level governing institution that primarily works in the water supply sector of Nepal formulating and implementing national plans and policies. Similarly, the Department of Water Supply and Sewerage (DWSS) is responsible for planning, implementation, operation, repair and maintenance of water supply and sanitation systems of the country. Besides, the Ministry and Department, boards, committees, project directorate, water supply corporation and water tariff fixation commission are other regulatory bodies involved in the delivery of urban water and sanitation services. The Water Resource Act (WRA) 1992 of Nepal is an umbrella act governing wider dimensions (priority right, use and management) of water access and management in the country. WRA, 1992 declares that the ownership of the water resources goes to the state. The local government operation act, (LGOA) 2017 set out the power, functions and responsibilities to the local government i.e., *Palikas* which

² <https://www.imnepal.com/rainfall-nepal/>

³ Basic level means- access to 45 litres water per person per day either from piped water supply system or other system.

⁴ <https://www.unicef.org/nepal/water-and-sanitation-wash>.

⁵ <https://mows.gov.np/about-ministry-of-water-supply/?lang=en>

also includes other committees' members who are not elected rather selected but play crucial roles in local decision making. The LGOA 2017 authorizes local governments to formulate and implement the plans and programs at the local level. The governments have been implementing various policies and plans to manage water resources and tackle the problem of water access but the results are still not satisfactory. Although the act (clause no. 3) provides the state authorities with the power to control the water sources located in both public and private land, rescinding the established local norms and associated traditional institutions and practices of control and claim over water sources is not easy. Sometimes these traditional norms and social practices, which are broadly categorized as informal practices, are more powerful than the existing formal laws, and can ensue disputes between and among the formal and informal actors (Regmi and Shrestha, 2018).

Proper management is necessary to ensure access to clean water for all since it is a crucial right. This may include effective distribution, conservation, and protection of spring sources. Studies in South Asia region also stress that effective management of springs is a prerequisite for effective water management in the Himalayan region. In this regard, inventory and revival of springs have gained an increasing priority in the neighboring countries, particularly India and Bhutan. For instance, the Niti Aayog of India has formed a Springshed Management Working Group and prompted systematic approaches to inventory and revival of springs in India (Rathod et al., 2021). Broadly, this report, through primary data of a case of drinking water supply system of Kavrebhanjyang located in Dhulikhel Municipality ward no. 9, analyses the availability and distribution of drinking water sources and attempts to unpack some of the issues related to equity and marginality in local water governance. Specifically, this report is to map and prepare a detailed inventory of the different types of existing water sources (both tapped and untapped) available in Kavrebhanjyang. We hope that the mapping of the local water sources can be useful, primarily for the local communities, the ward and municipality for devising sustainable water management strategies and ensure inclusive decision making and equitable water access for all. This report primarily focuses on exploring:

- What are the major water sources in the study site and where are those located?
- What is their state of use? What are the challenges and opportunities in their use for improving water access in the area?

The following section describes about the study site and the methodology adopted in this study. Subsequently, we analyze the status of various water sources located in the study sites, broadly categorizing them into four broader types based on distinct features. Discussion on the issues of water access and management is made in the later section that also comprises the arguments made on government project 'one-house-one-tap'(1H1T). This section also reflects on the dominant municipal discourse 'source unavailability'. The report ends with some conclusions and ways forward that can be instrumental towards making an inclusive future action plan.

2. Kavrebhanjyang – Study Site

Dhulikhel is a municipality in Kavrepalanchok district of Nepal located about 30 km east from the capital city, Kathmandu. Among the 12 wards (administrative units) of DM, Kavrebhanjyang is ward no 9. bordered by ward no. 10 (*Sharada Batase*) and ward no. 11 (*Patlekhet*) in the south. Towards its north, are ward no. 7 (*Narayanesthan Etol*) and ward no. 8 (*Bhattedanda*). It spans to Panchkhal Municipality to the east. The B.P highway (Sindhuli-Bardibas) connecting Kathmandu and Tarai passes through Kavrebhanjyang.

Geographically, it has a hilly topography, a temperate climate and a primarily south-facing slope. *Dhobikhola*, *Sitaghari*, *Sudi khola*, *Dolcha Kholsa* are the small seasonal streams. Sub-tropical trees such as Chilaune (*Schima wallichii*), Katus (*Castanopsis indica*), Utis (*Alnus nepalensis*) are major trees found in the upper area (about 1670 m.a.s.l) and some tropical species like Sal (*Shorea robusta*) are also found in the lower belt (about 1080m.a.s.l). *Dhobikhola* and *Sitaghari* Community Forests (CF) are the major forest user groups within this ward. Pine tree, which was initially planting by the Australian government in the 1980s, dominates the forests in the area.

As per the municipal record, the total population of the ward is 3343 (see in the table) and agriculture (crop farming and livestock) is the main source of livelihood. Production of varieties of vegetable crops and milk production are popular in this area as it is located near larger market centers (Dhulikhel and Kathmandu). Ranachhap, *Tamang tole*, *Pariyar tole*, *Lamsal Gaun*, *Darimbot*, *Chhotedanda*, *Phusrethumka*, *Bajgain Danda*, *Phaskot*, *Pani tyanki* etc. are the major settlements where primarily Brahmans-Chhetri, Tamang and Dalits⁶ live (see in the map 1).

Table 1 Population distribution of Dhulikhel Municipality

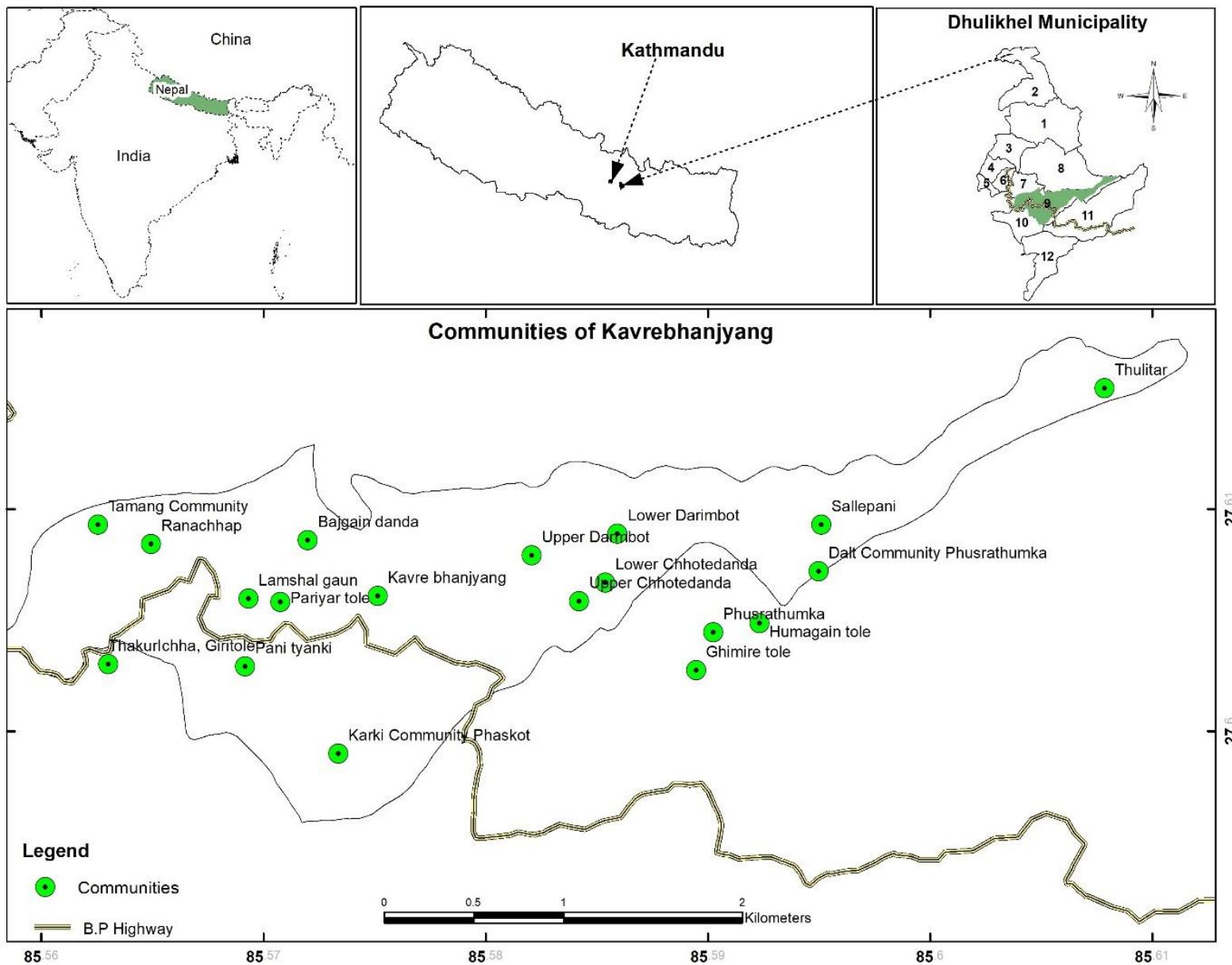
Ward no.	Name of the ward	Total household	Population	Total Dalit HHs (Households)
1	Devitar	550	2240	
2	Rabi Opi Gaun	621	2659	
3	Dhulikhel	524	2533	
4	Bakhundol	853	4798	171
5	Shreekhandapur	1000	1852	
6	Bhagawatisthan	375	2114	
7	Narayansthan Etol	390	4190	
8	Bhattedanda	915	3739	(60)

⁶ Dalit, previously known as untouchables, is a symbolic name of people historically placed at the lowest stratum of the castes. See GURUNG, H. 2005, BHATTACHAN, K. B., SUNAR, T. B. & BHATTACHAN, Y. K. 2009.

9	Kavrebhanjyang	1047	3343	200 (250)
10	Sharada Batase	322	1484	18
11	Patlekhet	839 (1050)	4112	(About 160)
12	Shankhu Patichaur	660	1930	
	Total	8096		

Source: Municipal record (ward profile)⁷ and updated based on interviews (The figures in the parentheses are from the interviews)

⁷ <https://dhulikhelmun.gov.np/en/ward-profile>



Kavrebhanjyang was a Village Development Committee (VDC), named as Kavre Nityachandeshowri prior to the administrative restructuration of the nation in 2015. After restructuring, it became ward no. 9 of DM merging the whole VDC and some of the previous wards of the DM (10,11 and 12). Although Kavrebhanjyang is administrative part of a municipality, which in Nepal denotes urban, its land uses, lack of urban infrastructures and lifestyle manifest rural features of the area. A number of infrastructural development projects primarily road construction and water supply are ongoing in Kavrebhanjyang. Although a large part of the budget has been invested in road construction, the Ward Chair stipulated that water supply remains a priority. After the local election in 2017, the elected municipal government initiated '1H1T' project in line with the national target of achieving Sustainable Development Goal (SDG – 6, Clean Water and Sanitation for All) by 2030. This project aims to provide "improved" tap water to all the households located within the municipality. The 'one- house-one- tap' project in Kavrebhanjyang started in 2019 through both 'spring-fed system' and 'deep bore system' with more priority given to the latter one. DM has invested a huge amount for the two deep bore wells made at Kavrebhanjyang but the communities are uncertain about its reliability and sufficiency. They rather opined that local spring sources are more reliable so their management would rather be a more sustainable option. Similar perspectives foregrounding the potentiality of local-spring fed water system in all the participatory fieldwork conducted at Kavrebhanjyang (see below) indicated that the spring sources of this place might have not been adequately explored. Together with the communities and ward government, we concluded the mapping of the local spring sources would give an idea on their availability and reliability of spring sources in the area. The findings of this report can be useful to co-design local water supply system and expedite the progress of ongoing 'one-house-on-tap' project.

3. Methodology

The study adopted qualitative research method and used Geographical Information System (GIS) as a tool to map and present the status of the water sources, their types and locations. Field data were collected in multiple rounds of field visits between July 2021 to September 2022. We began collecting data by conducting Participatory Mapping Exercise through Focused Group Discussions (FGDs) in nine different settlements of Kavrebhanjyang. The participants in the mapping exercise ranged from five to 12 locals from the community, including community level water managers and elected representatives. In each mapping exercise, we asked participants to draw and locate the water sources as well as other major features such as roads, rivers and forests of their settlement. Participants actively engaged in sketching their water source on the given card board. This was followed by discussions on the available water sources, history of water management, state of water access for different social groups and other socio-political aspects. As researchers, we (SIAS team) facilitated the exercise and discussion and ensured equal

opportunities to all the participants to put forward their thoughts and knowledge. The participants openly shared the challenges they were facing due to the water scarcity issues and ineffective water management systems. These discussions with the communities were helpful to understand existing knowledge and water management practices adopted in different settlements and document them. It also helped us to build a network and convey the purpose of the study with the locals and stakeholders for further exploration.

In the next round of fieldwork, we visited the water sources (that are primarily being used for drinking water purposes) located within the ward and collected coordinates of each of the water sources using a GPS (Global Positioning System - GPSMAP® 65) device. It was accompanied by the local resource person/community people. Along with the GPS coordinates, we also collected the socio-political and environmental aspects [e.g., numbers of users, current status, existing management practices, users committee] of the sources through consultation with local resource person and informal conversation with the locals. The local resource persons were local residents and well-acquainted with the location of local water sources as well as the traditional and current water use and management practices. The identity of all field supporters is anonymized throughout the report as RP1, RP2, RP3, etc.

We also inquired the nature of the source discharge and the seasonality of the sources. This experiential knowledge, observation and perceptions of the daily water users helped us to substantiate the quantitative assessments which as per the municipal authority was done through one-time dry discharge measurement of selected sources. The discharge of springs of the Himalayan region varies due to the rainfall pattern (Adhikari et al., 2021). Building on the existing literature and to establish methodological consistency, the field visits (visiting the sources) were conducted a week after the rainfall. The collected socio-political and environmental information was documented in detail, analyzed and tabulated. Also, the collected GPS coordinates were plotted in ArcGIS 10.4 software to produce maps. We produced four GIS maps categorizing water sources into four types. Additionally, the issues of water access and management have been mapped out separately after analyzing of the data.

We also organized a local level workshop in August 2022 where all the elected representatives from the ward and community people including local water stakeholders (total 50 - representing all social groups castes, gender, age) participated. The workshop involved presentations and discussions to get final inputs, corrections and validation of the information presented in the report. During the workshop, participants were divided into five different groups based on their proximity to the spring water sources and settlements. The printed draft maps prepared in Nepali language were provided to each group where they got an opportunity to check and ensure if all the drinking water sources of their communities were included in the maps and if the information were presented correctly. They added all the water sources that were not

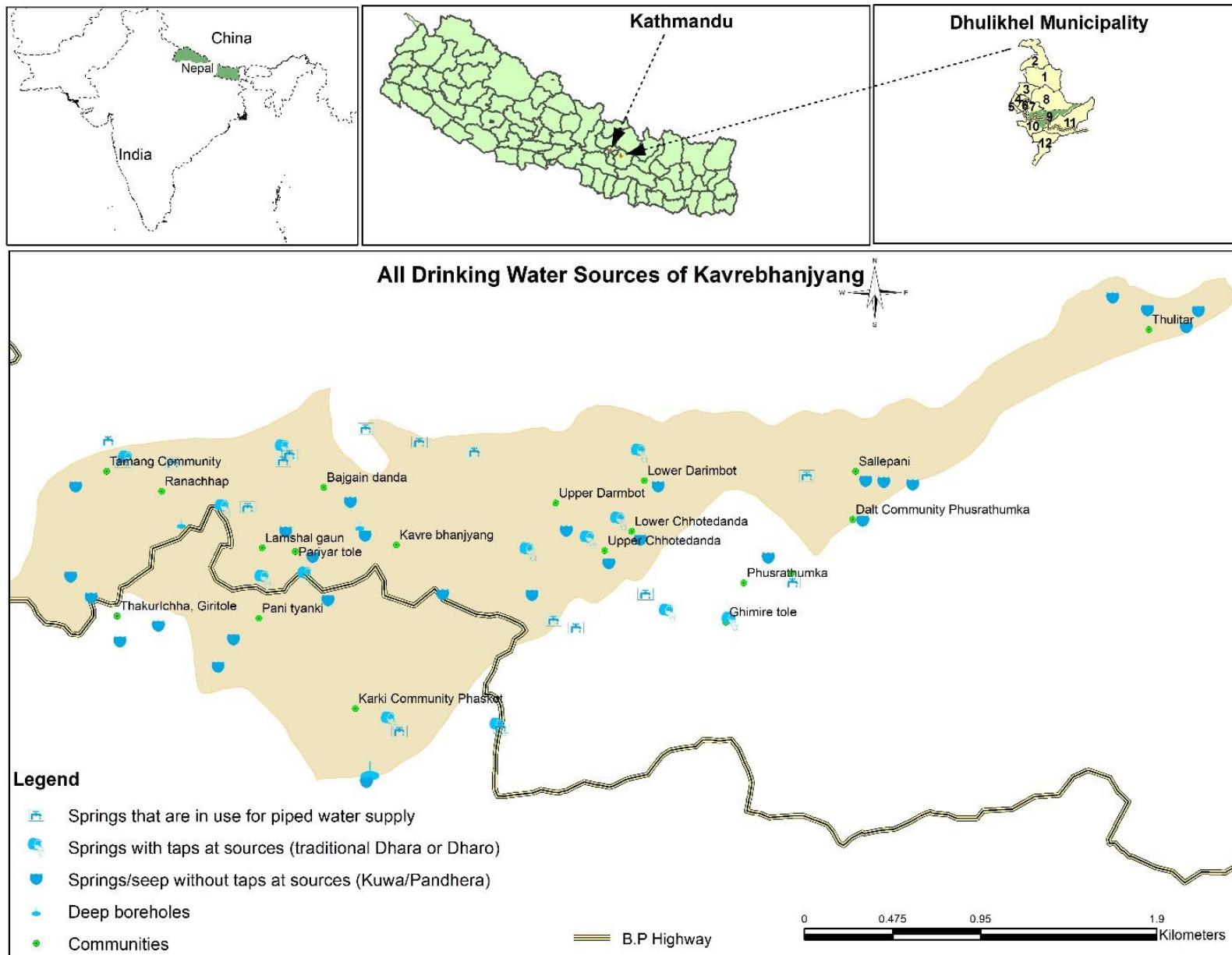
included in the maps and provided other socio-economic information of each source as per the checklist designed by researchers. Subsequently, another round of fieldwork was conducted during September to October 2022 to incorporate information of the missing sources that were identified by the participants during the workshop.

This report documents the state-of-the-play of the existing local drinking water sources and does not cover sources that have dried already. We also attempted to capture the perception on the reliability of the existing sources asking people about the seasonal fluctuation and variations in water discharge in different sources. This information was triangulated through series of discussions with water user communities and concerned stakeholders. The ultimate objective of this study is to understand and document the availability of the drinking water sources that possibly helps to inform the stakeholders and community to co-develop the strategies for equitable access to water. The local government can consider this report as a baseline study to identify the most potential sources for planning and developing local water supply system.

4. Water Sources and Classification

Springs in Kavrebhanjyang are primarily used for domestic purposes such as drinking, washing, and feeding livestock. Different scholars and academics use different indicators to categorize springs. For instance, Sharma et al. (2016) classified spring sources into four different types based on the purpose of their use and the nature of discharge; *Dharo* (free flowing), *Kuwa* (a shallow hole), *Innar* (well) and *Tyanki* (water stored in a tank). Based on geology, Chinnasamy and Prathapar (2016) classified springs into six categories; Depression spring, Contact spring, Joint spring, Fault spring, Fracture spring and Sinkhole spring.

Based on their seasonality, springs can be categorized in two broader types: i. Perennial-springs with regular yearly discharge but with varying amount in different seasons, ii. Seasonal-springs that only emerge during the monsoon and dry up during dry season (Upadhyay, 2009, Sharma et al., 2016). In this study, we focused on the state of the use of aquifers and classified various water sources of Kavrebhanjyang into four broader types (see map 1)- i. Springs that are in use for piped water supply, ii. Springs with taps at sources (traditional *Dhara* or *Dharo*), iii. Springs/seep without taps at sources (*Kuwa/Pandhera*), and iv. Deep boreholes. We also noted the seasonal characteristics of those springs. Beyond these four categories, we have presented some specific cases of the sources that are left stranded due to migration of people and sources that are only in use for irrigation but have higher potential for drinking water purpose.



Map 2 All Drinking Water Sources of Kavrebhanjyang

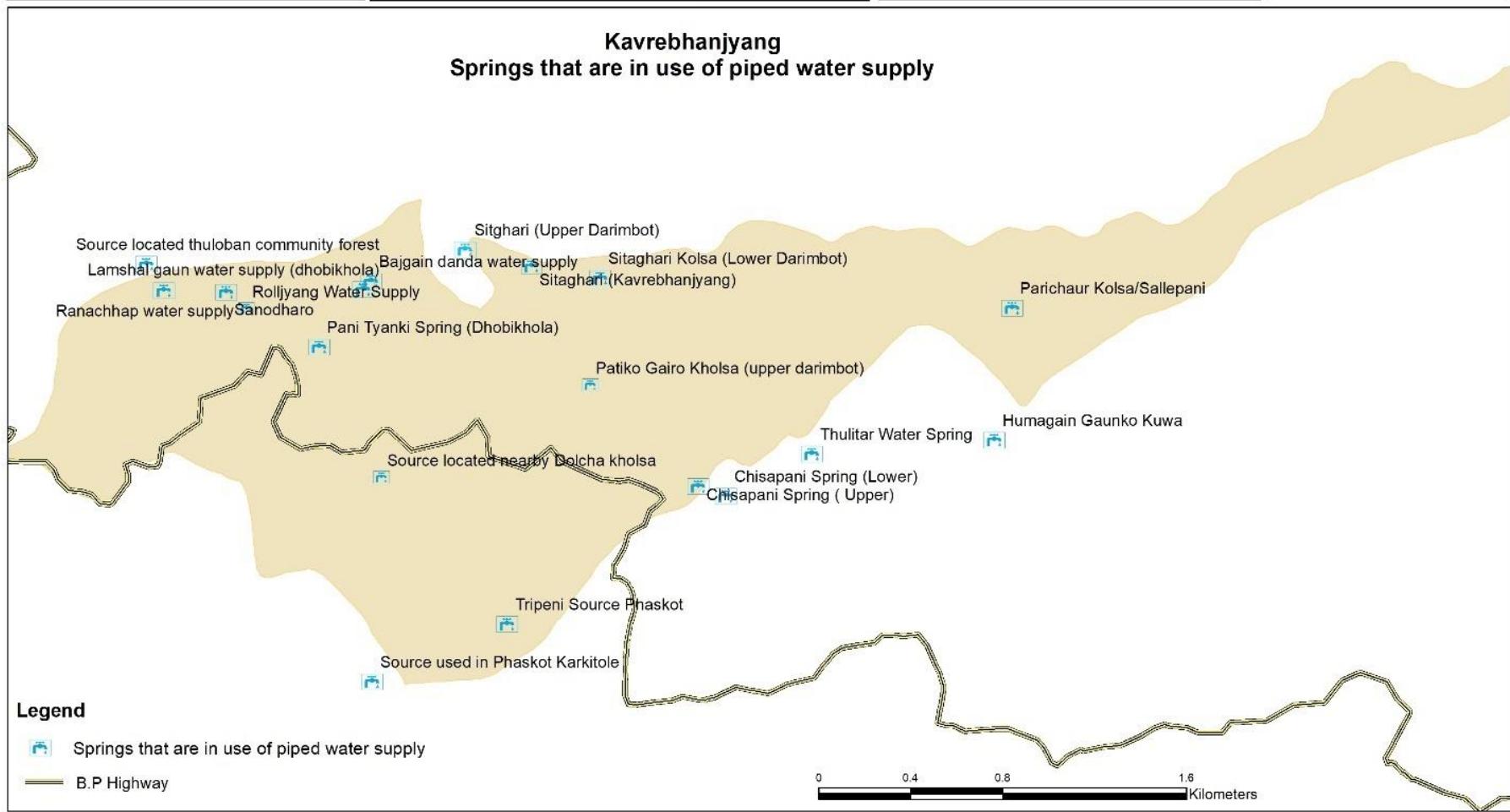
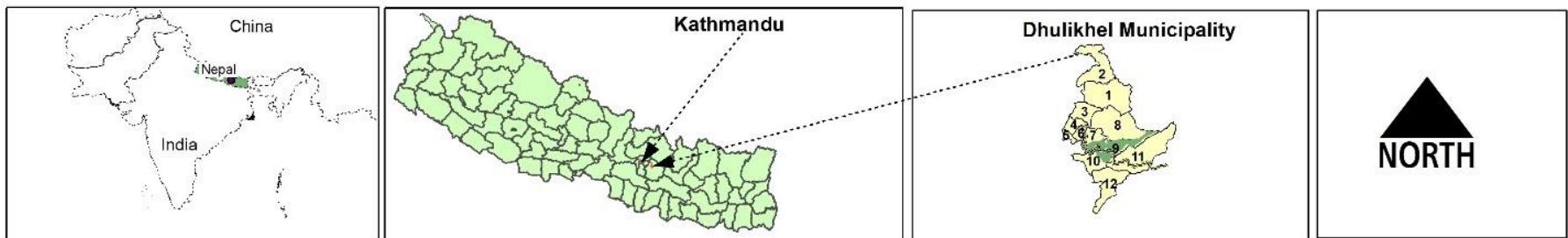
Dug well⁸ and rainwater are other types of water sources that are partly in use in some of the areas of Kavrebhanjyang (e.g. Phusrethumka School, A household in Phaskot). Use of dug well is more common in the southern belt of Kavrebhanjyang. According to our respondents, households have built dug well on their private land with their private investment. The dug well water is being used for domestic purposes, including for drinking needs. In users' experience the dug well water is better than some of the piped water supplies. Some households belonging to Dalit community of Phusrethumka area collect rainwater for their alternative usages, e.g., cleaning and livestock feeding. We found that an NGO (Shechen Huspess) supported the building of rainwater harvest system in Dailt community and lower secondary school in Phusrethumka. The Phusrethumka lower secondary school has a capacity of 75 thousand liters underground tank to collect rainwater. The collected water is used for washing, cleaning and other sanitary uses. Sometimes the school provides water to the community people in case of emergencies and special functions such as parties, community gatherings, festivals and wedding. Below, we present the details of each source under the four categories.

4.1 Springs that are in use for piped water supply

Generally piped water supply is considered an improved, safe and quality water supply system. Despite Nepal's long history⁹ of piped water supply system, many people still do not have access to it and even those with access face multiple managerial issues (Gautam et al., 2020).In Kavrebhanjyang, many spring sources are tapped for distributing water through the pipelines either from individual taps or community taps. The existing piped water supply systems in Kavrebhanjyang are primarily based on gravity flow. In a couple of places, the water lifting system has also been used (i.e., in *Sitaghari* and *Thuloban* C.F). Some of the piped water distribution systems are new, recently upgraded under the 1H1T project, while others have been managed by the community themselves for years. However, these existing piped water supply systems (either old or new) are not problem free and have been facing many managerial problems. The common problems are frequent leakages in the supply pipes, lack of proper intakes, old and deteriorated collection/distribution tanks and unequal water access (disproportionate water distribution) within the communities. As a consequence of these poor infrastructures, there are problems of contaminations and frequent disconnection in the supply. In total, we found that 20 spring sources are currently being used for piped water supplies in different communities of Kavrebhanjyang (Map 3). The sources are scattered and water discharge differs from the source to source. The key information of each source is summarized in the table 1 and details of each of the sources are presented in the following section.

⁸ Though many households primarily use dug well, this report does not cover the information about dug wells.

⁹ The history of the piped water supply systems development in Nepal dates back to 1995(1938 BS), during the time of Bir Samsher (Rana Regime) (GWP-Nepal, 2018).



Map 3 Springs that are in use for piped water supply

Table 2 Springs that are in use for piped water supply

Sources Name /Water Supply	Location of the Source	Users Community /Village	Major users' caste groups	Reliability Perception ¹⁰ /Seasonal or perennial	Current Status	Supported by
1. Ranachhap Water Supply (Gravity flow)	Western part of the Ranachhap, (<i>Public land</i>)	Ranachhap 20 HH	Ranabhat	- Perennial - Discharge remains almost same during whole year	- Private taps (connection) - Not integrated in 'one-house-one-tap'	WaterAid and Youth Coordination Council
2. Source located Thuloban Community Forest (Lift water)	Thuloban Community Forests (<i>Public land</i>)	Tamang tole, Rampur danda, Bhujel gaun, Danda basti 35 – 40 households	Tamang, Bhujel, Ranabhat	- Perennial - Reduces discharge during winter	- Public taps (Well managed compared to other) -Not integrated in 1H1T project	Community and municipality
3. Lamshal Gaun Water Supply (Gravity flow)	Dhobikhola (middle) – (<i>Public land</i>)	Pariyar Tole (10HH), Lamshal Danda (25HH)	Lamshal, Pariyar, Humagain	- Perennial - Decreases by 40-50 % during dry season	- Poorly managed (old and unprotected water tank) deteriorated, poor water quality -Integrated in 'one-house-one-tap'	Govinda Upreti – Panchayat
4. Pani Tyanki Drinking Water Supply (Gravity flow)	Dhobikhola (lower part, above the highway) – (<i>Public land</i>)	Pani Tyanki (82 HH)	Humagain, Giri	-Perennial - Decreases by 20 % in dry season	-Used, deteriorated and old distribution tank - Poor water quality - Integrated in 'one-house-one-tap'	Govinda Upreti – Panchayat
5. Sitaghari Drinking Water Supply (Lift water)	Sitaghari/ Bhandarkharka C.F. (<i>Public land</i>)	Kavrebhanjyang (90 – 130 HHs)	Sigdel, Humagain, Sarki, Damai	-Perennial -Decreases by 25% during dry season	-Water distribution is being distributed by water users' group. - Problems occur frequently and higher maintenance/operating costs as it is lifted	Rural Water Supply and Sanitation Fund Development Board (RWSSFDB)

¹⁰ Here, reliability refers to the source that are available to the community for all seasons and at all times. Also, sources are risk free from the damage of the potential natural hazards.

6. Water supply of Bajagain tole (Gravity flow)	Source from Dhobikhola <i>Public Land</i>	Bajagain Danda 12 HHs	Bajagain	- Perennial - Source decreases by 30% during dry season	- Limited water (half hour a day) - 100 litres per day - Private connection	Invested collectively by all users' households
7. Darimbot Water Supply (Upper) (Gravity flow))	Patiko Gairo Kholsa <i>Public Land</i>	Upper Darimbot – 24 HHs	Bhujel, Humagain and Acharya	- Perennial source - Water decreases by 20-25%	- Integrated in 1H1T - Built all new infrastructure - enough water supply	Municipal budget
8. Darimbot Water supply (Lower) (Gravity flow)	Sitaghari Khola mool <i>Public Land</i>	Lower Darimbot – 25 -30 HHs	Humagain, Bhujel,	- Perennial - Remains almost the same during both dry and wet season	- Integrated in 'one-house-one-tap' - Built all new infrastructure - Enough water supplies	Municipal budget
9. Chhotedanda Drinking water supply (Gravity flow)	Upper – Chisapani mool <i>Public Land</i>	Mijar tole – 10 – 15 HHs	Mijar	- Perennial - Decreases by 20 % during dry season	- Integrated in 1H1T - Used old infrastructures - Runoff along with debris that come from the road creates frequent problems during the rainy seasons.	Previously - Red Cross society, Municipality- 1H1T
10. Chhotedanda Drinking water supply (Gravity flow)	Lower – Chisapani mool <i>Public Land</i>	Mijar tole	Mijar	- Perennial - Decreases by 20 % during dry season	- Integrated in 1H1T - Built all new infrastructure	Municipality- 1H1T
11. Balaute Khola Water supply (Gravity flow)	Phusrethumka <i>Public Land</i>	Regmi tole, Humagain tole, Phuyal tole, Ghimire tole (50 – 60 household)	Regmi, Humagain, Phuyal, Ghimire	- Perennial - Discharge slightly decreases during dry season	- Poor management/ planned to be used in one house one tap - Frequently face disconnection	VDC, Community contribution
12. Humagain Gaunko Kuwa (Gravity flow)	Humagain gaun <i>Private land</i>	Humagain – 14 HH	Humagain	- Water comes entire year but decreases by 25 to 30 percent during dry season	- 3 community taps - Protected storage tank	Municipal budget

13. Thulitar Drinking Water	Baldhyangra ghari <i>Public land</i>	Thulitar (Initially-80hhs, currently - 120)	Gautam, Chaulagain, Dhital, Tamang	- Water discharge does not decrease below the annual average.	- 3 distribution tanks and 9 community taps.	NEWAH
14. Sallepani Ghaterarumti	Parichaur Kholsa/Naulibot khola <i>Public land</i>	Sallepani-16 HH	Humagain	- Decreases by almost 40 percent during dry period	-Well managed - Private taps	Municipal budget
15. Source used in phasko karki tole	Phaskot, few meter nearby Phaskot road <i>Private land</i>	Karki community, below road 10 to 11 HH	Karki, Tamang	- Perennial	-Poorly managed, -Limited water, - no intake -Private taps	Community contribution
16. Source located in the Kapileshwor C. F.	Kapileshwor C.F., <i>Public land</i>	Koirala community 3 to 5 HHs	Koirala	-Perennial	-Private taps	Kamadhenu
17. Dolch Kholsa source	Below the Pani tyanki area nearby Dolcha Kholsa <i>Private land</i>	Humagain family 3 -4 HHs	Humagain	-Perennial	- Private taps	Community contribution
18. Sitaghari (Upper Darimnot)	a few meters above the Kavrebhanjyang- Dhulikehl, an alternative road <i>Private land</i>	6 – 7 households of upper Darimbot	Humagain	-Perennial	-Private taps - Does not have the intake, frequently disconnects and blocks the pipes by sediments	Community contribution
19. Sanodhara	Few meters above the Rolijyang source <i>Private land</i>	2-3 household	Ranabhat	Seasonal (comes only for six months in a year	Private taps	Community contribution
20. Rolliyang	About 200 meter above the thunga khani <i>Private land</i>	7-8 Households of Rolijyang area	Mijar	Perennial	-Small intake is built reserve/distribution tank	Community contribution

Fieldwork, 2022

4.1.1 Ranachhap Drinking Water Supply

The current piped water supply system at Ranachhap community started during 1990/91 (2047/48 BS) with the financial support of the WaterAid. The source of this water supply system is located in the western part of the Ranachhap community, just below the Bagheda (see the description below). According to our local resource person, a Canadian team arrived in the village in the early 1990s for another project but after realizing the problem of drinking water helped villagers to bring the drinking water project funded by WaterAid and Youth Coordination Council. The WaterAid provided technical assistance to build the water supply infrastructures which consisted of one intake (located just below the Bagheda) and two distribution tanks (one in the upper part of the village and another is in the middle part of the village). Both distribution tanks are located on the private land but were built with the consent of the landowner. After completion of the construction, WaterAid provided plumbing training to the community people, formed a community water users committee (*Bhatgaun Drinking Water Users Committee*), opened a bank account and handed over the ownership of the water supply system to the user committee. However, the users committee turned inactive after some years. Still, there is some money in the committee's bank account but no one is there for handling the community level activities through the committee. Some of the committee members have passed away. The initial water users committee has not handed over the committee to a new team yet.



Figure 1 Distribution tank (Left-unused and Right-in use) of Ranabhat water supply

The upper tank and the intake are now useless because the water source was buried while constructing a road track some five to seven years ago. Further, the landslide also swept away the supply pipeline. However, the water seeped out from a bit lower area where a new intake has been made (from the cost-sharing with all users themselves) and the water is being supplied only from the lower tank. Now every household (that get water from the source) have their own storage tanks (plastic tanks called *Bhyat* locally) and those who need water, connect the pipe and fill the tank mainly during the morning and the evening. No one has to pay the tariff for

water use. According to RP2, there are 10 households who lost their water access after the upper tank was buried have been relying on *Bagedhara* (see Section 4.2.1 for *Baghedara*).

4.1.2 Source located in the Thuloban Community Forest (CF)

This spring water source is located inside the *Thuloban* Community Forest (CF), about a kilometer down of the ridge (*Thulo Chaur*). Until the 2017, it was the boundary between then DM and Kavrebhanjyang VDC and this source was not in use at that time. As per the informants, before merging this area into DM, the municipality obstructed the use of this source for the people of Kavrebhanjyang but after the annexation, DM through the ward office provided technical, financial and institutional supports for its operation. The community also made some financial contributions and started operating this water supply system from the last four to five years. About 35 to 40 households of four different settlements (*Bhatgaun*, *Tamang Gaun*, *Basnet tole* and *Bhujel tole*) along the ridge and below the ridge area use this water source. About six to seven community taps are shared by the user households. There is an intake with storage at the source location and the stored water is distributed every day for three hours to the households through the community taps. Before the operation of this water supply system, Tamang households used to fetch water from *Bagedhara* but now they occasionally fetch the water from *Bagedhara*. The water flow/discharge does not change in this source in both dry and wet seasons. A local male expressed that the water quality is better than mineral water. A water users committee has been formed for its operation and management, such as collecting monthly tariff (NRs. 300 per household) and distributing water every day.

4.1.3 Lamshal Gaun Water Supply

The water source located in the middle part of the Dhobikhola is supplied to Lamsal Gaun and Pariyar Tole (see map 3). But it is reported that neither the source has been formally registered nor it has water users committee formed yet. The water supply infrastructures (tanks, pipelines and taps) of this source were constructed in 1981 (2038 B.S, in the time of Govinda Upreti, a former Panchayat leader). Before, a regular staff was arranged to regulate and maintain the water supply system. The staff used to clean the distribution tank twice a year but this practice has been stopped since 10 -12 years. The tank of this system is located in Lamsal Gaun, on public land (owned by Dhobikhola CF). 11 community taps were built but they are now dysfunctional as people started haphazardly connecting individual pipes. Recently, the municipality has integrated it into 1H1T project using existing distribution tank, for which a new intake has been built near the source.

4.1.4 *Pani Tyanki* Drinking Water Supply

The source used in *Pani Tyanki* drinking water supply system is located on the lower part of Dhobikhola, and (about 200m. below the water source of Lamsal Gaun) is supplied to the *Panityanki* area where residents are Brahmans and Kshetris. This drinking water supply is officially registered in the name of '*Panityanki* Drinking Water Users Group' and the users' group is working actively. The drinking water supply infrastructures (tanks, pipelines and taps) of this source were built in 1981 (initiated in the time of Govinda Upreti in the same year when *Lamsal Gaun* drinking water was built). A distribution tank (with 20-25 thousand liters capacity) is located in *Panityanki* of ward no 9, just above the B.P. Highway. This source has also been integrated in to the 1H1T project. According to RP1, before the implementation of the 1H1T project, the water was distributed to about 42 households from 10 community taps but now only about 82 households are getting water from individual taps. However, the project uses existing infrastructure built 40 years ago which are deteriorated now. It was observed that the tank is open, not fully protected and safe enough and as a consequence water contaminates frequently. Thus, people do not prefer using it for drinking purpose and rather prefer traditional community taps or water from dug. It seems to provide improved water supply as the municipality has aimed but repair and maintenance of existing water supply infrastructure is pivotal.

4.1.5 *Sitaghari* Drinking Water (Kavrebhanjyang)

Sitaghari Drinking Water Supply Project was built almost 20 years back with the financial support of 'Fund Board' (The Rural Water Supply and Sanitation Fund Development Board or Fund Board). Our informant claimed that this is the first drinking water operated through lifting system in Kavrepalanchwok district. The source is located in *Sitaghari Khola* - a stream on the public land. A small intake has been made near the source location. From that intake, the water is taken to a large storage tank (with 75 thousand liters capacity) that is located about 150 meters west, inside of the *Sitaghari* CF. The stored water is then lifted to the two distribution tanks located at the upper part of the village. 16-17 community taps were installed and these taps supplied water for three hours on every alternate day. Rather than fetching water from the communal tap, households (HHs) have now started supplying water to their homes. On an average, five to six households share one tap in the lower belt (mostly inhabited by the so-called upper caste). In the upper belt, however, a single tap has to be shared by 20 HHs belonging to the socio-economically marginalized groups.

According to the former ward chair of Kavrebhanjyang, during his tenure from 1997-2003, one of his friends who worked in the Fund Development Board¹¹ coordinated to get fundings for the project. The organization provided the materials and technical assistance and the community/users provided several days of labour contribution for the construction of the project. At present, there is a drinking water users committee named Kavrebhanjyang Drinking Water User Committee that is responsible for the management and decision making. The number of water user households has increased from 90 to about 150. Each household has to pay NRs. 300 as water tariff per month which is mainly used for paying electricity charges and providing salary to regular staff (a guard). He also reported that the system gets damaged time and again but they manage to access financial support from the district coordination office and from the municipal government. The community, however, use this water to feed their livestock and for other domestic purposes only. They depend on traditional sources for drinking water. Since this water supply is operated by lifting system, monthly tariff and costs of maintenance is comparatively high. After the 2015 earthquake, the Fund Development Board again provided financial support for the maintenance of the supply infrastructures such as checking and repairing the cracks in storage tanks, repairing the broken taps and pipelines, etc.

4.1.6 *Bajagain Danda* Drinking Water Supply

This source is located on the eastern slope of the *Dhobikhola*, inside the *Dhobikhola* CF, about 200 meters above from the source supplied to *Lamsal Gaun*. The source is comparatively smaller in size and is distributed to nine households of *Bajagain Danda*. The supply system was initiated with the individual household contributions (12 thousand from each users' household) as they did not seek for any help from the ward referring it to be a tedious process. The source has smaller water discharge so the only community gets limited water (half an hour a day) and sometimes have to rely on other alternatives sources (dug well and *kuwa*). For operations, they have hired a guard who gets a monthly salary of Rs.2500. These nine HHs collect NRs. 500 per month for the payment of electricity charges and the guard's salary. A couple of households using this system also have private dug well and some of them also collect rainwater. Besides these, *pandhero* located nearby *Pariyar Tole* is a traditional water source nearest to the community.

4.1.7 Upper *Darimbot* drinking water supply – *Patiko Gairo Kholsa*

Patiko Gairo Kholsa is located along the Kavrebhanjyang - Darimbot road, and is also a spring-fed source mainly distributed to the 24 households located in upper Darimbot (Bujhel, Humagain, Acharya). According to RP4, this source has been used by the people of Darimbot since 1980. The previous water supply project was funded by the District Development Committee (DDC),

¹¹ <https://www.rwssfdb.org/>

later by the municipality and then handed over to the community. Before the beginning of the 1H1T project, the previous system was not functioning well and limited households were using this water supply system. Since 2021, this source has been used under the 1H1T project. A new storage tank (with 30 to 35 thousand liters capacity) has been built in upper Darimbot (15-20 meters away from the house of the leader of the construction user committee).

About four households of upper Darimbot do not get water supply from the Darimbot 1H1T water supply as households are located above the sources/distribution tank. As per the plan, these households were supposed to get water from the deep bore made at Kavrebhanjyang. Water distribution of water from the deep bore already started a few months back but these HHs did not get water supply due to limited water yield of the deep borewell. As these households were not in priority to get water from the deep bore, they have been using another small source brought from *Sitaghari* (see below). The municipality has distributed water to only about 50 HHs of the upper belt (although, the initial plan included distribution to 142 HHs). For the rest of HHs, the municipality has proposed to use water from *Sitaghari* and also allocated budget for lifting water from the source near to *Sitaghari*.

4.1.8 Lower Darimbot – *Sitaghari Kholsa*

Lower Darimbot is comparatively rich in spring-fed water sources. Multiple sources are located in the surrounding of *Sitaghari Kholsa*, a local stream located at the eastern side of the village. RP4 stated that lower Darimbot is heaven for water but willingness to share source to the larger community is important. This particular source is located about 500 meters below the storage of *Sitaghari* Drinking Water. The source has been explored and brought into use under the 1H1T project since 2021. An intake and distribution tank were built under this project. Currently, this source is used to supply water to about 30 households in the lower *Darimbot*. Among them, about 10 households do not use it regularly as they temporarily live in the village. Previously, some part of this source had been used by an individual household of the lower *Darimbot* but they agreed to integrate source for larger water supply. The intake for this new water supply system has been built very close to *Sitaghari Kholsa/Khola* – a local stream (see. Fig 2).



Figure 2 Intake of lower Darimbott water supply

We observed that the water intake is at a risk of damage from seasonal flash floods as it is built in the course of the stream. The *Sitaghari Khola* is not a big river but it drains a large amount of runoff during the monsoon. Our resource person shared,

We also realized the need to build a wall for protection from the boulders that potentially comes during the monsoon 'flow'.

4.1.9 Chisapani Mul (Upper – Chhotedanda)

Chhotedanda is dominated by Dalit households where relatively limited water sources exist. The Upper Chisapani water source is located nearby *Thulokhola*, known as *Chisapani Mul*. Geographically, these sources are located on the steep slopes. The water supply from upper Chisapani source started over 15 years back with the support from the Red Cross Society. Before the construction of the lower Chisapani water supply under the 1H1T project, all the households of *Chhotedanda* used the upper-Chisapani source. Since the implementation of the 1H1T project, the upper-Chisapani source is only being used by the people living in the upper part of Chhotedanda. The source seems more reliable and the existing water supply infrastructures (storage and pipelines) are still functioning well. However, it is important to note that these have crossed their design period. As shared by the local residents the source is located on the private land and has recently been sold to an outsider (an investor from Bhaktapur). This is an important issue which shows the prevailing uncertainty of the water supply even after years of state ownership of the water source (WRA, 1992) and recognition of water access as a fundamental right. A local of Darimbott who worked as a broker to sell the land shared that the source had

been taken by an outsider and that might have serious repercussions for the water rights and water access of the community in the future. However, some other residents of *Chhotedanda* were certain that there would not be any barriers to water access since there is a written agreement with previous landowners signed during the construction of water supply in *Darimbot*.

4.1.10 *Chisapani*, Upper – Chhotedanda

The lower-Chisapani source is located about 100 meters below the Upper Chisapani and has recently been used under the 1H1T project. During our first field visit in 2021, there was no intake and water was being distributed (under 1H1T) without proper filtering system. We observed that the water was not potable as it was contaminated with sediments/mud due to lack of intake and water filtering system. The local staff (water guard) said that he had to frequently visit the source to clean up the area as sediments and plants' leaves blocked the pipe. According to the Chair of the Construction Users Committee of the *Chhotedanda* Water Supply, the total allocated budget of NRs. 3,00,000 for this project was not enough to make an intake. In our final field visit in 2022, we found that the intake has been built by the Construction User Committee. As reported by the former ward member for *Chhotedanda*, the main Construction User Committee of 1H1T project arranged the budget to build intake almost a year after the distribution started. Now there is an intake and the problem of frequent supply disconnection is somewhat solved but as said, the problem of sediment deposition after the rainfall is still the major problem.

4.1.11 *Balaute Khola* Spring

Balaute Khola source located downside of the B.P highway, is one of the major sources of *Phusrethumka*. This water supply project was built in 1994/96 with the support of the VDC. Before the construction of the B.P highway, there was a narrow ditch nearby the source and water used to be collected in the storage tank located in *Regmi tole*. A new intake had been built by a highway construction project during 1998 as the road track of the highway passed from just above the source location. About 50 to 60 households have been using this source, mainly *Regmi tole*, *Humagain tole*, *Phuyal tole*, and *Ghimire tole*. It is particularly a very important source for *Phuyal* (10HHs) and *Ghimire tole* as they do not have other options.

According to RP6, this source used to be supplied to the Dalit settlement which was located around the Phusrethumka Lower Secondary School, but water does not reach there now. One of the informants (whom we met during the field visit) shared

There was a tap made for Phusrethumka School as well as for the Dalit community located in the periphery of the school. The pipeline and a tap are still there.

They used to get water from this source until 2020 but now there is no water as the pipeline was damaged while constructing the road. RP6 added that on the one hand, due to the distance between the storage tank and Dalit settlement, water rarely reaches the settlement if the leakage is not fixed properly. While on the other hand, Dalit community just rely on others to fix their problems rather than taking initiations by themselves.

The Dalit community of Phusrathumka has poor access to water compared to other communities (i.e., high castes groups). There are about 20 households in this community and most of them are Dalit (Pariyar, Mijar). It seems that the Dalits households are excluded from the access to water of the *Balute Khola* spring. A young Dalit guy said, “*We regularly contribute to and support the villagers to repair and maintain supply system but do not have water in the taps.*”

4.1.12 *Humagain Gaunko Kuwa*

Humagain Gauko Kuwa was an open source, a traditional shallow pit dug to collect water. People used to collect the water from the *kuwa* and there used to be limited water. But in 2017, the source was upgraded/improved by using the municipal fund¹² and an intake/storage (with 6000 liters capacity) and three community taps were built. Now water from this source is distributed to 14 households of the *Humagain tole*. It is thus evident that if the traditional sources can be improved or managed effectively, the capacity of the sources can be increased. However, we still identified some managerial issues, for instance, as the source is located on a bit lower surface, the runoff from the road during the rainy season mixes up with the water. One of the water users said that this problem has been more severe after the construction of the road. During water scarcity, the users have to fetch water from *Boriko Dhara* (see subsection 3.2.6), which is located at a 10 minutes walking distance from the Humagain community.

4.1.13 *Thulithar* Drinking Water Supply

This source is located in *Baldhyangra Ghari* on the lower belt of Phusrethumka, one of the important water sources for the *Thulitar* people. This water supply system has three distribution tanks and nine community taps around the village. This drinking water project was supported by an organization called NEWAH in 1993 AD (2050 B.S.). At that time, due to the absence of transportation facility in the village, the villagers had to carry all constructional materials on their back from Panchkhal. The water supply infrastructures like intake, pipelines, and distribution tanks are still functioning well. However, a couple of issues were observed during the field visit. One is increasing water demand due to the growing migrant population in the *Thulitar* area. Initially, one tap was shared by around seven households but now around 17 households have to share the tap so the water is not sufficient for all households (this is the case in tap no. 8 of

¹² It is noted that this is one of the two development tasks completed by the local government in the drinking water sector. (*Sallepani* Drinking Water Project is another one).

Thulitar). Other issues were related to management, like water leakage in the pipeline. The land owner of the place where pipeline has been broken reported that due to unnecessary flow of water in his land and water leakage, he could not cultivate potato.

4.1.14 *Sallepani/Ghaterarumti* Drinking Water

Sallepani/Ghaterarumti water supply system was built about two to three years ago from the municipal budget of NRs. 9,00,000. The source is located in *Parichaur Kholsa/Naulibot khola* which lies within the *Biruwa Danda - Mudulthumka* CF. There is another water source straight above this source which has been supplied to *Badalgaun*, a neighboring village of the ward no. 8. The storage tank of *Sallepani* drinking water is built about a kilometer (approx.) away from the tank near the settlement and has 10 thousand liters storage capacity. About 16 households are using water from this drinking water supply. The tank is built on private land. RP6 said that villagers have made a written agreement with the landowner before building the storage/distribution tank. It is an example that the private land can also easily be used for building water supply infrastructures if government could better communicate with the communities. Community people have not registered the source and they also have not formed the users committee yet. But they collectively handle the day-to-day water supply and fix management problems.

4.1.15 Source located in the *Kapileshwor* Community Forest

A source brought from *Kapileshwor* CF is being used by a neighboring community located on the southeast side of the Dalit community near Phushrathumka school. Administratively, this source is in ward no 11¹³ of Dhulikhel Municipality but it is also used by some HHs of ward no 9. The water supply system was built around 12 years ago with the financial support from an NGO called Kamadhenu. Three taps were installed and about five HHs regularly use this source. People from the Dalit community (of ward no – 9, Phusrethumka) also fetch water from the nearest tap. However, as these households are residents of a different ward, they do not have ownership of this source and have to take permission to get water. One of the water users' households of ward no. 11 said, “*This source is not for the people of another ward since they have their own source. We just allowed them to fetch water from our taps as they are currently facing a water problem. It is fine if the government implements a policy like 1H1T. Otherwise, inter-ward water sharing is not accepted.*” This suggests that despite belonging to the same municipality, there is a lack of governmental initiation for inter-ward coordination and collaboration for the use of water sources. Some of the water sources are being appropriated by powerful people claiming ownership based on administrative unit they belong to.

¹³ As the source located in ward no. 11, it could not be mapped within the ward boundary of ward no. -9

4.1.16 Source used in *Phaskot Karki Tole*

About 11 households in *Karki Tole* of Phaskot have been using a small spring-fed source located in the southwestern side of the *tole*. It is located on a private land but the owner has already migrated to the city. The user households have placed about five concrete rings (normally such rings are used while constructing a dug well) inside the source. According to our field assistant (RP7), the source is not properly managed and even the locals hesitate to contribute time for its management as the source is located on a private land.

In case of emergency (for instance, when piped water supply does not function), they also fetch water from *Tripeni Dhara* (details about *Tripeni* is given below) which is located about a kilometer away from the Karki community. Local communities complained that except for some pipes and financial support to dig the well for a few households, the local government has not provided any significant amount of fund to maintain water supply in this area.

4.1.17 *Dolcha Kholsa* Source

Humagain households (4-5 HHs) located below the *Pani Tyanki* area use a water source located nearby *Dolcha Kholsa*, about one kilometer away from their settlement. The source is small and located on private land (*Khet*). About 10 years ago, they used to carry water from the source but now they have made a small intake in the source and laid a pipeline. Earlier all of the Humagain families used to rely on this source but now it is used by only one household. Other households now depend on their private dug well and piped water from *Pani Tyanki* drinking water supply. A local resident (female) said that the trend of constructing dug well on private land has increased over the years and almost every household located in lower flat land has its own dug well and the usage of traditional source has declined.

4.1.18 *Sitaghari* (Upper Darimbot)

This perennial source is located in *Sitaghari* area, near to market centre and a few meters from the Kavrebhanjyang-Dhulikhel road that connects to BP highway. It is about two kilometers away from the water user settlement of the upper Darimbot. The source emanates from the slopy land which is privately owned. Previously the land was owned by local people but had been sold to the outsiders. According to a male respondent, the land owner is informed that the water from his land is being used by the community and he has no issues with this. After migrating from the lower Darimbot, about six to seven Humagain households inhabiting in the upper part of the Darimbot have been using this source for more than 10 years. At the beginning, they collectively bore the cost of pipes and placed the pipeline. As the water is being supplied directly from the source without intake, the supply is frequently blocked by plant leaves and sand. The HHs fully rely on this water supply since they could not get water from 1H1T due to the technical failure of Kavrebhanjyang deep borewell. Although, water taps are installed in their households,

they have been stranded for more than a year. According to one of the water users, they had proposed to build a storage tank and manage this source under the 1H1T scheme before installing the tap but construction committee did not agree on this.

4.1.19 *Sanodhara*

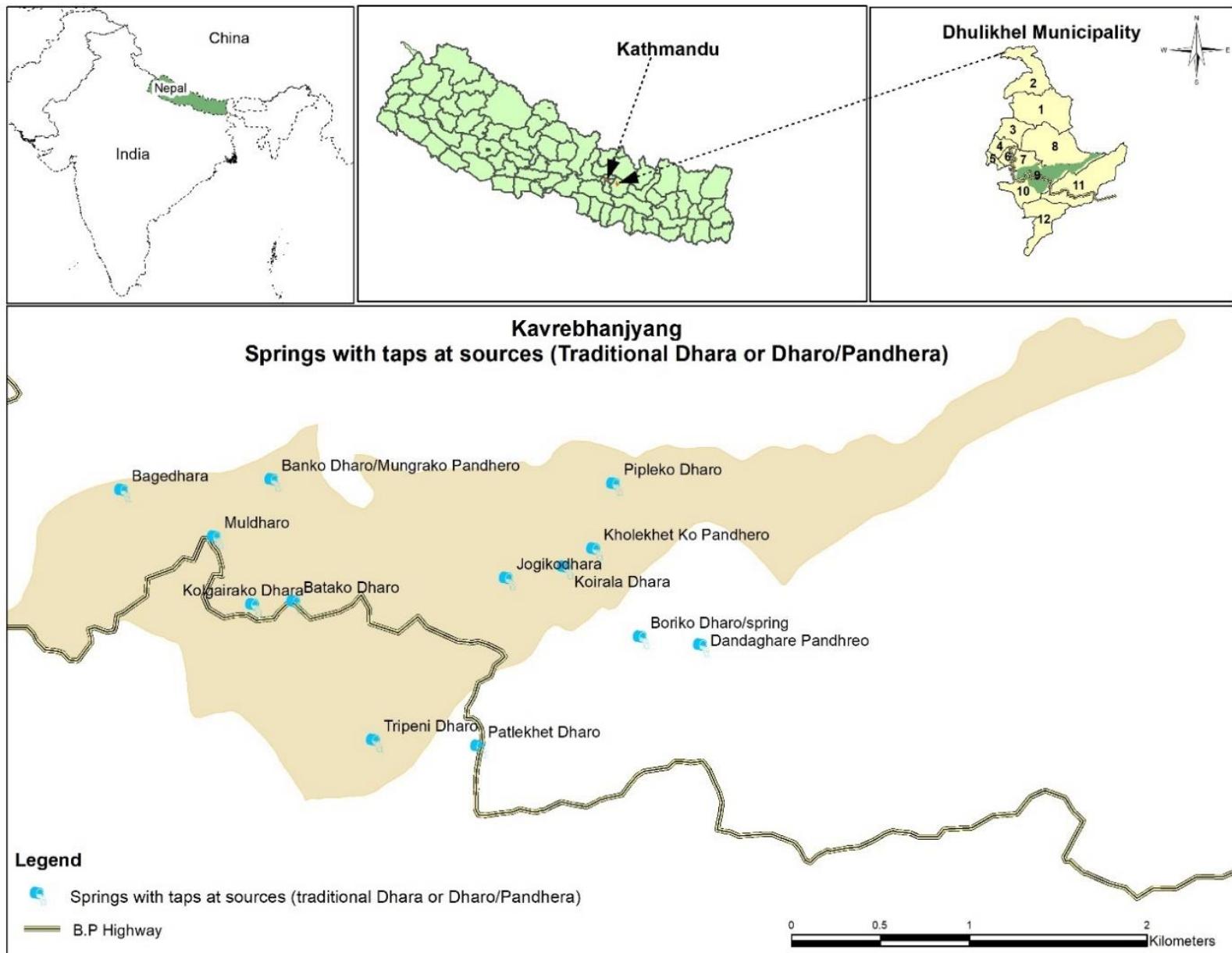
This source is located towards the eastern side of the Ranachhap, just above the *Roljyang Tole*. It is a small and seasonal source located on the private land that emanates during rainy season only. Three households mainly of the Ranahbhat community use this source. These households also have individual taps under 1H1T project. However, they prefer the water of *Sanodhara* or *Bagedhara*. (*Bagedhara* is traditional *mul*)

4.1.20 *Roljhyang* Source

The Roka community of Kavrebhanjyang has been using water from Roljhyang source. The source is located towards the eastern side of the Ranachhap community, about 200-300 meters above the stone quarry (*Dhunga Khani*), on the privately owned land. They have constructed an intake near the source location and have laid pipes to take water to their settlement. The Roka community has used a 300m long pipe of half an inch to bring the water from Roljhyang to downhill Ranachhap and collect/store it in a small intake (20-liter) at Roljhyang.

4.2 Springs with taps at sources (traditional *Dhara/Dharo*)

These are traditional spring sources with free-flowing taps at sources, generally known as *muldhara* or *dharo* locally. These sources either have a permanent stone spout or plastic /metal pipe taps fitted at the source (in the past there used to be a short bamboo pipe and people had to come in person to fetch the water). Intending to increase the capacity of the sources, community have built storage tanks in some of the sources where water is stored while it is not in use. According to the users, these sources are most reliable and preferred sources for drinking water in the community even though they have to carry water from the distance. We found 13 sources under this category. The following map no. 4 shows the location of each source and the table 2 summarizes the sources-related other information.



Map 4 Springs with taps at sources (Traditional Mul Dhara)

Table 3 Springs with taps at sources (traditional Dhara/Muldhara)

Sources Name /Water Supply	Location of the Source	Users Community/Village	Major users' caste groups	Current Status	Reliability Perception/Seasonal or perennial
1. Bagedhara	Western side of Ranachhap, just a kilometer downhill of Thulo Charu <i>Public land</i>	Tamang tole, Ranachhap – 74/75 HHs	Tamang, Ranabhat	-Intake/storage tank has been made (at source) -Looks safe as it has been protected	-Perennial source -Source decreases by almost 30-40 % during dry seasons
2. Kolgaira Dhara	Tikhe Dhungo C.F, just a few meters above the B.P highway (panityanki section). <i>Public land</i>	Pariyar tole, Panityanki, Lamshal gaun 40-50 HHs	Pariyar, Lamshal Humagain, Baniya	- Free-flowing water - No intake, open - Increasing water users	- Perennial source - discharge slightly decreases during dry season (by 10 %)
3. Bankodhara/Mugrako Pandhero	Western slope of the upper Dhobikhola (inside of Dhobikhola C. F <i>Public land</i>	Below Devithan 20-25HHs	Gajurel – 3 Bajgain – 3 Pariyar – 11/12	-Free-flowing water - Source is open	- Perennial source - discharge slightly decreases during dry season (by 10 - 15 %)
4. Muldhara (Near Dhungakhani source)	Along the newly constructed road toward Lamsal gaun from B.P highway <i>Public land</i>	Lamsal Gaun 20- 22 HHs	Lamshal	- Free-flowing water - Intake has been made	-Perennial source - discharge decreases during dry season (by 20- 25%)
5. Kanshiko dhara (thulaghare)	Upper part of Phusrethumka, Ward members' <i>private land</i>	Phusrethumka, Ghimire tole (user 4-5)	Humagain Ghimire	- Used privately - Neighbour also use it as an alternative - Smaller than other	- Decreases by 25 percent during dry season but does not fully dry up
6. Kofalrumti dhara (Boriko Dhara)	On the middle of private land, nearby phuyal tole <i>Private land</i>	Ghumire tole, Phuyal tole and Humagain tole (user 20-25)	Ghimire, Phuyal and Humagain	-Free flowing water -No reserve tank/intake	-Perennial source, - The water comes more constantly during year around

7. Tripeni dhara,	Phaskot- Below the Kavrebhanjyang- Phaskot road <i>Private land</i>	Tamang tole (7-8 regular, occasional users are more)	Tamang, Ghimire	-There is no reserve tank/intake - Free-flowing water	- Perennial
8. Pipleko dhara	Located in the lower part of the Darimbot in <i>Khet</i> . <i>Private land</i>	5-10 households (in dry season) Farm workers,		-Not maintained - Covered by sediments - Usage decreased	-Perennial
9. Kholekhetko dhara	Lower Chhotedanda <i>Private</i>	10 households, Mijar tole Farm workers	Mijar	-Not maintained -Placed small pipe in the source	-Perennial
10. Jogiko Dhara	Upper part of Darimbot <i>Private land</i>	Bajagain family and other 4-5 HHs	Bajagain, Bhujel	-Not maintained -Covered by bushes - Usage decreased	-Perennial
11. Koiraladhara	Nearby Darimbot Primary school, <i>Public land</i>	Lower Chhtedanda 10- 12	Mijar	-Intake is covered by debris (not in use)	-Perennial
12. Batokodhara (near Milan Chowk)	located nearby Milan Chowk <i>Intake is on public land</i> <i>Tap is on private land</i>	15 -20 households	Mixed	-Tap is in an individual household but anybody can come to fetch	-Perennial
13. Patlekhetko Dhara	Along the B.P highway <i>Public land</i>	Public use	Travellers and residents of Bazaar area	-Maintained -Stone sprout is built	- Perennial

Field work, 2022

4.2.1 *Bhagedhara*

Baghedhara is a traditional spring-fed source located on public land. People of Ranachhap and Tamang settlements have been using this source for generations. It is one of the most reliable water sources as the community gets potable water throughout the year. But the water discharge slightly decreases during the dry period. According to RP2, there used to be two taps and no storage tank earlier. About 25 years ago, a storage tank (with capacity 7000 liters) was made with the financial support of then Kavre Village Development Committee (VDC) to store water flow during the night time. The intervention seems practical as it improved the water supply capacity in the context of growing demand of drinking water in the community.

At present, about 75 households regularly fetch water from *Bagedhara*. Mostly Ranabhat (35/36 HH) and Tamang households use this source. Some of the households are located around the tap and some households come to fetch water by walking more than 20 minutes specially during the dry season. The local unit of the Nepal Army also used to fetch water before but now they have managed/built their water supply from *Thulo Ban* CF.

4.2.2 *Kolgaira ko Dhara*

Kolgaira ko Dhara is located just a few meters above the B.P highway (*Pani Tyanki* section), in the *Tikhe Dhunga* Community Forest. In communities' experience, it is one of the most reliable traditional spring-fed water sources. 10 to 12 years earlier, people used to come even from *Bhanjyang* (market area of Kavrebhanjyang). As per the local water users, the water of this source has a good taste as well as preferable quality. During group discussion, people from surrounding settlements like *Bajgain danda*, *Pariyar tole* reported that they still fetch water from this source for drinking purpose and also in case their regular water supply is interrupted. A local 54-year-old male who came to fetch water said, "*This water is better than mineral water. The water remains cold during the summer season, (during the day) and warm during the winter (in the morning and evening).*

Currently, about 40-50 households regularly fetch water from this source. The water discharge of the source slightly decreases (by approximately 10 %) during dry and increases in rainy seasons. Moreover, the surface runoff does not harm this source during monsoon.

4.2.3 *Banko Dhara/Mugrako Pandhero*

Banko dhara, also known as *Mugrako pandhero*, is a traditional spring-fed source, located on the western slope of the *Dhobikhola*, inside of *Dhobikhola* C.F, just downhill of *Devithan*. In the past, the local Nepal Army unit (when they lived nearby Devithan) also used this source but now, as mentioned earlier, they have their own source. In 1988/89, they had also upgraded the source

and made a tap as well as a concrete surface. The discharge of the water is large in comparison to other similar sources in the village, almost full in one-inch pipe. According to RP1, water slightly decreases during dry season. About 11/12 households (three households- Gajurel, three households- Bajgain, five to six households Pariyar) from the surrounding areas regularly fetch water but the users increase during the dry season.

During the late 1990s, the Bajgain community registered this source in the name of *Bajgain Danda Khanepani Upavokta Samiti* and tried to use the water. The surrounding households as well as people of *Lamsal gaun* protested and did not allow them to tap the water. During the FGD at *Bajgain danda*, one of the respondents shared that if the 1H1T project fails to address their issues then they would anyhow fetch water from the *Mungrako Padhero* as it is the most reliable option for them. Recently, a small tank has been built nearby the source from the budget of the 1H1T project so the source will possibly be used in 1H1T.

4.2.4 *Muldhara* (near *Dhungakhani* below the *Lamsal Gaun*)

This source is located along the newly constructed road towards *Lamsal Gaun* which connects B.P highway (a section nearby *Dhobikhola*). The source was found in 2014/15 while opening the road track and later upgraded by making a storage tank. The financial support to build a tank was provided by a political party. Earlier, people of another village (of ward no. 2) attempted to use this water source but locals did not allow them. In terms of water quality, the local people said that water is potable. The water discharge decreases by 20-25 % during dry season. Currently, about 20-22 households of *Lamsal Gaun* fetch water from this source.

4.2.5 *Kanshiko Dhara* (*Dandaghare Pandhero*)

Kanshiko Dhara is located on the former ward members' private land in upper Phusrethumka and his family has been a regular user of this source since many years. Occasionally, the neighboring households of *Ghimire tole* also fetch water from this source when they do not have any other alternatives. The source has a small water discharge and slightly fluctuate between the dry and rain seasons.

4.2.6 *Kafalrumti Dhara*

Kafalrumti Dhara is located in the middle of the cultivated land (*khet*). It has a larger water discharge (almost full of one-inch pipe) in comparison to others, and according to locals, it is one of the most reliable water sources in the area as there is continuous and constant supply during both dry and rainy seasons. People of *Ghimire tole*, *Phuyal tole*, and *Humagain tole* use this source mainly for drinking purposes.

Sometimes, when they do not have *Balaute Khola* spring water, they have to fully rely on this source.



Figure 3 Free flowing water of Kafalrumti Dhara

4.2.7 *Tripeni Dhara*

Tripeni source is located in Phaskot settlement, below the Kavrebhanjyang-Phaskot road. It is located on a private land in a Kiwi farm. The water quality of the source is said to be good and people prefer to use it for drinking purposes. The landowner allows villagers to fetch the water but does not allow them to place pipelines or pumps to take it to their places. Our respondent said that if the source can be fully utilized by installing necessary infrastructures, it would be enough for more than 100 households in the Phaskot area. He further insisted that the water discharge remains almost same for the whole year (does not decrease during the dry season).

4.2.8 *Pippleko Dhara*

Pippleko Dhara is located at the bottom of the Darimbott village. Since the source is located in the middle of the farmland (*Khet*), farm workers are the most frequent users. According to our local resource person, the source actually is a stone sprout and was preserved by their ancestors. Till a couple of decades back, there used to be many users but now usage has decreased and people only use it during the dry (10-12 HHs) season.

4.2.9 *Khole khet ko Dhara*

Khole khet ko dhara is located in the lower belt of the *Chhotedanda*. The source is small in size, has free-flowing water, and the discharge increases during rainy season. About 10 Dalit

households (Mijars) use it as alternative sources for drinking purposes. The source is located on the private land owned by a Dalit family.

4.2.10 *Jogiko Dhara*

Jogiko Dhara source is located in eastern slope of Darimbot on the private land (*bari*) owned by a Bajagain family. It is a traditional stone spout, *muldhara*, a perennial source. The Bajagain family and some other four to five HHs regularly used it when they did not have piped water supply in the village. However, they stopped using it once they started getting water from *Partiko Gairo Kholsa* under community-managed rural water supply scheme. According to our resource person, the source is comparatively safe from natural disaster such as flood, surface runoff etc. and it remains clean all the time, even in the rainy season. Thus, source is still an important alternative during dry season. Currently, clean and free flowing water can be observed at the source where a plastic pipe is placed. Bajagain said, '*I will manage this source and start using it soon because the piped water supply is increasingly being polluted due to rising urban expansion in Kavrebhanjyang. We can collect a little money from the potential users' households to build an intake and start using it.*

4.2.11 *Koirala Dhara*

Koirala Dhara is located on the western slope of the *Chotedanda*, nearby *Dhungakhani*. It is perennial and an important alternative source for the people of lower *Chotedanda*, mainly to the Dalit community. About 12 Dalit (belonging to Mijar caste) households use it for drinking water purposes. In 2020, an intake/tank (with 2000 liters capacity) and a tap were made with the financial support (NRs. One lakh) of the ward office but after a year of construction, a landslide buried and destroyed the structure. Currently, both tap and tanks are not in use but a plastic pipe has been placed to fetch water.

4.2.12 *Bato ko dhara* (near *Milan Chowk*)

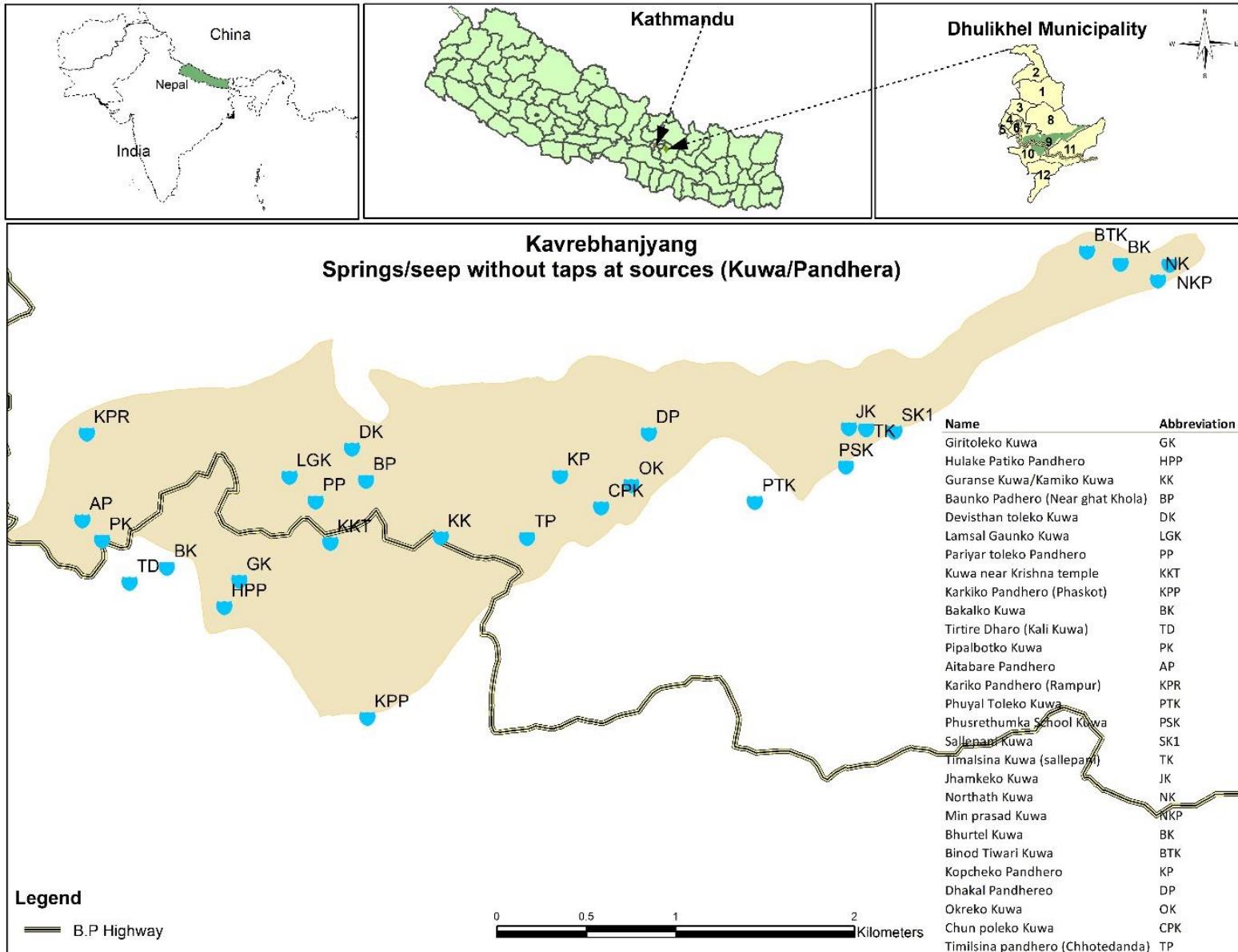
Another traditional spring source is located nearby *Milan Chowk*, next to the B.P highway. Before the construction of B.P highway, the source was in the middle of the current road track. While the road track was surveyed, just above the source which could bury it, the locals did not allow the construction of road track without preserving it so the road construction team had built an intake. They laid the pipeline from the intake to a nearby house and built a tap. Though the tap is made at a nearby house, everybody can go and fetch water as the source is public. People even from *Bhanjyang*, which is three to four kilometers away, come to fetch the water during dry season (mainly in March, April, May). There is full pipe water (a half inch) and is an important source of drinking water of this particular area. Due to the absence of storage system, the water is wasted when not in use. A local shopkeeper said that the water is clean and potable for drinking purpose.

4.2.13 *Patlekhetko Dhara*

This is a traditional stone sprout, located along the B.P highway, a kilometer away from the Kavrebhanjyang *bazaar*. As the source is located on the side of the highway, travelers stop and use the water. According to our local resource person, many residents from Kavrebhanjyang *bazaar* go to fetch the water when their regular water supplies are not available. They fill up their water jars and transport them using bikes and other vehicles. Sometimes, they also carry on their own for drinking purposes. The source is located on the public land (within the Right of Way (ROW) of the BP Highway), administratively in ward no. 11, but it has been an important alternative water source for the people of Kavrebhanjyang *bazaar*.

4.3 Springs/seep without taps at sources (*Kuwa/Pandhera*)

Another category is also traditional spring sources, locally known as '*Kuwa*' or '*Pandhero*' which generally does not have tap at sources. It is a shallow pit dug where water seeps slowly out of the ground. Unlike the previous category, the water in this source does not flow freely out of the source. People have to scoop out water from the *kuwa*. Once the water is scooped, the water level drops and gradually again rises and fills up the shallow pit. The community people have upgraded some of the traditional *kuwa* by making different protective structures.



Map 5 Springs/seep without taps at sources (Kuwa/Pandhera)

We found more than 28 existing *kuwas* located in different parts of Kavrebhanjyang¹⁴ (See map 5). Some *kuwas* have already dried up or vanished due to natural disasters as well as road construction activities. For instance, a *kuwa* located nearby *Pariyar tole* has been buried due to road construction. Similarly, *Machheli Kuwa* located in the lower belt of *Darimbot* has already dried. Community people have converted many *kuwas* into dug well by placing concrete ring around the source expecting to get clean and more water. Some *kuwas* are protected by covering with concrete spring boxes. Rest of the other are open and have been used in a traditional way. The seep collection tanks have been made in some of the sources so that seepage water can be tapped efficiently. A brief but most important information about each of the *kuwa* that are currently in use has been summarized in Table 3 as well as demonstrated in Map 5.

¹⁴ There might be more *kuwas* that we might have missed out during our field survey.

Table 4 Springs/seep without taps at sources (Kuwa/Pandhera)

Sources Name /Water Supply	Location of the Source	Users Community/Village	Major users' caste groups	Current Status	Reliability Perception/Seasonal or perennial
1. Guranse Kuwa/Pandhero (Bazaar tole)	Kuwa is located, nearby Kavrebhanjyang bazaar and the ward office <i>Private land</i>	- Only used for construction or other non-drinking purposes	Dalits	-Converted into modern dug well -People do not use it for drinking -Lack of maintenance	- No potable water - Water decreases during dry season. It was a good water source before the B.P highway was constructed
2. Bahunko Pandhero	Few minutes' walk from the Kavrebhanjyang bazaar, <i>Public land</i>	Bahun tole (50-55) households	Humagain, Sigdel, Bajgain	- Source has limited water. - Concrete protection has been made around the source.	- There will be less water during the two months of dry period but water remains same rest of the time.
3. Devisthan tole ko kuwa	50 meters above the Kavrebhanjyang deep bore, in Devisthan tole <i>Public land</i>	20-22 HHs Dalit families	Damai and Sarki	-12/14 years ago, source was upgraded using concrete - Water level is lower than before	- Water decreases by 50 to 60 percent during dry seasons
4. Lamsal gaunko kuwa	Lamsal Gaun <i>Public land</i> , in a seasonal stream	10/11 HHs, occasional use	Lamsal, Timalsina, Humagain	-Not in regular use -Upgraded in 1995/96 using concrete -After upgrading, the water level decreased	- Less water in dry period
5. Pariyar tolko kuwa	Nearby Pariyar and Biswakarma tole <i>Public land</i>	11- HH (Dalit communities)	Pariyar, Biswakarma,	- Upgraded in 2052/54 - Way towards the source is difficult	- Water does not fully dry but decreases during the dry season
6. Giri Toleko Pandhero/Kuwa	Lower part of the Panityanki (<i>Khet</i>) <i>Private land</i>	4/5 HH <i>Panityanki</i>	Giri HH	- Recently upgraded (converted into well) - Water is pulled by water pump to the individual HH	-
7. Hulake Patiko Pandhero	Low land area of Panityanki, in the middle of cultivated land <i>Private land (donated)</i>	5 HH <i>Panityanki</i>	Shrestha, Karki and Ranabhat	-Recently upgraded/maintained -User are increasing as numbers of commercial farms increased (low land)	- Water does not fully dry out but there is less water during dry season

8. Kuwa near Krishna temple	Below the Krishna temple, nearby <i>Milan Chowk</i> <i>Private land</i>	-	-	-need maintenance	-Not in use
9. Karkiko Pandhero Phaskot	nearby Shree Balchetaan Primary School of Phaskot <i>Private land</i>	Upper Phaskot, 10-12 households	Mostly Karki	-Maintained well, constructed dug well	- Potable, perennial but there will be more water in dug well in dry season
10. Bakalko Kuwa	nearby Giri settlement <i>Public land</i>	10 -15 households	Giri, Khatri, Thakur and Basnet	-Not storage tank, Open source - Ward allocated NRs. 50,000 for maintenance	- Perennial but it dried after the 2015 earthquake but emerged again
11. Kali Kuwa	Located nearby <i>Tishmure Khola</i> <i>Public land</i>	Thakur Chhap 20-25 HHs	Malla, Shahi (including farm workers)	-Storage tank and a tap were made, -Well maintained	-Perennial, people collect stored water
12. Pipalbotko kuwa	located just next to the B.P highway <i>Public land</i>	6-7 HHs	Ranabhat, Basnet and Karki	-Converted into dug well - Dusts from the highway covers the source,	- Perennial
13. Aitabare Pandhero	nearby <i>Aitabare kholsa</i> (a small stream) and downhill of the <i>Rampur Danda</i> <i>Public land</i>	22-25 household	Mijar, Basnet	-Covered with concrete box but no storage tank	-Perennial, important source for the Mijar community
14. Rampur Karkiko Pandhero	about 500 meter down from Rampur ridge <i>Private land</i>	9-10 households	Karki and Basnet	-Storage tank and a tap were made about three decades ago	-Perennial, discharge decreases during dry seasons
15. Paire Khet ko Kuwa	Located in <i>Koirala tole</i> <i>Private land</i>	3-4 HHs	Phuyal, Koirala	Open source, no tap and reserve tank	-Perennial, it is more important for the irrigation purpose
16. Phuyal Toleko Kuwa	located in <i>Phuyal tole</i> <i>Private land</i>	6-7 households	Phuyal families	-Well maintained by making dug well and a tap, land owner pulls the water using water motor	-Perennial and has potable water

17. Phusrethumka School Kuwa	located nearby Phusrethumka Secondary School	3-4 households	Dalits/Mijars and School	-Converted into dug well but not maintained well	-Perennial but water level sharply decreases during dry season
<i>Public land</i>					
18. Sallepani Kuwa	Sallepani Kuwa is located in Sallepani	Sallepani tole 8HHS	Dalits and Brahmins	-Still has traditional looks but one nearby household use water motor to pull the water	-Perennial
<i>Public land</i>					
19. Kopcheko Pandhero	Located in upper Darimbot, <i>Private land</i>	Bhujel tole 7 HHS	Bhujel	-Open source, has no storage tank	- Perennial, has potable water, preferred source
20. Okreko Kuwa	lower part of the Chhotedanda, <i>Private land</i>	Mijar tole 4-5	Mijar	-Open source, not well protected	- Perennial
21. Chun Poleko Kuwa	About 20 meter down to the Kavrebhanjyang-Darimbot road, <i>Private farmland</i>	Mijar tole	Mijar (used to feed livestock)	-Open source, has no storage tank	-Perennial but decreases in the dry period
22. Timalsina Panhdero	Upper part of the Chhotedanda	Timilsina tole	Timalsina	-No storage tank and not well maintained	-Perennial but sharply decreases (by 60 to 70%) during dry period
<i>Private land</i>					
23. Dhakal Pandhero	Located in lower Darimbot, <i>Private land</i>	Dhakal tole	Dhakal	-Converted into dug well	- not in use
24. Timilsina, Jhamkeko, Nornath, Min Prasad, Bhurtel, Binod Tiwari Kuwa	Sallepani and Thulitar area All are located on the Private land	Sallepani and Thulitar Most of them are used privately (but allow other if the come to fetch water)	Mixed	-Timalsina and Jhamkeko Kuwa are open and rest of other are converted into dug well	-All are perennial

Source: Fieldwork 2022

Field work, 2022

4.3.1 *Giri Toleko Pandhero/Kuwa*

This source is located nearby Giri settlements in the lower part of Panityanki in flat land (Khet). A couple of months ago, users (4-5 Giri HHs) took an initiative to improve the kuwa by placing some concrete rings. They have also placed a water pump inside of the well and started pulling water to the households. Although they recently received water supply under the 1H1T project in this area, they also invested in improvement of this well. According to RP8, locals prefer using it since the water quality is better than the tap.

4.3.2 *Hulake Patiko Pandhero*

This source is located in the low land area of *Panityanki*, in the middle of a cultivated land. This source has been mainly used by four households belonging to Shrestha, Karki, and Ranabhat. This is also the main drinking water source for all the villagers who come to work in their fields/farms. According to the community people, water quality of this source is potable. The source was improved last year by making protection wall around the source with the financial support of NRs. 1,00,000 from the ward. There are six to seven pig farms nearby the source location and they also take water from this source for drinking. Although, the source is located on a private land, the land owner has donated it for public use.

4.3.3 *Guranse Kuwa (Bazaar tole)*

This *kuwa* is located nearby Kavrebhanjyang *bazaar*, just next to the B.P highway. Until the mid-1990s, Bishwakarma community living in the surroundings used this source. Over the years, its water level gradually decreased and the *kuwa* has almost dried up. According to some local people, drying of the source is due to the construction of the B.P Highway Road which passes from a few meters ahead of the source. The locals assumed that the vibration of the machine blocked the ground waterways. In 2013, an organization called Love Green provided financial and technical support to revive it by making a concrete well. Although, the water re-emerged after the well's construction, it is not drinkable due to lack of maintenance of the *kuwa*. Nowadays, people use water from this *kuwa* for construction activities specially building houses and other domestic purposes such as cleaning, washing, livestock feeding, etc. The local further said that if well-managed and protected, water from this *kuwa* could be used for drinking.



Figure 4 Hulake Patiko Pandhero

4.3.4 *Bahunko Pandhero* (Near *Ghat Khola*)

This source is a traditional source, located just above the Kavrebhanjyang *bazaar*, nearby a local stream. The source is somehow protected making concrete box around it but still surface runoff can easily enter the shallow pit. About 50-55 households (some regularly and some other occasionally) use this source. Most of the water users of this *Pandhero* are Brahman (Humagain, Bajgain, Sigdel, Nepal, etc.) hence, the source was named as *Bahunko Pandhero*. According to a local woman, there is a queue of people during the winter season and sometimes they even return empty-handed as many people come to fetch water. There is a dug well nearby the source, which was built about 8 years ago with the joint financial contribution from the ward office, and the community. The water of this well is used for cleaning clothes and other household activities. There was also a small *kuwa* (known as *Payuko Phedko Kuwa*) nearby *Bahunko Pandhero* but it dried out last year. Local people assumed that this source dried due to the construction of a deep bore. The newly constructed Kavrebhanjyang deep bore is located about 50 meters ahead of the dried source.

4.3.5 *Devisthan tolko Kuwa*

This source is located about 50 meters above the Kavrebhanjyang deep bore, in *Devisthan tole*. About 20-22 households regularly come to fetch water, mostly from Dalit families, and only three from Brahmin families. It is a traditional source which has been improvised 13 years ago using concretes/cement. A dug well has also been constructed nearby *Pandhero* and water from which is used for cleaning cloths and other household activities. The dug well was constructed with a joint financial contribution of NRs. 29,000 from an organization (community people do not remember the name), and NRs 16, 000 from the community.



Figure 5 Devisthan tolko Kuwa

In the past, caste-discrimination was strongly prevalent in the area and Brahmins would not allow Dalits inside their boundaries. Hence, separate spaces were allocated for Brahmins and Dalits but this has changed and everyone can collect from both the *kuwa* and the dug well. A senior citizen who came to fetch water said that there used to be plenty of water 20-25 years ago but it has decreased in recent years. There is enough water during the rainy season now but not sufficient in the winter seasons. A woman said that sometimes they have to wait for hours to fill up a water jar (about 20 lit).

4.3.6 *Lamsal Gaunko Kuwa*

Lamsal Gaunko Kuwa is a traditional source, located nearby a seasonal stream (on public land). Almost nine to ten households (Lamsal, Timalsina, Humagain) occasionally come to collect water in this *kuwa*. Until 1991/92, it used to be full of water for an entire year but afterwards, the water discharge gradually decreased in the source. Nowadays, water comes only during the rainy season. In 1995/96, the *kuwa* was upgraded from the budget (about NRs. 20,000) of the DDC but as said by RP1, the level of water has gradually decreased after the execution of the upgrading task. He added that that the use of concrete inside *kuwa* might have created blockage creating decline in the water level.

4.3.7 *Pariyar tolko Kuwa*

This is a traditional water source, located nearby *Pariyar tole* and *Biswakarma tole*. The source is on public land. About 11 households (Pariyar, Biswakarma, and Sigdel) are regularly using it. In 1995/97, the then VDC provided about NRs. 20,000 fund to maintain the source. A 38-year-old male from *Pariyar tole* said

“Water quality is good, we are fully relying on this but the way to the source is difficult, specifically in the rainy season it is slippery. We fell many times on that way while carrying water.”

He further added that there used to be many users in the past but two households (who were the major water users as they had livestock) recently migrated to another place so the users' number has decreased. Water slightly decreases during the winter/dry season.

4.3.8 *Kuwa* located nearby Krishna Temple

This *kuwa* is located a few meters below the Krishna temple, nearby *Milan Chowk*, Kavrebhanjyang. Until 1980/82 it was one of the important drinking water sources and even locals from Kavrebhanjyang *bazaar* and the surrounding area fetched water from there. However, since the early 1980s the water level has gradually decreased. In local's experience, water decrease was possibly caused by increasing number of dug well construction in surrounding areas. In addition to that, the value of this *kuwa* has also decreased because people started getting access to piped water/individual connections in their households. The *kuwa* is currently useless and restoration actions have not been undertaken by both the community and local government.

4.3.9 *Karkiko Pandhero, Phaskot*

Karkiko Pandhero is located nearby Shree Balchetan Primary School, few meters away from the newly constructed deep bore of Phaskot. The source is located on a private land. About 10 – 12 (mostly Karki) households located in surrounding area relied on this source for water before the construction of



Figure 6 Karkiko Pandhero Phaskot

Phaskot deep bore but once the deep bore water distribution (partially) started, the number of regular user households decreased. At present, about five to seven households regularly fetch water (primarily for drinking) and other users come occasionally as per their convenience and requirement. The source is perennial but decreases during the winter/dry season. The concrete dug well (with concrete rings) was built in 2018 with a financial support of NRs. 1,00,000 provided by the newly elected ward government with the aim to store and get more water during dry seasons. The budget was also used to build a wall just next the source to protect from the surface runoff that could come to the source.

4.3.10 *Bakalko Kuwa*

Bakalko Kuwa is located on the public land nearby Giri settlement of Kavrebhanjyang. About 10 -15 households (mainly Giri, Khatri, Thakuri and Basnet) are the main users of the source, who primarily fetch water for drinking purposes. According to a local male, the source dried right after the 2015 earthquake but has started reemerging since the past two years. It is a perennial source and water has to be scooped out as there is no water storage tank and a tap. Due to lack of storage tank, a large amount of water is wasted. As informed by a women ward representative, in the fiscal year 2022/23, the ward has allocated budget of about fifty thousand (NRs. 50,000) to maintain and repair the source. She further said that this source is one of the important sources for the community as there are no other reliable alternative sources.

4.3.11 *Kali Kuwa (Tir Tire dhara)*

Kali Kuwa is located in *Thakuri Chhap* nearby *Tishmure Khola* – a local stream. The source is also known as '*Tir-Tire Dhara*'. A water storage tank and a tap were made more than a decade ago, which helped to protect water from contamination and improved the efficiency. This is one of the best examples that shows if action to improvisation is taken, the capacity of the water source can be increased. *One of the respondents shared, "Water would be insufficient without a storage tank but most people have received water after building the*

storage tank." Although, the source is located on a private land, it also occupies 15 meters of the rivers' buffer zone. Hence, no one can claim their ownership. The source is perennial and remains almost the same in both dry and wet seasons. In total, 20 to 25 households (Malla and Shahi) from *Thakuri Chhap* and five to six households of ridge use this source. The farm workers who work on the farm located on lower part of the settlement also use this source.

4.3.12 *Pipalbotko Kuwa*

It is a traditional source (*Kuwa*) located just next to the B.P Highway in the western side of the ward, nearby the former ward Chair's resident. The source is located on the public land. The traditional structure of the source does not exist now as it has been converted into the dug-well using concrete rings. The purpose of using rings on the source is to tap all the seep water as well as to keep water clean. The source is small compared to other available sources around the community where about six to seven households (Ranabhat, Basnet and Karki) reside.

4.3.13 *Aitabare Pandhero*

Aitabare Pandhero is located in the northwest side of *Pipalbote Kuwa* towards the western border of the ward, nearby *Aitabare Kholsa* (a small stream) and downhill of the *Rampur Danda*. It is located on a public land and water discharge does not dry up in dry season. The Dalit community (Mijar) on the eastern side of the source is the main water user community. As informed by one of the water users, about 22 to 25 households use this source. Before the beginning of the Ranabhat deep-bore water supply under the 1H1T project, these households fully relied on this source. They had to carry water for drinking, domestic use and feeding livestock. At present, they fetch water from this source for drinking purposes only as other options (deep bore water and dug well water) are available in village. Some of the households of this area also have private dug-well constructed in their private land.

In the budgetary plan, the ward office has allocated about NRs 2,00,000 budget to maintain and improvise the structure of the source. As per a female ward member, ward office has already announced the application call for the community people to get the budget.

4.3.14 *Rampur Karkiko Pandhero*

This source is located about 500 meters down from Rampur ridge on a private land. About 9 – 10 households (Karki and Basnet) are the main water users' households. This source was improvised constructing a small water storage tank at the source location about three decades ago when there were no road access and the community people had to carry construction materials from Dhulikhel on their own back. Since then, they have not repaired except cleaning and blocking the leakages. It is a perennial source but the discharge decreases during the dry season.

4.3.15 Paire Khetko Kuwa

Paire Khetko Kuwa is a traditional source located on the private land (*Khet*) owned by Koirala family. Etymologically, the Nepali term 'Paire' refers to landslide. There used to be landslide in paddy field in the past so the area was named *Pairekhet*. The source is open and the discharge of the source increases by 30 to 40 percent. About two decades ago, Koirala family used to fully rely on this source but once they started getting piped water supply (from *Balaute Khola*), their full



Figure 7 Paire Khetko Kuwa

dependency on the source decreased. At present, the Koirala family only fetch the water occasionally whereas other three Phuyal households still use this source regularly for drinking. In terms of quality, locals said that the source has clean water and also tastes good. Its irrigational use is crucial as it irrigates large area of farm land located on the lower part of the source owned by the Koirala and Phuyal households.

4.3.16 Phuyal Toleko Kuwa

This is a traditional source located in *Phuyal tole*, and has been used for generations by Phuyal families. About six to seven households regularly use this source, which is located on a private land. As reported by locals, the source dried a couple of times in the past, once due to drought and another time due to the 2015 earthquake 2015. During that time, the community people struggled to manage their water needs, and could hardly collect one jar of water by scooping out using small bowls. Three years back, the land owner of the source location constructed a dug well by personally investing around NRs. 1,00,000. A water motor has been placed inside the well to lift the water to his home. One additional pipe has been placed and a tap has been made in the source so other households that want to fetch water can collect it. Before making personal investment, he requested the ward office for the budget to improvise the source for a couple of times but did not get support, and thus, decided to personally invest on it. He is content with his decision and shared, "I am happy with this investment because I am getting clean and chilled (*Chiso*) water. I have a cow farm and need more water so the use of water motor is helping a lot. I don't restrict the neighbors (most of them are under his clan) to fetch water from my home as well. Thus, to be honest, the 1H1T project is not very essential to me."

4.3.17 Phusrethumka School Kuwa

Phusrethumka kuwa is a small source located nearby Phusrethumka Secondary School and is located on a public land. About seven years ago, this *Kuwa* was converted into a concrete dug well where six to seven concrete rings were placed with the NRs. 25,000 financial supports received from Love Green Nepal (LGN), a local NGO. The main aim of the conversion is to utilize the seep water more efficiently. Some Dalit households as well as, occasionally, the school use this source but do not prefer it for drinking purpose due to the poor quality of water. A water user said “The students from the school pollute the source.” (*School Ka ketaketile dherei fohor garchan*)’ The water level in the well increases during rainy seasons and only little water remains during the dry season.

4.3.18 Sallepani Kuwa

Sallepani Kuwa is located in *Sallepani tole*, just next to the Phusrethumka-Sallepani-Thulitar Road. At present, about eight households (five Dalit HH and three Brahmin HH) are using this source mainly for drinking purposes. It does not dry out even during the key dry seasons. There are two separate *Kuwas* and one small pond nearby the source where overflowed water is stored.

Traditionally, these two *Kuwas* were allocated to Dalits and Brahmins in the past. Due to discriminatory practices of untouchability, Dalits were not allowed to collect water from Brahmins’ *Kuwa* but now households from any castes can fetch water without any restrictions. The traditional physical structures of both *Kuwa* still exist as no improvisation have done previously except one of Dalit households that has placed personal water motor to pull the water. He pulls the water and stores in the 1000 liters plastic tank. A few years back, a large runoff along with sediments and debris that came from the road covered the *Kuwa* as well as the pond. In response to this, the ward office had provided NRs 35,000 to conduct cleanup activities. The water user's households cleaned up the *Kuwas* and used excavators to remove the deposit in the pond. Before the construction of *Thulitar Drinking Water Supply Project*, villagers used to fully rely on this source and the pond water was used to feed grazing animals. At present, the water pond is used to irrigate kitchen gardens as animal grazing is not in practice.

4.3.19 Kopcheko Pandhero

This source is located in upper Darimbot, about a half kilometer down from the Jogiko Pandhero, on the private land owned by Bhujel family. About seven Bhujel households use this source mainly for drinking water purposes. The number of water users increases if piped water supply is not functioning well. Currently, all households around the source have



Figure 8 Sallepani Kuwa

individual piped water connection so they do not fetch water for other domestic purposes from the source. When there were no piped water supplies, people from the Bajagain tole would also come to fetch the water as there was large water discharge but it slightly decreased about two decades ago. However, the water discharge has again increased after the 2015 Earthquake. The discharge remains almost the same in both seasons. A local woman who lives near the source shared that the water's taste is good and she had also heard the water's taste was famous during her ancestor's time.

4.3.20 *Okreko Kuwa*

Okreko Kuwa is located in the lower part of the *Chhotedanda* on a private land owned by a Mijar family. It is small in size and perennial in nature and has been used by four to five Mijar households for generations. As reported by our resource person, this is the main source of drinking water for the Mijar households. These households also have access to the water that is supplied from the 1H1T project but they only utilize it for other domestic uses such as cleaning, washing and livestock feeding.

4.3.21 *Chun Poleko Kuwa*

Chun Poleko Mul is located on the private farmland (*Khet*) owned by a Dalit family. Locals 20 meter down from the Kavrebhanjyang-Darimbot road, do not use this source regularly as the distance from the settlement is a bit long. About four Mijar households occasionally use this source, mainly to feed livestock that are kept in the farms in the surrounding areas. As informed by the local people, the source is perennial and the water comes almost full in half inch water pipe during the rainy season and decreases by 30 percent in dry period. As this source is located at lower altitude, the water supply-based on gravity flow can only serve few households.

4.3.22 *Timilsina pandhero of Chhotedanda*

This source is located in the upper part of the *Chhotedanda* about half kilometer down from the Kavrebhanjyang *bazaar*, on the private land of Timilsina family, a few meters away from their' house. Currently, four households within the family are using this source. As informed by one of the water users, water discharge in this *kuwa* has decreased over the years, particularly after the 2015 earthquake. The discharge further decreases 60 to 70 per cent in dry season. These households also have another water source at their houses that is brought from southeastern part from nearby *Thuli khola*.

4.3.23 *Dhakal Pandhero*

Case 1: Useless source due to migration

This is one of the important cases of Kavrebhanjyang where the traditional *Kuwa* has remained unused due to migration of users. This *Kuwa* is located on the lower part of the Darimbot, nearby Dhakal community. It is on a private land owned by a Dhakal family. About six Dhakal households used this source but they migrated to Banepa about a decade ago and only visit occasionally for their ritual activities. Hence, the source has not been in use since then.



Figure 9 Dhakal Kuwa

4.3.24 Timilsina kuwa, Jhamkeko kuwa, Nornath Kuwa, Min prasad Kuwa, Bhurtel Kuwa, Binod Tiwari Kuwa

Case 2: Traditional *Kuwa*, located on private land and used privately

There are a couple of traditional *Kuwas* located on the private land *Khet* (Paddy field) in Sallepani and Thulitar areas. In addition to drinking purposes, all of these sources are being used for irrigation as they are located on an agricultural field (*Khet*). In fact, these sources are being privately used but only in emergency (when there is no piped water supply) neighbors are free to collect water. *Timilsina kuwa* and *Jhamkeko kuwa*, located in Sallepani area, have a bit larger discharge compared to other four and the owner have placed water motor to get water to their houses. The remaining four are located in the lower part of the Thulitar area and all of them are modified into dug well using concrete rings and also have placed the pipe to take water to their houses. Since source location is higher than their houses, they get water from gravity flow. The land owner (where the source is located) themselves invested to build those infrastructures, thus, pipes are taken to their own homes for their convenience. Locals also fetch water from *Nornath*, *Min Prasad* and *Bhurtel Kuwa*, and Binod Tiwari's kuwa is being used by a pig farm and a poultry farm operating in the rented land located around the source. Water in *Nornath* and *Min Prasad Kuwa* decreases during the dry period but in *Bhurtel Kuwa*, the discharge remains almost the same. According to one of the male water users of *Bhurtelko Kuwa*, water would be enough for all of the residents of the Thulitar area if it is stored in the reserve tank.



Figure 10 Timilsina kuwa, Jhamkeko kuwa, Nornath Kuwa, Min prasad Kuwa, Bhurtel Kuwa, Binod Tiwari Kuwa

4.3.25 *Baluwa Khetko Mul, Patalrumti Mul, Biruwa Dhara*

Case 3: Sources that are only in use for irrigation

There are three sources which are not in use for drinking purpose but listed by the community people during our workshop in Kavrebhanjyang. *Biruwadhabra* is located in the mid-west part of Darimbot, on land owned by Humagain. It was used for drinking water in the past but has become useless for more than 15 years as the community got the piped water supply. According to our resource person, the distant location of the source from the households is another reason that deterred the locals from using it since they prefer traveling to sources nearby. The other two (*Baluwa Khet ko Mul, Patalrumti Mul*) are located in *Patlekhet Phant* in the middle of a private paddy field (*Khet*) nearby *Kafalrumti dhara* and are not in use for drinking water supply. In case of *Baluwa Khet ko Mul*, a teacher of the Phusrethumka Lower Secondary School said that no one has attempted to use it because they are aware that the land owner would not allow it. He also explained that the owner would not be ready to share this source even if the community needed it because his cultivation is fully dependent on the source, mainly during the paddy plantation and dry period. Whereas in the case of *Patalrumti mul*, a few years back, the people of *Badalgaun*, a neighboring village, tried to buy the land where the source is located for drinking water but the households that have been using this source for irrigation resisted and did not allow. A canal called '*Pairekulo*' located just a few meters down takes the water towards the farms, that reaches to upper part of the *Phuyal tole*. The teacher further said that despite the source being located on private land, it is one of the potential water sources that can be utilized for drinking in the future as it has been used by community people for irrigation.



4.4 Deep boreholes

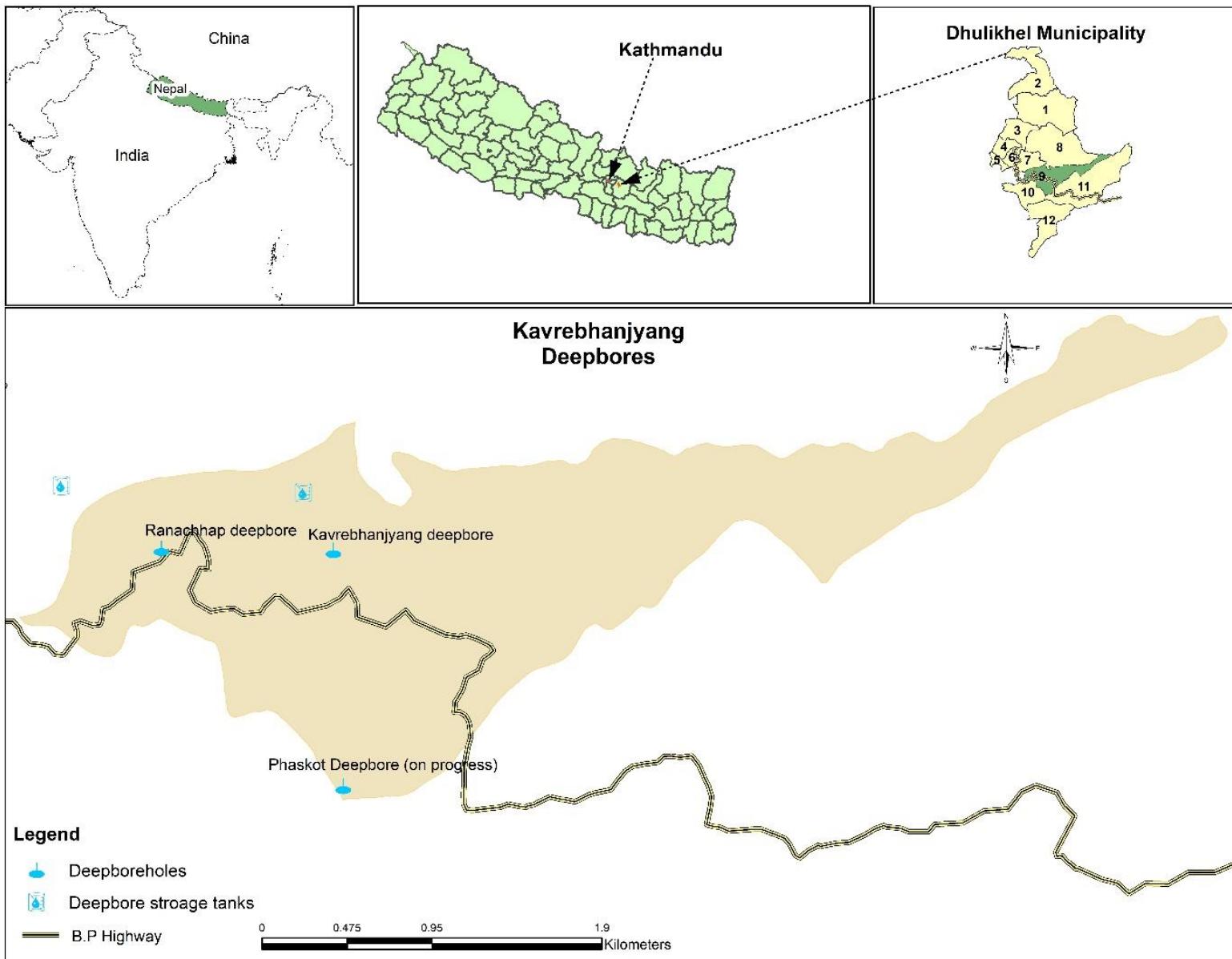
Under the 1H1T project, the municipality has three deep boreholes drilled at three different places of Kavrebhanjyang. According to one of the 1H1T construction committee member, at the beginning of the project, two deep boreholes were planned for the project- i. *Ghatkhola* Deep Bore and ii. Kavrebhanjyang Deep Bore, mainly for the area with limited water source and densely populated communities (*toles*). The committee also realized the need of deep bore in Phaskot area as they did not find proper source to supply piped water. With the technical and financial support from the municipality, the main construction user committee installed an additional deep bore in Phaskot a couple of weeks prior to the local election in May 2022. The deep bore water was the main anticipated water source under the municipal project 1H1T in Kavrebhanjyang.

4.4.1 Ranachhap Deep bore (*Ghat Khola*)

The deep bore of Ranachhap was constructed in 2017. A technical team surveyed first in 2016 and identified an appropriate place to drill the deep bore. Road access was the requirement for the deep bore to bring the digging machine so they selected the point next to B.P Highway, at the bottom of the Ranachhap village. The bore is over 200 meters deep. The technical team estimated that three inches of water volume from the deep bore. In the following year, they tested the size and quality of water again and found it potable. The water discharge from this deep boring was expected to be at least two inches but the discharge received was approximately 1.5-inch only. For the water collection from this deep bore, a storage tank of 70,000 liters has been built on the ridge (which is approx. 0.6 Kilometers) above the deep bore. As we knew from our latest field visit to Kavrebhanjyang in October 2022, the water supply from this source has already started. Initially, this deep bore was expected to benefit 180 HHs which later increased to 230 HHs during the installation of taps and water meter. As per RP2, the total budget for the 1H1T project in Ranachhap was NRs. 39,00,000. Out of this total budget, NRs. 21,00,000 budget was used for placing the pipeline, NRs. 13,00,000 for storage tank and the remaining for plumbing and other works.



Figure 11 Ghat Khola Deep bore tank and Deep bore



Map 6 Deep Boreholes

4.4.2 Kavrebhanjyang Deep Bore

The Kavrebhanjyang deep bore is located on a private land about half kilometer above the Kavrebhanjyang *bazaar*. As per the municipal plan, about 142 households were supposed to get water supply from Kavrebhanjyang deep bore but the water did not come as expected. As reported, Kavrebhanjyang deep bore has failed technically and its water yield is very low as compared to the former one (*Ghat Khola* Deep bore). The technical team is trying to find out the faults and ways to resolve the problem but still (at the time of writing this report) the team has not come up with the solutions. Despite smaller water discharge, water distribution from this deep bore also started just a few days before the local election but will only be supplied for about 50 HHs for now. For the rest of the HHs, municipality has already allocated around NRs. 15,00,000 budget to manage the water supply from the spring source located near *Sitaghari*.

4.4.3 Phaskot Deep Bore

Phaskot Deep Bore is located on a public land nearby Balchetana Primary School. It was drilled just a couple of weeks before the local election in May 2022. In terms of water extraction, it has been successful since water yield is received as expected. But infrastructures such as pipelines, distribution tanks, water taps are yet to be built. According to a male of Phaskot, since the water of deep bore has been wasted, people themselves started arranging pipe and using water. The households located below the Phaskot deep bore have laid the pipe and connected it from the deep bore to their community. There is one tap nearby the deep bore which is being used by the household located in the surrounding areas. He further shared, “Honestly, people are getting water even though the supply is not well managed. We should take this as an opportunity because half a bread is better than no bread.”

5. Challenges of Drinking Water Access and Management

Most of the community people of Kavrebhanjyang are getting at least some sort of drinking water supply. However, dedicated collective efforts are needed to make it equitable, adequate, safe, and affordable for every household in the community. In this section, we present existing issues of water access and management that we found in different communities of Kavrebhanjyang.

While the coverage of piped water supply service has expanded, water quality remains a major challenge compelling the local communities to rely on the traditional sources for their drinking water needs. The water users of different communities reported various problems related to the water distribution in the existing piped water supplies. For instance, the water is clean at its origin but households hardly use it for drinking purposes in *Lamsal Gaun* and *Pariyar tole* as it gets contaminated during distribution. The storage tank is roofed with tin and there are holes between the wall and the roof. One of the respondents at *Pariyar tole*

shared, “Earlier, we used this tank water for drinking, but it is not drinkable now. For drinking purpose, we carry water from kolgahirako dhara though it takes 15 minutes.

They do not use water for drinking purposes supplied from new project 1H1T which said to improve water supply. The situation was similar in many other settlements including *Chotedanda*, *Kavrebhanjyang*, *Panityanki* and *Lamsal gaun* (see table 4 for other settlements). During a group discussion with the local communities of *Chotedanda*, one of the participants said, “*Water distribution from the 1H1T project has already started in our area. But since the tank has not been cleaned and chamber has not been made at the source, runoff along with the debris makes the source dirty*”. Hence, their primary choice for drinking water needs is traditional *Dhara*, *Kuwa*, and *Pandhero* rather than the new piped water supply system which aims to provide water access at the doorstep.

Besides water quality problem, frequent pipeline disconnection and irregular water supplies are other critical managerial issues. For example, in *Baluate Khola*, drinking water supply users often face frequent disconnection of water. Due to the lack of maintenance of the water supply system, a large volume of water was running out of the source. A hotel owner located along the B. P. Highway (about half a kilometer away from the source) tapped the source and dug well that is constructed nearby the source, which the community feared could reduce their water supply. The pipeline from the *Balaute Khola* source towards storage crosses the private farmland so it is often disconnected while doing farm works, i.e., digging, and ploughing. The distribution tank looks fine but the pipe connections are unsystematic, and scattered on the surface (see figure 10). People who live nearby the tank area, handle the daily water distribution (opening and closing the water towards taps). There is no dedicated/assigned person for handling the management (e.g., taking care of the source, looking after the leakage, opening and closing the water every day).

Although some communities (either individually or collectively) occasionally self-organized and cleaned their water supply system, in lack of strong management mechanism and groups, managerial problems such as unequal distribution and frequent pipeline disconnections prevail. One of our respondents at Humagain tole, who is also a teacher said

*‘Due to the lack of proper water management in our village, we are facing the water scarcity issues even though we have multiple sources.’ Previously we had installed five gear balls with the financial support of Resource Management and Rural Empowerment Centre (REMREC) to systematically supply water from *Balaute Khola* in each tole, but now these gear balls have been damaged. So, the HHs have started to join the pipe manually by removing other pipes.’*



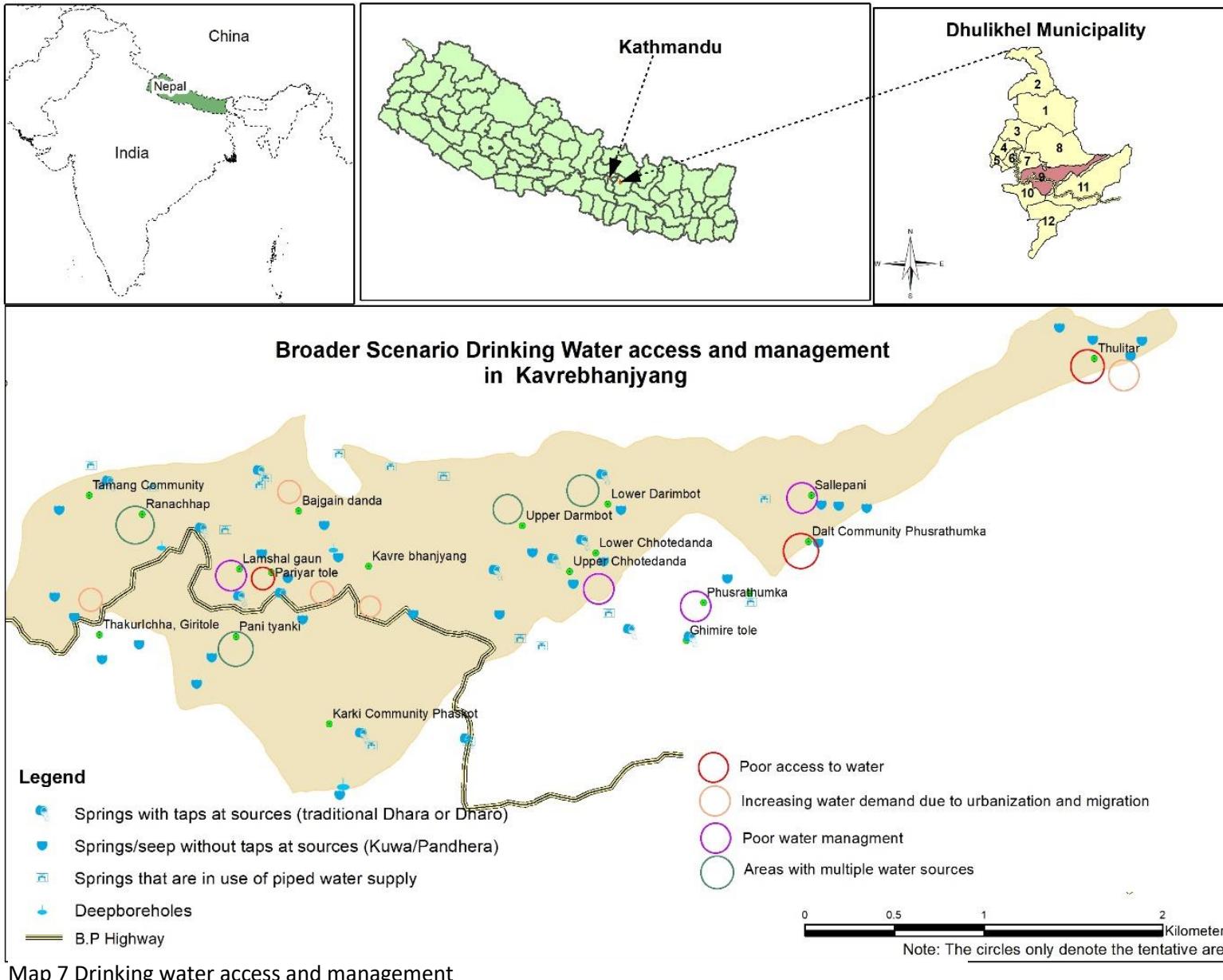
Figure 12 Pipes around *Baluate Khola* water supply distribution tank

Table 5 Summarizes different communities/toles of Kavrebhanjyang and available water sources in each of the communities.

Community/tole/area	Sources/Nearby Sources		
	Piped water supply	Dhara/Muldhara	Kuwa/Pandhera
<i>Lamsal Gaun</i>	<i>Lamsal gaun</i> drinking water supply ('one-house-one-tap')	Muldhara source, <i>Kolgairako Dhara</i>	<i>Lamsal gauko kuwa,</i> <i>Kolgairako Dhara</i>
<i>Pariyar Tole</i>	<i>Lamsal gaun</i> drinking water supply 'one-house-one-tap'	<i>Kolgairako Dhara</i> Muldhara	<i>Pariyar toleko pandhero, Lamshal gaunko Pandhero</i>
<i>Bajgain Danda</i>	<i>Bajgain Danda</i> Drinking water supply, Kavrebhanjyang deep bore ('one-house-one-tap')	<i>Kolgairako Dhara</i>	<i>Pariyar toleko pandhero, Bajgain Kuwa</i>
<i>Panityanki, Milan Chowk</i>	<i>Panityanki</i> Drinking Water Supply ('one-house-one-tap'), <i>Dolcha kholsa</i>	Kolgaira ko dhara Batako dhara	<i>Giri tole ko kuwa, Hulake patiko kuwa, Kuwa near Krishna temple</i>
<i>Ranachhap/Ranabhat tole, Mjiar tole</i>	Ranachhap Drinking Water Supply, <i>Sanodhara</i> Drinking Water Supply, Ranachhap/ <i>Ghatkhola</i> Deepbore ('one-house-one-tap' Rolljyang	Bagedhara	
<i>Tamang Community</i>	<i>Thuloban</i> Drinking Water Supply, Rolljyang source	Bagedhara	
<i>Kavrebhanjyang Bazaar, Devisthan tole</i>	<i>Sitaghari</i> Drinking water, Kavrebhanjyang deep bore	<i>Patlekhet Dhara</i>	<i>Guranse Kuwa, Devisthan tolko Kuwa,</i>
<i>Thakur Chhap, Giritole</i>	Ranachhap/ <i>Ghatkhola</i> Deepbore		<i>Tirtire Kuwa/Kali Kuwa, Bakalko Kuwa, Pipalbotko, Aitabare, Karikiko Pandhero</i>
<i>Phaskot, Karki tole, Surrounding of Balchetana Primary School</i>	<i>Karki tole</i> water supply (<i>bahunko dhara</i>) Phaskot deep bore ('one-house-one-tap')	Tripeni Source	Karkiko Pandhero,

Darimbott (upper and lower)	Upper Darimbott Drinking Water Supply (one-house-one-tap), Lower Darimbott Drinking Water Supply ('one-house-one-tap')	<i>Jogikodhara, Pipleko Dhara</i>	<i>Kopcheko Pandhero, Dhakal Pandhero</i>
Chhotedanda (upper and lower)	Chisapani source (lower and upper), other small traditional water sources (one-house-one-tap)	<i>Koiraladhara, Kholekhetko dhara</i>	<i>Okhareko Kuwa, Chun Poleko Kuwa, Tlmasina Panhdero</i>
Phusrathumka (<i>Ghimire, Phuyal tole</i>)	Balaute Khola Drinking water,	<i>Kafalrumti Dhara Kanshiko Dhara</i>	<i>Pairekheto Kuwa, Phyaltolko Kuwa</i>
Phusrathumka (<i>Humagain tole and Ojha tole</i>)	Balaute Khola Drinking water, Humagain Gaunko Kuwa, Source brought from Kapileshower CF.	<i>Kafalrumti Dhara Kanshiko Dhara</i>	
Phusrathumka (Dalit Community)	Balaute Khola Drinking Water		<i>Phusrethumka School Kuwa</i>
Sallepani	Sallepani-Ghaterumti Drinking water Thulitar Drinking Water Supply		<i>Sallepani Kuwa, Timalsina Kuwa, Jhamkeko Kuwa</i>
Thulitar	Thulitar Drinking Water Supply		<i>Nornath Kuwa, Minprasad Kuwa, Bhurtelko Kuwa, Tiwari Kuwa</i>

Field work, 2022



In some settlements, economically better-off households have invested and managed water supply for themselves but economically weaker groups mostly from the Dalit communities were left out. For instance, two Dalit HHs in *Bajgain danda* do not use the water managed by the Bajgain community as they are unable to pay the monthly tariff. Likewise, the Dalit HHs at *Pariyar tole* could not install the tap and meter for the 1H1T project and were waiting for the support from the municipality.

Local communities unanimously shared that the lower belt of the Kavrebhanjyang (primarily – lower Darimbot, *Panityanki* and Phusrethumka) have multiple good water yielding sources. Our visits to these sources also confirmed it. Many of these sources are, however, on private land or used for private household water supply. Such private use of the source severely limits the potential beneficiaries of these sources. A member of the 1H1T Water Supply Committee in Darimbot shared a case that shows how improved management practice can enhance the beneficiaries. He explained, “*Water previously used by an individual household served seven households after the sources were integrated and management of spring sources improved for initiating the 1H1T supply.* Similar situation exists in *Chotedanda*.

Disparity in access to drinking water was also found in other settlements where few elites benefitted from self-managed individual water supply as well as government supported community water supply and the recently initiated 1H1t. Many economically weak or marginalized groups such as in Phusrethumka lacked access to basic water supply services. This indicated that poverty is one among the various factors that is interlinked inequality in access to water. The existing inequality in access to water calls for greater attention of municipal authority to improve the local water management and supplement the existing water supply system.

Thulitar area has limited numbers of larger size springs. Due to the increasing migrant population (basically, they come from *Koshipari*, a remote village of another rural municipality) the water demand is growing but the supply is limited. The source currently in use of *Thulitar* water supply is brought from the lower part of *Patlephant* (nearby Phusrethumka) which is more than three kilometers away from the main settlement of *Thulitar*. Some of the good-yielding spring sources are being used for irrigation as they are located in the middle of farmland and many small springs have been used as individual sources (see in case no. 2). Therefore, farm owners do not want to share or integrate those sources for community drinking water supply. One Bhurtel women of Thulitar said “*They can collect water but cannot use it for community water supply because this is an important source for irrigation for us. In case of delayed rainfall, we use it for paddy plantation.*”

The cases in Kavrebhanjyang shows accessing spring sources on private land can be challenging but with effective negotiations, they can be used as primary water sources for community water supply. In some cases, interventions of landowners on their private land have led to disruption in the functioning of community water supply (e.g., *Balaute Kholsa* supply). In others, communities have also effectively coordinated with private land owners

and accessed springs on private lands for community water supply (e.g., *Thulitar* supply). Likewise, some of the communities (such as Upper Chhotedanda, Upper Darimbot, Roljhyang) have managed to convince the land owners and continue using sources located on the private lands although those lands are already sold to non-local landowners. Although the new land owners have not restricted the communities to use those sources yet, the users are concerned about the prevailing uncertainty in their access to these sources. They realize that their access to water can be more challenging as land value rise with increasing urbanization despite that ownership over water resources is formally vested on the state. It is important that the municipal government work closely with the local water institutions to identify potential water sources and possible coordination mechanisms.

Local water institutions are responsible for managing and maintaining water resources and ensuring efficient and equal water distribution. In Kavrebhanjyang, the lack of or inactive water institutions, however, is observed as a key factor causing multiple managerial issues. The community water users' committees should be responsible for the local water management and facilitate day-to-day water distribution. However, water users' committees have not been formed in all settlements and those that exist are not actively working in water management. For instance, there was no water users committee in *Lamsal gaun* before the beginning of 1H1T project. Similar was the case in *Karki tole*, Phaskot. The water user committee was formed in Ranachhap but has been inactive for a long period of time. The absence of local water institutions has affected the distribution leading to inefficiency, water waste and delayed actions for everyday problems.

6. Towards 1H1T project, Transition of Local Water Governance

With the aim of ensuring access to water for all, the municipal government in Dhulikhel initiated 1H1T in 2017. During the first year of its implementation, the municipality had provided a budget of NRs. 30,00,000 which was entirely used to buy pipes. The provincial government then provided NRs. 50,00,000 which had been invested in other infrastructures such as digging deep bores and constructing a large storage tank on the ridge of Kavrebhanjyang. The project has already started water supply in most of the areas of ward no 9. The municipality also provided additional budget for Phaskot and Phusrethumka where work is in progress (until the last fieldwork in August 2022) and is expected to soon expand to Thulitar area.

The initial plan of the 1H1T project was to form one main construction committee (i.e., Kavrebhanjyang - Darimbot Drinking Water Supply) and about eight users committees (one user's committee in each village) in ward no. 9. After completion of the construction, the main committee would hand over the responsibility of water management to local users' committees. At the time of writing this report (October 2022), the main construction committee had handed over the project to most of the water users committees (*Lamsal gaun*, *Panityanki*, *Darimbot*, and *Chhotedanda*, including two deep bores i.e., *Ghatkhola* and

Kavrebhanjyang) but construction has not been completed yet in Phaskot and Phusrethumka. In Darimbot, most of the water supply infrastructures (basically, intake and storage/distribution tanks) are new and were recently built under the new initiative but in *Lamsal gaun*, *Pani Tyanki*, and *Chhotedanda*, existing supply infrastructures have been used without repair. As a consequence, there is still a problem with the water quality distributed under the 1H1T project. In some cases, some households have lost access to their previous water sources after rearrangement of the water supply systems for the 1H1T project. The expected new supply from the deep borewell has not been provided to these groups due to poor water yield of the borewell.

The optimum utilization of available water resources and fair water distribution may help increase access to water for all. We observed that some of the free-flowing traditional water taps can be utilized up to their optimum level and distributed to the nearby communities that have poor water access. This, however, will need dialogues and discussions with the communities to formalize existing private sources for the long-term use of water use as the owners are against sharing those water sources with other communities. For instance, there was a proposal of using *Kolgaira* source in 1H1T project but locals of the surrounding area of the tap protested and did not allow it. Earlier, the settlement located on the lower part of the source also attempted multiple times to take water to their community but locals did not allow it. A local water user said,

"We will not allow anyone to use this source for a large project and also to dig a deep bore in the nearby area. Some years back, about NRs. 50,000 budget was allocated to make intake/ reservoir nearby the source but we refused it. If we make a storage tank, people from the lower part (below the B.P Highway) will connect the pipe and we will not get enough water. We are not against 1H1T project but we do not want to lose the Kolgaira source. We are ready to walk through an hour's distance but we do not want it to be mixed or integrated it with the 1H1T project."

This indicated that the community who claim users' right over the sources is one of the challenges that has hindered the municipality to integrate the existing potential drinking water sources leading to initiate a compulsive/expansive alternative, i.e., construction of deep boreholes for larger water supply. For instance, the water users of *Bagedhara* and from the peripheral area do not want to integrate it into 1H1T project as well due to the fear of losing regular water access. They are also reluctant to integrate sources because of the monthly cost they possibly have to bear after the implementation of the project. The water users of *Kolgaira ko dhara*, *Muldhara*, *Bagedhara*, *Kafalrumti dhara*, etc. are getting water without any cost but people have a fear that if these were integrated into the project, they would have to pay monthly fees for this water. Moreover, people who have source in their private land often claim its ownership and do not want to share it with the community or households.

Amidst these challenges of managing water in Kavrebhanjyang, the municipal government invested on the deep borewell fed system which has yielded less water than expected. This created a fear among the communities about the deep borewell-fed system but simultaneously sensitized them about the significance of improving their spring-fed systems. During our interactions, many communities opened up about the fear of losing their access to water if they shared their water sources. This was in many cases due to lack of clear information on how their water access will be ensured after the integration of water sources that they are using. Their fear escalated after one of the deep borewell did not yield expected volume of water. However, the deep borewell of Phaskot which yielded good volume of water has generated new hope among the communities. This has created an important opportunity for the municipal government to communicate its strategy to provide a reliable water supply.

Despite the seasonal fluctuation, most of the available spring water sources of Kavrebhanjyang are perennial. This is also confirmed by a study done by the Kathmandu University which notes ward 9 of Dhulikhel Municipality is rich in water sources (Chaudhary, 2019). Having such number of perennial natural sources within the village is an important asset for the community since they get a year around water supply. This shows the potential that exists in management of improved drinking water supply using the existing natural springs. The Water Resource Act 1992 of Nepal stipulates that the ownership of the water resources is formally vested in the state. This implies that the municipality has the authority to use the sources whether it is on private or public land. However, it requires constructive dialogues with the community not only to use the sources located on private land but also to communicate the importance of the 1H1T project/system. Some communities have set examples by sharing their water sources that was previously used by fewer households with larger groups. In some cases, even individually-owned and used sources were shared to the neighborhood for drinking water. These instances can be important lessons for municipality to gain trust, and convince communities to integrate sources to improve the efficiency of the local water management practices and facilitate equitable access to water. Constructive dialogues with the communities can also foster the inter-ward coordination and collaboration needed to initiate water supply based on the location and proximity of the sources and users rather than their belonging to administrative unit. This is particularly important given its undulating terrain and dispersed water sources and settlements.

7. Conclusions

Natural springs are the key sources of drinking water in Kavrebhanjyang. The use of groundwater has started in the form of deep borewell for a couple of years under the new municipal drinking water project called the 1H1T project. This study documents detailed inventory of different forms of drinking water sources that are currently in use in Kavrebhanjyang and also highlights the existing challenges associated with the water access and management. Our findings show that the availability of the natural springs in

Kavrebhanjyang is not the same in all settlements. While uphill settlements have limited sources, lower reaches (e.g., lower *Darimbot*, *Panityanki*, *Patlephant*/eastern part of *Phusrethumka*) have many sources. Despite discharge fluctuation between the seasons, most of them are perennial, offering the community with year-round potable water in addition to serving their other domestic water needs. A study on the spring water sources assessment in Roshi and Melamchi watersheds also shows that ward no. 9 (i.e. Kavrebhanjyang) and 10 of DM are rich in water sources (Chaudhary et al., 2021). Thus, exploring the state of these sources and improving their management are important for achieving equitable, sustainable, and affordable water supply in Kavrebhanjyang.

The local government (municipality and ward) have been constantly making various efforts. The municipality has recently launched the 1H1T project to provide improved and accessible tap water to every household. This project has started providing water to the community utilizing existing spring sources as well as from deep bores constructed in three places which was expected to reduce use of and reliance on spring sources. However, during our series of interactions and discussions with the community members, they have shared various challenges associated with drinking water access and management. Many emphasized that rather than the challenges associated with the availability of water sources, inequitable appropriation of many sources by the local elites and lack of maintenance of sources have been significant challenges in Kavrebhanjyang. Old and inadequate distribution infrastructures are causing problems like water contamination, water leakage, and insufficient water supplies. Some of the locals are also critical with the municipal action of moving towards groundwater extraction rather than focusing on management of existing natural springs. They reflected that deep bore water extraction is an attempt of avoiding the potential contestations that may arise from the utilization of existing spring source where user community claims the rights. Many of the community people requested strong action from the municipality for improving the management of existing water supply system and expanding their services in conjunction with the newly added deep borewell-fed systems.

In this regard, we suggest that the municipal authorities and the communities should not perceive or portray deep borewell and spring-fed system as alternatives to each other, but rather consider that their integration can be a potential way-out. There is higher potential of tapping local spring sources to increase the capacity by adding new infrastructures, modifying and reconstructing the aging structures (such as, repairing storage tanks, making water chamber, blocking the leakages). In addition to this, there are many other sources that are located on the private land which yield potable water but the right to use water (i.e., water right) has traditionally been linked to the land tenure rights. Thus, developing and enacting mechanisms to handle the issue of access and control over the sources located on private land can become serious as the pace of urbanization and water demands continue to rise. Moreover, rather than avoiding the potential contestations from the community, initiating dialogues to convince the local communities for sharing the water sources within and between the wards can open new opportunities for sustainable water management. This is

particularly important for the effective utilization of the unused/partially used water sources and to overcome prevalent insecurities and subsequent hesitations among the communities against inter-community and inter-ward water sharing. Constructive dialogues and discussions can help in gaining trust of the communities, proactively address these insecurities, communicate the importance of integrating spring sources in conjunction with the deep borewell fed system and collectively generate strategic alternatives to ensure and improve access to enhanced water supply for all in the face of increasing urbanization and environmental-driven obstacles and opportunities. In this regard, it is equally important to implement spring conservation and protection initiatives along with management of water supply systems. Transcending the prevalent prior users base and administrative mindset and modalities of water management, the community also need to appreciate the strengths and limitations of existing systems and water sources and collaborate with the municipality to discuss, devise, design, develop, maintain and manage inclusive and sustainable water systems taking into account the ongoing social and environmental changes.

Overall, it is important to note that despite small geographic area, community people in Kavrebhanjyang are using diverse types of drinking water sources (ranging from traditional *kuwa/pandhero* and small local spring to recently constructed deep bores) and this diversity in drinking water sources is the valuable asset but communities encompass a range of challenges associated with water access and management. Addressing those issues is crucial and should be prioritized in higher governmental plans and policy. Thus, this report on mapping of existing drinking water sources of Kavrebhanjyang can be a valuable document in making informed decisions, future water strategies, prioritize the water management plans to ensure clean water for all households.

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