

2024: Ms. Suchita Jain & Dr. Sreenita Mondal



Gendering Water and Climate Science Research in South Asia

# Regional Research and Capacity Building Training Programme

Gendering Water and Climate Science Research  
in South Asia  
2022-2025



Regional Training for SAWA fellows on  
Interdisciplinary Research Methods &  
Gender and Water

Proceedings Report

04– 08 Feb, 2024  
Kathmandu, Nepal

# Project funder and consortium Partners



## Funder

International Development Research Center (IDRC)  
Ottawa, Canada



## Consortium Lead

Postgraduate Institute of Agriculture, Faculty of Agriculture  
University of Peradeniya, Kandy, Sri Lanka



## Consortium Partner

Institute of Water and Flood Management (IWFM),  
Bangladesh University of Technology, Dhaka, Bangladesh



## Consortium Partner

Nepal Engineering College, Changunarayan, Bhaktapur, Nepal

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# Summary

The SAWA fellowship program aims to nurture an interdisciplinary approach linking climate change and water insecurity by awarding fellowships and training to Ph. D./Master's level students (primarily women) in Interdisciplinary Water Resources Management (IWRM) program since 2007. The current phase of SAWA program – “Gendering Water and Climate Science Research in South Asia” continues to work towards improved integration of gender analysis and larger interdisciplinary research and practice in WCS in South Asia and funded by International Development Research Centre (IDRC; GIST 2022-2025, <https://idrc-crdd.ca/en/project/gendering-water-and-climate-science-research-south-asia>).

As part of the current phase of SAWA program, a Regional Capacity Building Training Programme was organized on Interdisciplinary Research methods and Gender inclusion in Kathmandu, Nepal from February 04-08, 2024. IDRC provided the financial support to the programme.

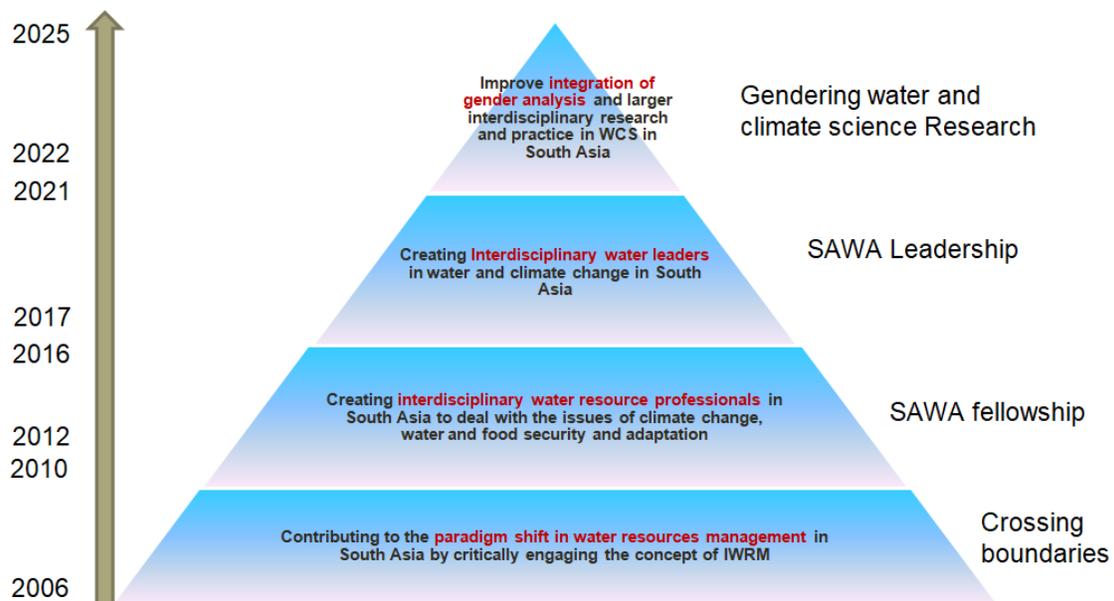
A hybrid mode of training was adopted to train the fellows which included some online sessions introducing the basics of Interdisciplinarity and concepts of Gender followed by in-person training and field work followed by in-person training and field work in Kathmandu. Post field-work some more online sessions are added to the training program towards strengthening their knowledge on data analysis and writing skills.

The details of the regional program including online and offline sessions, details of field work and the feedback from the sessions are presented in the following part of the report.

# Introduction

## The SAWA programme

Nearly two decades ago, the initiation of process of change in the basic orientation of water resources management “the paradigm shift” happened during Crossing Boundaries project (2007–2011), funded by the Dutch Research Council (NWO). This program was followed by SAWA “South Asian Water (SAWA) Fellowship” (IDRC – 107240) with an aim of creating interdisciplinary water resources professionals in South Asia to deal with the issues of climate change, water and food security and adaptation. The third phase of SAWA “South Asian Water (SAWA) Leadership Program on Climate Change”(IDRC – 108441), focused on fostering Interdisciplinary water leaders in water and climate change in South Asia. Continuing the interdisciplinarity and gender-water-climate change intersections at the core focus the current phase titled “Gendering Water and climate science Research in South Asia” (IDRC - 109793) intend to improve Integration of gender analysis and larger interdisciplinary research and practice in water and climate science research in South Asia.



## The current phase of the program

Comprising some of the most sensitive socioecological systems – eco-sensitive island nations, Himalayan region and low-lying deltaic region – South Asia is most critically poised to be impacted by climate change and widespread water insecurity making research on WCS in this region most needed and relevant. Social and gendered research in WCS is critically important and yet largely lacking. Social and gender theories and analysis, often rooted in social science and humanities fields, do not organically translate across sharp disciplinary boundaries between natural and social sciences. There is a gap in understanding the impact of pedagogy, institutional and market factors in furthering or constraining interdisciplinary and gendered research and practice. Gender inclusive participation in science education is a challenge in South Asia, particularly in planetary sciences and

engineering. It is yet to be seen how this affects gender analysis in WCS and if more gender inclusivity improves gender analysis in WCS research.

The overarching objective of this project is to improve integration of gender analysis and larger interdisciplinary research and practice in WCS in South Asia. The specific objectives are to:

1. Understand barriers and catalysts for effective practice of interdisciplinarity and gender analysis in WCS research with particular focus on whether gender inclusivity among WCS scholars improves this practice
2. Improve frameworks of methods, approaches, and pedagogical tools to effectively translate social and gender theory and analyses across disciplinary boundaries between social and natural sciences, and embody these frameworks in a common teaching curriculum and capacity building of 35 fellows towards their postgraduate research.
3. Strengthen a network and platform of multiple stakeholders for knowledge exchange, advocacy, and mentorship of young water and climate scientists for fostering and developing interdisciplinary research within and beyond higher education and academia.

Based on these objectives the action research project is being implemented in 3 countries of South Asia – Sri Lanka, Bangladesh, and Nepal. The three technical universities one in each project country are part of this consortium since 2006. The Post Graduate Institute of Agriculture, the institute under a public University called University of Peradeniya (PGIA - Sri Lanka) is the lead organization and responsible for overall financial and programmatic reporting and coordination for the project. the second lead organization, Institute of Water and Flood Management, Bangladesh University of Engineering and Technology (BUET - Bangladesh) is also a Public University and as the consortium second lead organization, they support to the lead applicant for project reporting and general coordination support. The third partner Nepal Engineering College (NEC - Nepal) is a private non-profit led University. All the three Universities are responsible for co-designing the comparative research framework collaboratively with other partners, facilitation of fellowship based capacity building of postgraduate research of fellows from the respective countries, supervision of student research assistance for tracer study research, and building stakeholder network and platform in their country.

## Sponsor

International Development Research Centre (IDRC) is a Canadian Crown Corporation that initiates, encourages, and supports research in developing countries in order to help find practical and sustainable solutions to social, economic, and environmental problems that are being faced in these countries. <http://www.idrc.ca>

Taking into consideration the importance of on-site field training the funder IDRC agreed to utilize the project fund for this in-person capacity building program for the SAWA fellows. Earlier, the training was planned only through the virtual mode.

## Organizer

Nepal Engineering college, one of the three consortium partners, hosted this regional capacity building training program at Kathmandu. Nepal Engineering College (*nec*) is a renowned academic institute established in 1994 with the aim of providing quality technical education to Nepalese students. It was founded by a group of visionary professionals and academicians who recognized the need for an institution that could contribute to the country's economic growth through engineering and technology education. *nec* is a not-for-profit social institute registered with the District Administration Office in Bhaktapur. Despite its modest beginnings, *nec* has expanded its physical and

instructional resources and now possesses comparable learning facilities to other reputed institutions in the country and the region. Its campus, situated in the Changunarayan Municipality of Bhaktapur, spans 210 ropanies (10.69 hectares) of land and provides an ideal learning environment amidst natural surroundings. Currently, **nec** offers Bachelor and Masters degree programs. <https://www.nec.edu.np/>

## Programme Venue

The initial two days session of the SAWA regional training workshop was held in the Hridaya Hall of Hotel Manaslu, Lazimpat, Kathmandu. The stay for all the participants was also arranged in the same hotel.



The team headed to Dhulikhel municipality on 6<sup>th</sup> February 2024 for the field work. There stay was booked at the hotel Himalayan Horizon and post lunch teaching sessions/discussions/data compilation (6<sup>th</sup> February 2024 to 8<sup>th</sup> February 2024) were held in the Haveli Hall of the same hotel.



# Overview of the training Programme

## Objective

This training initiative was focused on building capacity in the areas of Interdisciplinarity and gender along with gaining knowledge on review of literature and developing an understanding for secondary and primary data for the research work. As the students of the partner institutes are trained through their curricula in technical aspects of water resource management, this training aimed to orient them mainly to social inclusion in their decision-making.

## The Hybrid mode of learning

During the project inception stage, this training was proposed virtually based on the experiences from the past pandemic situation. However, as the situation improved, the team members proposed the hybrid mode of training which includes a few online sessions introducing the basics of Interdisciplinarity and concepts of Gender followed by in-person training and field work. Again post the field work some more online sessions are added to the training program towards strengthening their knowledge on data analysis and writing skills.

The detailed training agenda for the virtual and offline sessions is attached as annex 1

## Methods used for facilitation

The in-person training program lasted for five days, with multiple sessions on the first two days followed by the field work for three days. The following methods of facilitation were used.

**Interactive Sessions:** The sessions were interactive in nature. Each classroom session included classroom lectures using PowerPoint, followed by a discussion of about 15 minutes. Participants were encouraged to take an active part during the discussions.

**Group Exercises:** Participants were divided into different working groups with each country student in each group. For the field practicum, initially three groups were formed and later divided into six groups.

**Field Exposure:** Participants were taken to Dhulikhel (30 km away from Kathmandu) for the three days to provide exposure on community based drinking water supply system.

## Participants' profile

The participants for this training programme were those who were selected as fellows as part of the first batch of South Asia Water (SAWA) Fellowships, through a competitive process from each of the three partner institutes. Seven fellows each from Sri Lanka and Nepal and four fellows from Bangladesh were in attendance, leading to a total of eighteen fellows. Five participants were pursuing Doctoral degree while the remaining 13 fellows are registered for the Masters in IWRM.

Most had a conventional civil engineering background and few had an agriculture and environment background. Introduction to concepts of qualitative research and gender were important to develop an interdisciplinary perspective in their approach towards water issues. The detailed profile of the participants is shared in annex 2.

## Outcomes expected

It is expected that at the end of the sessions and the fieldwork, the fellows will have fundamentals know-how of the qualitative research approach and will appreciate the importance of including social dimensions within the technical solutions they design as part of their assignments in future.

## Course Instructors

- **Prof. Peter Mollinga**  
Senior Fellow, Center for Development Research (ZEF), University of Bonn, Germany
- **Prof Vishal Narain**  
Professor, Management Development Institute (MDI), Gurgaon, India
- **Dr. Anushiya Shrestha**  
Research Director, South Asian Institute of Advanced Studies, Kathmandu, Nepal
- **Dr.Sreenita Mondal**  
Regional Research Lead, Gendering Water and Climate Science Research in South Asia
- **Ms. Suchita Jain**  
Regional Research and Training Coordinator, Gendering Water and Climate Science Research in South Asia

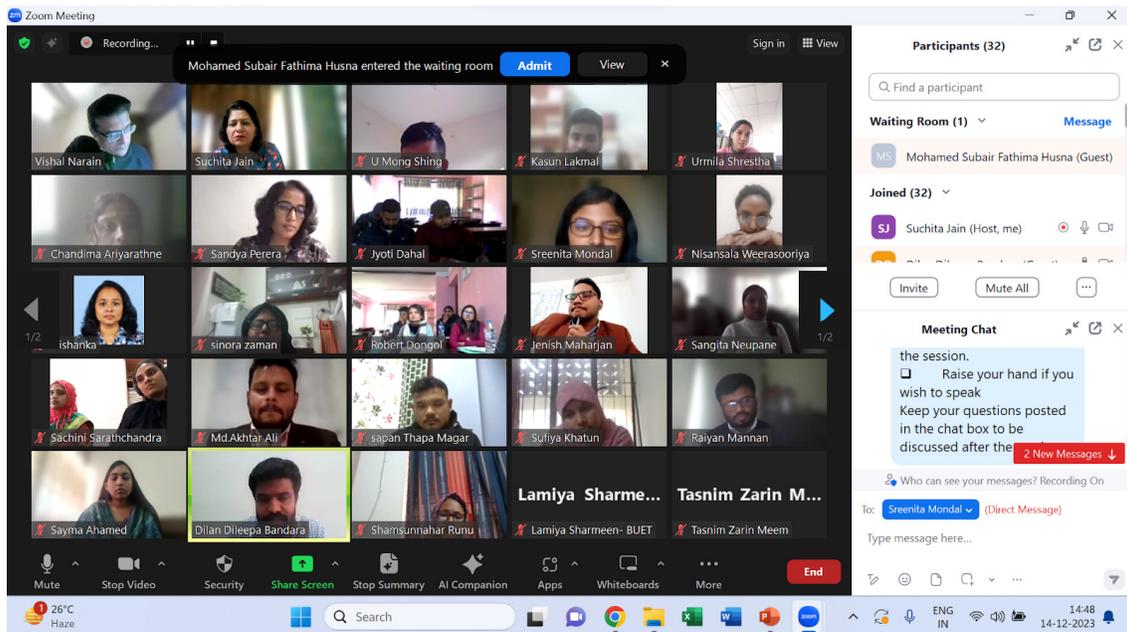
The detailed profile of each of the course instructor is given as Annex 3

# Pre-workshop virtual learning sessions

The capacity building of the SAWA award recipients is one of the major goals under this fellowship program. This time, the instantaneously planned in-person Capacity building program was scheduled for five days including the three days of field work. Since the duration of in-person capacity building program was short so it was necessary to prepare the participants for the field work in advance by training them with the basics of Interdisciplinary research methods and the concept of gender. A total 7 virtual sessions were organized of 2 hours each on the basics of Interdisciplinarity (2 sessions), concepts of Gender (2 sessions), literature review (1 session) and preparation understanding the field site (2 sessions) before the Kathmandu workshop.

## Virtual learning session1 | 14 December 2023 | Prof. Vishal Narain Paradigms in Social Sciences

The research paradigm from which we operate has a fundamental relationship with the nature of our research enquiry as well as the research methods and tools that we employ to engage with it. However, paradigms are never made explicit. Understanding paradigmatic differences in how research is conducted is also essential in making a transition from natural science research to social science research. With this backdrop, this session explained the concept of research paradigm and the differences across different research paradigms – namely, positivism, interpretivism and critical social science research.

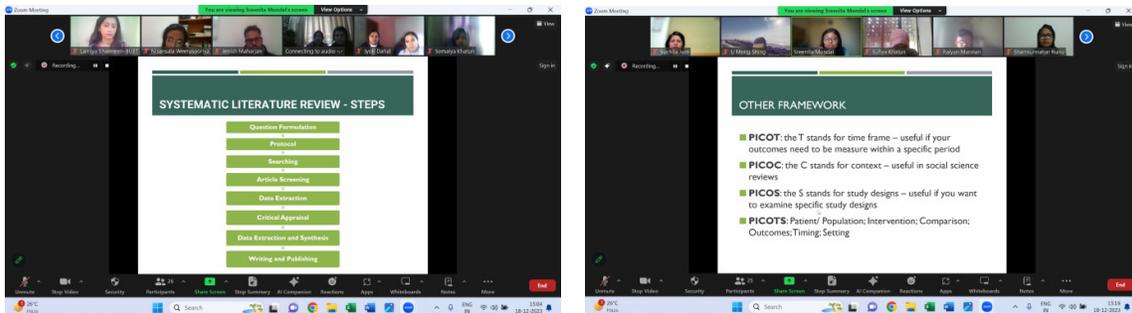


Prof. Vishal explained the challenges faced by natural science researchers transitioning to social science research due to the differences in approaches, methods, and data analysis techniques. He emphasized the importance of empathy towards different research paradigms and methods. Prof. Vishal encouraged researchers to be clear about their own orientation and empathize with other paradigms. He also touched upon critical social sciences, acknowledging its focus on recognizing power differences in society, strength and weakness of each of the research paradigms and concluded the session with some further reading suggestions.

## Virtual learning session2 | 18 December 2023 | Dr.Sreenita Mondal

### Overview of literature Review

The session on an overview of the literature review aimed to provide a comprehensive understanding of the significance of literature reviews in academic research with a special emphasis on Systematic literature review, empowering participants to navigate scholarly databases effectively, distinguish between different types of literature, fostering skills to critically analyze and synthesize existing literature, and instilling methodologies for organizing and presenting a coherent review that forms a solid foundation for their research endeavours.

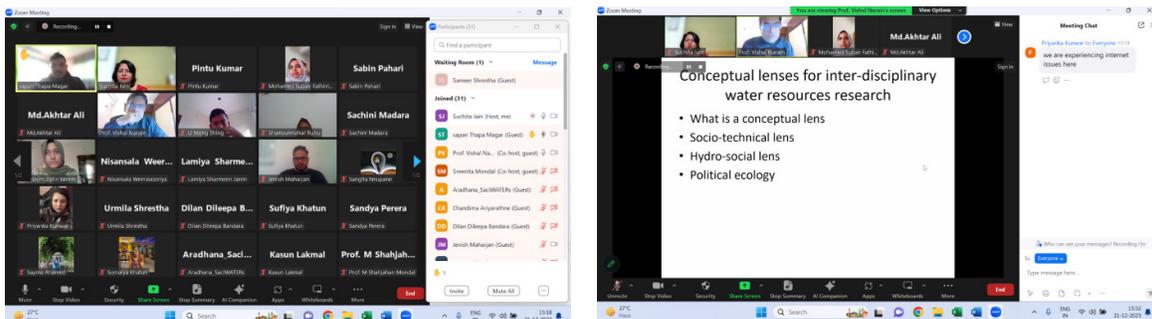


During the session, Dr. Sreenita emphasized the importance of systematic literature reviews and explained all the steps involved in the process of systematic review such as – Question formulation, developing a protocol, searching, article screening, data extraction, critical appraisal, data extraction and synthesis followed by writing and publication. She highlighted the need for comprehensive, unbiased, and reproducible searches, and the importance of reviewing the search strategy. She also explained various open source and paid tools to perform each task such as frame research questions, screening the data etc.

## Virtual learning session3 | 21 December 2023 | Prof. Vishal Narain

### Inter-disciplinary water research: an introduction

This session engaged the participants on the rationale for inter-disciplinary water research. There are close relationships between the biophysical, social and institutional contexts in which water is accessed and used, which our disciplinary training often prevents us from seeing. Inter-disciplinary water research seeks to explore the relationship between the social, technological and ecological dimensions of water use and access. This session briefly focused on some conceptual frameworks that are used to do inter-disciplinary water resource studies.



The session started with the discussion on the reading material provided by the instructor. By reading the research paper about water insecurity in Peri-urban Gurgaon, students summarised the

research paper specifically around “how interpretive/qualitative research is done?” Later Prof. Vishal emphasized upon the importance of understanding the methodology of research. The class discussed more about water management in a city, which highlighted challenges faced due to exclusion from the canal's design and the subsequent conflict over water utilization. The professor stressed the significance of interpretive research in capturing people's lived experiences of water insecurity. The professor noted that our perspectives and interpretations are shaped by our individual experiences and expertise.

Prof. Vishal discussed the significance of inter-disciplinary research, explaining how professionals from various disciplines, such as engineering, economics, law, and anthropology, might view a topic differently due to their respective training. The interdisciplinary nature of water research, noting the importance of integrating knowledge from both the natural and social sciences was also highlighted. To understand the relationship between the physical and social aspects of water, students were introduced to conceptual lenses.

Virtual learning session4 | 11 January 2024 | Prof. Vishal Narain

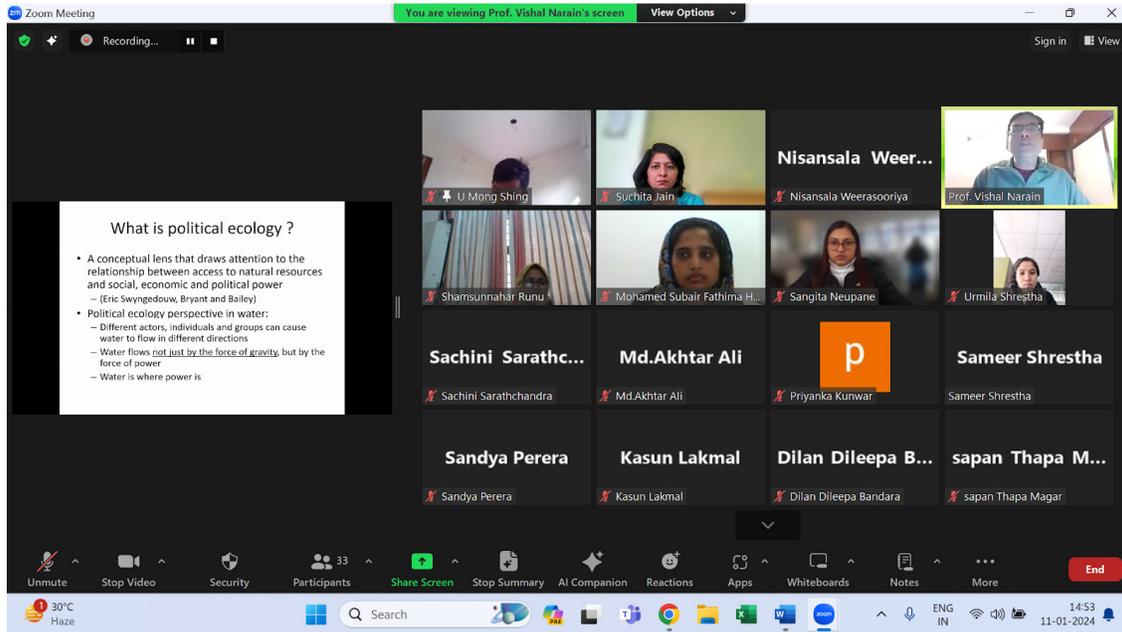
### **Gender and Water: Conceptual Groundwork**

The aim of this session was to introduce participants to conceptual issues in the gendered analysis of water access, use and governance. The concepts as sex, gender, gender identity, gender relations and inter-sectionality were also introduced to them along with explaining the rationale for a gendered analysis of water access and governance.

To broaden their understanding about the socio-technical lens, the fellows were asked to read a research paper on farmer managed irrigation systems shared by the instructor. In the beginning of the session some fellows presented their views from specifically focused on the following questions

- 1) What kind of research is presented in this paper (positivist/interpretive/critical social science)? Why? How do we come to that conclusion?
- 2) How does a socio-technical lens help us understand the dynamics around a farmer managed irrigation system?
- 3) What are some of the factors that shape farmers' differential vulnerability to the effects of climate change ?

Another paper focusing “shifting the Focus from Women to Gender Relations” was shared with students to discuss about the value of focusing on the concept of "gender" rather than on "women" and about the concept of intersectionality?



Later the session continued the previous discussion on interdisciplinary water studies, discussing the social and natural aspects of water management. The professor highlighted the importance of understanding the social construction of water governance, access, and distribution. He also discussed the role of caste, gender, and economic class in shaping access to resources such as water. The conversation also emphasized the need to use conceptual lenses such as the hydro-social and political ecology to understand the relationship between the physical and social dimensions of water. The session concluded with a discussion on the conceptual foundation of gender and water, highlighting the interconnections between gender and water and the disproportionate impacts on women.

#### Virtual learning session5 |17 January 2024 |Dr.Sreenita Mondal and Ms. Suchita Jain

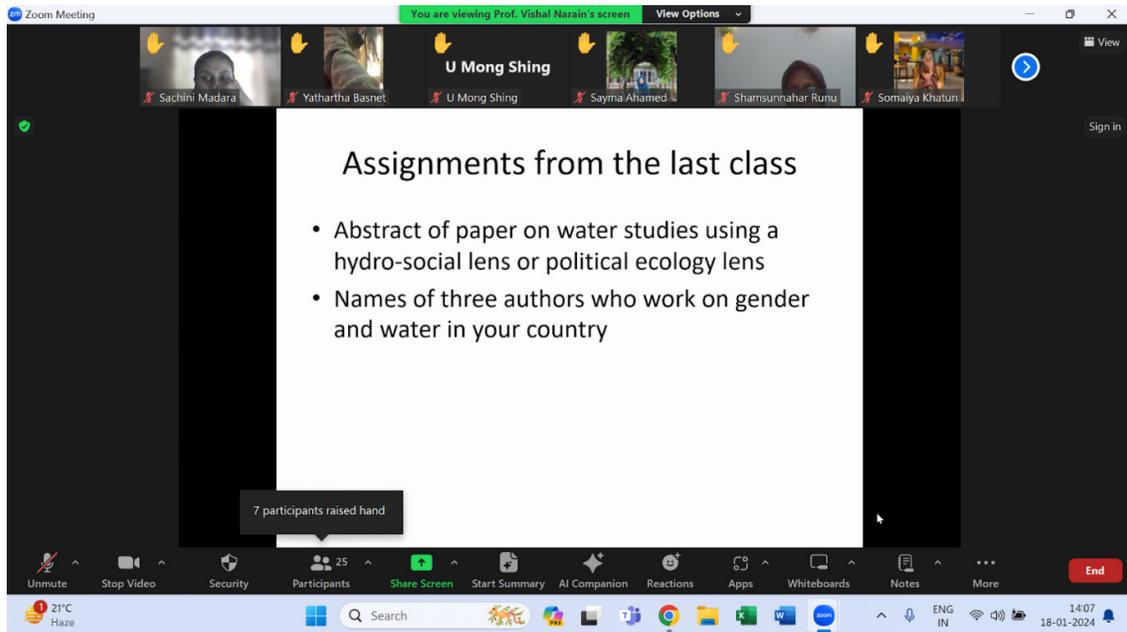
#### Field work preparatory session

Dr.Sreenita and Ms. Suchita outlined the plan for a training program involving first cohort 18 students from the three institutes. The students were divided into three groups to each research a different topic, with each group having a mix of students from different institutes, a few PhD students and also good blend of male and female fellows. It was also made sure that each group has a couple of Nepali students since the field work is being conducted in Nepal. Each group was expected to design a questionnaire before the field work and later, conduct a survey or focus group discussion, and keep all the data collected. The students also decided on a team leader and co-lead for each group who would be responsible for collecting data, guiding the process, and distributing work. The team leaders would also serve as the main point of contact for the instructors. The students were also encouraged to practice their language skills by acting as interpreters during fieldwork.

Dr.Sreenita instructed the team on the importance of designing a precise and efficient questionnaire for their fieldwork and emphasized on the importance of securing the raw data. Since Prof. Vishal have been part of the training program before and have good knowledge of the chosen field site, he suggested three broad topics and research questions. The research topics were further discussed with the fellows in order to choose the appropriate research method and design the suitable research questionnaires/interview guide.

## The gendered dimensions of water governance and climate change

In this session, participants were introduced to the different ways in which water governance and vulnerability to climate change are gendered. This included discussion on such aspects as the feminisation of agriculture, the gendered nature of decision-making around water, the gendered dimensions of protests against water infrastructure and the gendered vulnerability to the effects of climate change and climate induced disasters.



The screenshot shows a Zoom meeting interface. At the top, there are several participant thumbnails with names: Sachini Madara, Yathartha Basnet, U Mong Shing, Sayma Ahamed, Shamsunnahar Runu, and Sornaiya Khatun. The main content is a slide titled "Assignments from the last class" with the following text:

- Abstract of paper on water studies using a hydro-social lens or political ecology lens
- Names of three authors who work on gender and water in your country

At the bottom of the slide, it says "7 participants raised hand". The Zoom control bar at the bottom includes buttons for Unmute, Stop Video, Security, Participants (25), Share Screen, Start Summary, AI Companion, Reactions, Apps, Whiteboards, Notes, More, and End. The system tray at the very bottom shows the date and time as 14:07 on 18-01-2024.

At the end of previous session, students instructed to develop the habit of reading and as part of it Prof. Vishal given them an assignment to prepare an abstract of any research paper on water studies using a hydro-social lens or political ecology lens. Some of them read the abstract during this session while others were asked submitted the abstracts over the google drive. The submitted abstracts from the students are accessible at [https://drive.google.com/drive/folders/1UdMKVMo4yHuW\\_C9hbk8O68p4nYy4R2Cw?usp=drive link](https://drive.google.com/drive/folders/1UdMKVMo4yHuW_C9hbk8O68p4nYy4R2Cw?usp=drive_link)

The discussion revolved around the topic of collective action, specifically in the context of water management institutions. The participants discussed their understanding of the term and its relevance in this context. The professor led a discussion on the gender dimensions of climate change, outlining the varying vulnerabilities of men and women to its effects and highlighted the importance of understanding adaptive capacity and how it can be influenced by access to various resources. He suggested further exploration into the factors that shape these differential vulnerabilities and how they perceive and adapt to climate change. The gender disparities in life expectancy and vulnerability to climate-induced disasters, attributing higher female mortality rates to societal norms and other factors were also discussed during the class.

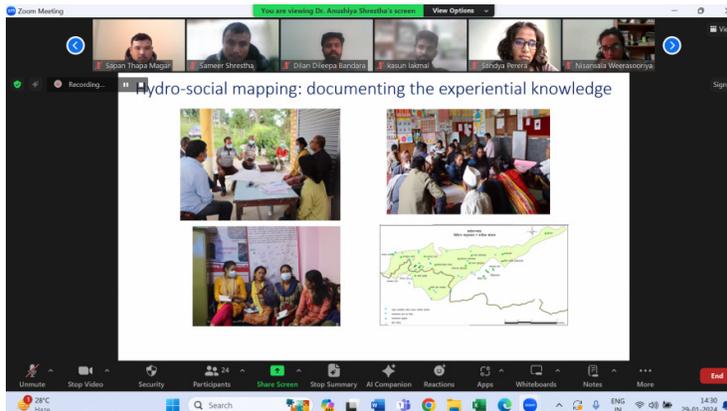
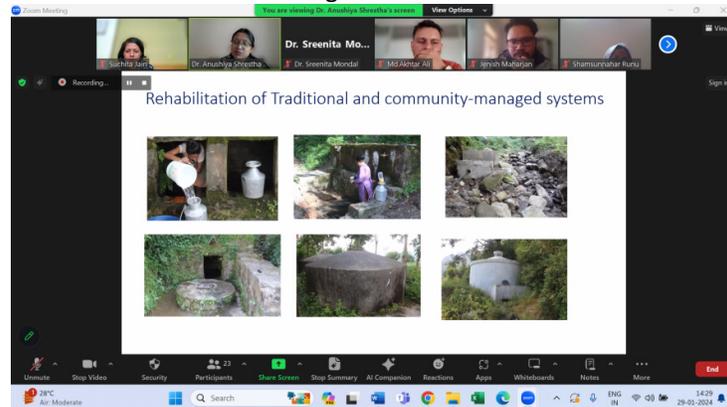
Virtual learning session7 | 29 January 2024 | Dr.Anushiya Shrestha

## Trials, triumphs, and tribulations in the pursuit of water security: A case of Dhulikhel Municipality, Nepal

To select a suitable site for the field work, the team Nepal (Coordinating professor and RC) visited a couple of field sites around Kathmandu and conducted the reconnaissance. They had discussion with local people and prepared a note for each of the site and those are accessible annex 4

Later as per discussion with the core team members, Dhulikhel municipality was finalized as the most suitable site in terms of approach, feasibility and pressing issues pertaining to drinking water insecurity and sustainability of water sources in the state of climate change. To acquire more knowledge about the field site to effectively design the research framework and questions, Dr. Anushiya

approached since herself along with their research team has worked extensively around that area with a similar focus on water and climate change issues.



Dr. Anushiya shared her research on Dhulikhel, a municipality in Nepal, where she has been working since 2014. She discussed the municipality's efforts towards ensuring water security, the challenges they faced, and the successes they achieved. Anushiya also mentioned the historical context of water scarcity in Dhulikhel and how the community leaders proactively sought solutions. The discussion also touched upon the impact of population growth and administrative restructuring on water resources in Dhulikhel. She also discussed the transformation of Dhulikhel, a Village Development Committee in Nepal, into a municipality and explained how the municipality had to be administratively divided into Urban and Rural wards to meet the population criteria to qualify for the German government support.

The implementation of the project was challenging due to water scarcity in Dhulikhel. The German government and the Dhulikhel Drinking Water User Committee worked together to establish a water supply system, which was the first community-based water supply approach in Nepal. The system later became the foundation for the municipality's rebounding commercial activities and expansion. However, due to increasing water demand, the interruption-free water supply has reduced to 2 hours. Dr. Shrestha also highlighted the importance of the region's land use data, which shows an increase in built-up area and commercial activities, leading to increased water demand. This session was extremely helpful for the students to design the research framework and the broad research questions. She was requested by the organizers to join for the field work in Dhulikhel and she kindly agreed to accompany for first day of the field work.

# The classroom learning sessions

Classroom learning allows students to interact with their peers face to face and build social connections, enhancing the learning experience. Amidst the structured and organised classroom training environment learners are more focused, motivated and concentrate well on learning without the distractions of home or work. The first two days of the Regional Capacity Building Training Program were dedicated to the classroom learnings.

The first day of the in-person training program started with the **introductory session** where the Regional Research and Training Coordinator Ms. Suchita informed about the training program and welcomed all the participants. From Nepal Engineering College, Principal Prof. Durga Prasad Bhandari joined the program and welcomed all on behalf of the host institution and expressed how important the research around water, climate change and gender is. The Regional Research Lead, Dr.Sreenita Mondal shared the overall trajectory of the SAWA program.



The program officer from IDRC Dr. Katie Bryant, virtually joined the session and highlighting the challenges specially women’s absence from the stem field and how this whole initiative from IDRC and this particular project will contribute to address the Gender Inequities in STEM Fields in South Asia.

The three professors being an integral part of this program since beginning also shared their experiences and the journey at their respective Universities across all the SAWA programs. Prof. Dhammika Dayawansa from Sri Lanka presented an overview of Post Graduate Institute of Agriculture and how the institute is linked with the program since last 17 years. From Bangladesh

Institute of Technology (BUET), Prof. M. Shahjahan Mondal talked about the program journey at the Institute of Water and Flood management (IWFM) and the changes he observed in past years in terms of enrolment etc. Mr. Robert Dongol from Nepal Engineering College expressed that unlike other two partner institutions, the IWRM course was initiated with the SAWA program at *nec* and now the graduates working across the world.

At the end of the introductory session, Ms. Suchita thanked all the resource persons, core team members and participants and requested Prof. Peter Mollinga to start his session focused on interdisciplinary approaches.

Classroom session 1 | 04February 2024 | Prof. Peter Mollinga

### Interdisciplinarity as Boundary Crossing

Prof. Peter Mollinga, the key person behind conceptualizing the SAWA program, delivered a two-hour session on Interdisciplinarity as boundary crossing and started explaining which Interdisciplinary boundary to be crossed and how to cross that boundary. He also emphasized that because of territorialism and Cartesian divide, we find it so difficult to combine natural/technical science disciplines with social science/humanities disciplines. Furthermore, he discussed about boundary concepts, objectives, internal and external boundary settings, boundary work and types of boundary crossing.



Classroom session 2 | 04February 2024 | Prof. Vishal Narain

### Doing fieldwork around water: an ethnographic approach



Prof. Vishal initiated the session with the discussion on the reading material he provided to the students beforehand. He called students to share their understanding about what does the research paper on “Replacement or displacement” tell about the ethnographic approach to water studies.

He explained ethnography especially in the context of water and when it is suited and elucidated on principles and various steps involved in the fieldwork starting from formulation of research question, selecting the study site, finding key informant to developing semi-structured interview guide etc. In case of research on water, he suggested to take leads from the field observations, to start with broad questions, let the conversation evolve and pay attention to words and expressions. Different sampling methods, techniques to analyse the data from field and Grounded theory were also mentioned during the presentation. Before closing his presentation he suggested to further read “the case study method” (Yin 1984) and “Grounded theory” by Strauss and Corbin.

**Classroom session 3 | 04February 2024 | Dr.Sreenita Mondal**

### **Field Research Methods and Questionnaire finalization**

Earlier, the students were divided into three groups and assigned with broad research topic and questions. Each team came up with the research design and questionnaires pertaining for their respective topics. The purpose of this session by Dr.Sreenitawas to discuss,explain and finalize the field questionnaires with the fellows for the upcoming field work in Dhulikhel. The research topics and detailed field questionnaires are attached as annex 5



**Classroom session 4 | 05February 2024 | Prof. Peter Mollinga**

### **Interdisciplinary Research Questions**

Continuing the previous day discussion Prof. Peter explained the meaning and difference between the common terms such as disciplinary, interdisciplinary, multidisciplinary, trans-disciplinary and participatory was described through info graphics. The session was interactive and during the session he described how science and politics are connected and what should researchers know while producing usable knowledge for sustainable development and also hetouched upon; the

politics of research, key paradigms, knowledge for sustainable development and the types of trans-disciplinary research on NRM.

Furthermore, during the interactive session on Interdisciplinary research questions Prof. Peter described different types of research with research design examples and Context/condition-Mechanism-Outcome (CMO) configurations along with Street level Theory of Change (STOC) which is useful in designing precise research questions. He took several examples from the student’s research topics and focused on finding the “why” question, reformulating the research objective as research question, knowing the A→B structure and how to make that an interdisciplinary question.



**Example 2**

Assessment of water, sanitation and hygiene practices of floating population in Dhaka city

- 1) What is the ‘why’ question underlying this research top?ic
- 2) How can we formulate a research question about this topic?
- 3) What is the A → B structure implicit in that research question?
- 4) How can we make this into an interdisciplinary question?

He explained qualitative and quantitative research from the stretagy/approach and design perspective and shared the types of research designs (Gilbert, 2008, p. 37). This session benefitted students to lucidly frame the respective individual dissertation/thesis research topics and design the research methods and tools efficiently.

			EXAMPLE
Quantitative	Cross-sectional	Case	Studies of particular organisations or settings (see Chapter 6)
Quantitative	Cross-sectional	Representative	Large social surveys (see Chapter 19)
Quantitative	Longitudinal	Case	Historical studies of nations or groups (see Chapter 15)
Quantitative	Longitudinal	Representative	Panel and cohort studies (see Chapter 19)
Qualitative	Cross-sectional	Case	Focus group studies (see Chapter 12)
Qualitative	Cross-sectional	Representative	Cross-national comparative case studies
Qualitative	Longitudinal	Case	Ethnography (observation) of small groups and settings (see Chapter 14)
Qualitative	Longitudinal	Representative	Studies of small societies and groups, by interviewing informants (see Chapter 13)

The classroom learning sessions were followed by the experience sharing by the SAWA alumani from Nepal.

# Experience sharing by SAWA Alumni

Starting from the Crossing Boundaries phase, the SAWA program supported a total of 54 fellows (45 Female, 9 Male) completed their masters in Interdisciplinary Water Resources Management (IWRM) from Nepal Engineering college. A few of them, who are based in Kathmandu, were invited to share their journey through the SAWA program with the current cohort.



**Mr. Prakash Gaudel** (Crossing boundaries) shared that the SAWA programme was a wonderful journey and he feels great honour by calling himself as a SAWA alumni. He added that he was fortunate to join the similar Regional Capacity Building training back in 2010 in Bangladesh. He expressed that the training was impressive and eye opening for him and the IWRM programme and SAWA fellowship ultimately let to start his professional journey in the water sector. For past 12 year he is working with Nepal Electricity Authority which is a government organisation and mainly deals with generating electricity with Hydropower. He emphasized that having interdisciplinary approach to any government project related to water is very vital and encouraged fellows to begin from this platform.

**Ms. Eva Manandhar** (SAWA fellowship) expressed that she learnt a lot and started seeing the world from different perspective. She got introduced to a new field to the development sector and to see the resources and her own country from an IWRM perspective.. She suggested the fellows to not to hesitate to keep their mind open and getting varied perspective about water and related areas.

Working as a Hydropower engineer with Department of Electricity in the government sector, **Ms. Poonam Pandey** (SAWA leadership) said that the regional workshop is the best part of the SAWA program and her knowledge got widened regarding field research methodology and interdisciplinarity and cross cutting issues. Based on the findings from the field visit during the program she was able to publish a paper in springer. Being in government sector she finds herself bounded in terms of utilizing her potential and she could have explored more if she would have been in some other sector.

**Ms. Mana Devi Shrestha** who is a fellows from the crossing boundary phase 2007, shared that after bachelors in civil engineering she applied for this course and got fellowship. Previously she had knowledge of technical aspects only but her vision got broader after joining this course. She mentioned about getting trained from the well known water experts such as Dr. Ajay Dikshit, Dr. Deepak Gyavali and Dr. Surya Nath Upadhyay. The practical knowledge during the course and the knowledge she gained though courses such as Water and Gender, conflict management and disaster

is totally different from the technical knowledge. The 15 days rigorous training was the best part of the program. She also quoted a sentence from one of the mentor “Dam is not just a civil structure but it means a lot”.

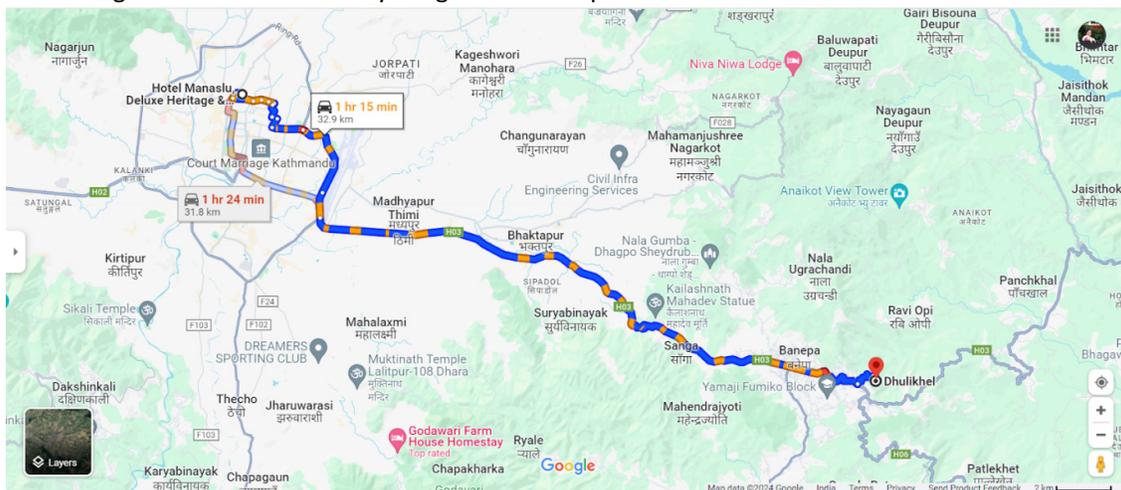
Later she appeared for the civil services exam and found this course wasn’t valid so she along with her colleague Mr. Hari Bahadur Thapa tried to get it included and it happened so. Currently she is working as the Deputy Director General at Department of Electricity Development and as part of the job she requires to deal with multiple sectors of different expertise. This course trained her well in all aspects and enabled her to deal with the issues.

**Ms. Manina Baidya** (SAWA fellowship), who is working as Deputy project director with Urban water supply and sewerage Management in Nepal. She is working in this sector after completing the course. She highlighted that this course focuses on practical aspects and show you what water sector looks like, what problems and challenges you will face and how to deal with it. It makes you a complete professional in all aspects. She also said that there are now many IWRM graduates in south asia and a collaborative approach will be good for the growth in this sector.

As a program director with a national NGO- ENPHO **Mr. Rajendra Shrestha** (SAWA fellowship) is working on water and sanitation for past 10 years. Water being related with multiple other things and he got chance to understand all associated aspects while doing the course. Beyond academic course, he was able to think in a different way beyond the structural perspective of water and sanitation. Being trained by several experts during the training program, he finds himself capable of utilizing this knowledge into practice.

# Field Exposure

After the two days classroom sessions, the team travelled to Dhulikhel on 6<sup>th</sup> February. Dhulikhel is around 30 kms away from Kathmandu in the South-east. The purpose of this field exposure was to train the fellows in qualitative research methods specifically approaching the community, conducting different kinds of surveys to gather the required information.



Dhulikhel did not have enough sources of drinking water due to its geographical location. So the people in Dhulikhel requested the Government of Nepal to manage the drinking water problem in the area. The water supply project started in 1989 as a component of Dhulikhel Development Project, and was completed in 1994 under financial and technical assistance from the German government. It was handed over to the local water users committee in 1992.

The drinking water supply scheme in Dhulikhel is one of the oldest community managed systems. Before its implementation, people used localized springs and streams as their drinking water sources and currently it fulfils about 80% of the water demand of the town. The users committee are effectively managing the system and supplying the water to more than 10,000 populations.

Dr. Anushiya Shrestha accompanied the team for the first day of the field work. After reaching Dhulikhel, the team first visited Dhulikhel municipality to understand the overall water supply management process, the issues and challenges faced by the municipality in order to refine the field questionnaires.

At Dhulikhel Municipality, honourable Mayor Mr. Ashok Kumar Shrestha has kindly agreed to meet the team. At the municipality office, first Er Rajan Neupane provided a brief introduction of the municipality and presented the history and current scenario of the Dhulikhel drinking water supply scheme. The municipality was established in the year 1986 with 9 wards and recently with the addition of three more wards makes a total of 12 wards spread across 54.62 Sqkm. Following the discussion, Er Hareram Humagai presented an overview of the wastewater management system.

Post presentations, the team got an opportunity to have a round of discussion with honourable Mayor Mr. Ashok Kumar and got their queries addressed by the Mayor.



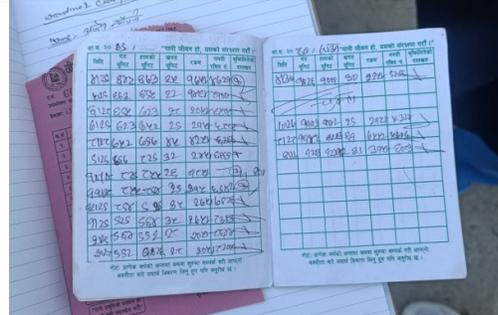
*Post discussion click with Mayor and other staff at Dhulikhel Municipality*

During the second half of the day, with support from the Dhulikhel municipality the team got an opportunity to visit Dhulikhel water treatment plant, from where the water is being supplied to the municipality and surrounding area.



*Satellite image of Dhulikhel water supply plant*

The Dhulikhel Water Treatment project with the aim to provide clean and safe drinking water to the residents of Dhulikhel and surroundings, is a gravity flow system managed by the local community with assistance from the German aid group, GTZ. It is located on the eastern uphill nearly 5 kms from the Dhulikhel town.



Discussion at water treatment plant and with person-in-charge, chlorination unit, filtration and storage units, Water tariff book

The overall process of water treatment was explained and different units – Chlorination unit, multiple filtration units (gravel and sand pit), water storage tanks were shown by the person-in-charge. In recent times certain challenges have been identified that affect the plant's ability to meet the growing water demand and maintain water quality standards.

On the same day, team visited ward no 2 to collect information as per the previously prepared questionnaires. The purpose was also to test the questionnaires/guides and modify in case any changes are required.



*Discussion with Ward Chairman*

In the evening, the team sat together to discuss the on-ground situation and amended the questionnaires accordingly.

In the next two days respective groups gathered a lot of information by using qualitative interviews. The evening hours were utilized to cross-share their group experiences and discuss the issues and challenges faced during the day in terms of data collection. Post-workshop when the interviews are transcribed, the qualitative data analysis part will be taught to the students. Also many team building activities were performed during the evenings.



*Glimpse from the evening hours- including team building activities and discussion on findings and challenges.*

The field work ended on 08 February and each of the training participants were given certificate of participations. On the next day participants travelled back to their destinations.



*Prof. Dhammika presenting certificate to one of the training participants.*

# Post workshop virtual learning sessions

Virtual learning session8 | 13February 2024 | Dr.Sreenita Mondal

## Transcription management in qualitative research

After collecting data from the field, the teams were asked to prepare transcripts and arrange photographs. Immediately after returning from Kathmandu, Dr. Sreenita took a session on Transcription management in qualitative research showing how to transcribe the interview recordings so that the fellows can perform the next task before their exams. Dr. Sreenita led a discussion about research methods, focusing on the differences between quantitative and qualitative methods and outlined the stages of qualitative research, including deciding on study questions, conducting a literature review, and selecting an appropriate method. She also discussed the process of data collection, management, and analysis, emphasizing the importance of ethical considerations and the challenges of recording human interaction. Dr. Sreenita then focused on the process of transcription, explaining the different types and emphasizing the importance of including non-verbal elements. She provided guidance on handling language barriers in transcribing interviews and preparing transcriptions for research. The discussion also touched on the importance of listening to and understanding different dialects and the need to prepare for an upcoming task.

The challenges and types of transcription, with a particular focus on verbatim transcription were also discussed. She explained that verbatim transcription captures all aspects of speech, including errors, filler words, slang, and repetitions, which are important for general research. She also mentioned other types of transcriptions such as intelligent transcription, which does not include emotions, half sentences, or mumbled speech and emphasized the importance of including non-verbal elements like voice quality, pace, reactions, hand gestures, and discourse markers in verbatim transcription.

Dr. Mondal explained the process of preparing transcriptions for research, emphasizing that it is particularly important for PhD students following a qualitative research method. She advised using simple language and not translating into the local language initially. On being asked about incorporating transcriptions into research papers, she clarified that transcriptions are not necessary but can be used for coding and analysis. She also mentioned that transcriptions can be published in different languages and shared if requested by a journal or publisher.

Virtual learning session9-1| 19February 2024 | Ms.Suchita Jain

## Geospatial Techniques – part 1

The session planned to give general overview of Geographic Information system, how effective and powerful tool it is for the Interdisciplinary research work. The presenter underscored the need to understand the terminology and the reason for using GIS, emphasizing its interdisciplinary nature and its utility in different fields such as watershed analysis, land management, and more. A discussion ensued about the goal of the training program, with a focus on learning various research methods. The detailed agenda for the planned 4 Geospatial techniques sessions is given as annexure 6.

The various aspects of Geographic Information System (GIS) software and its applications were highlighted and the importance of GIS tools in managing different resources and decision making was discussed. The conversation highlighted that the use of GIS is widely known in quantitative

research but whether and how it can be used in qualitative research. Ms. Suchita also focused on the benefits of using Google Maps and Geographic Information System for data collection and mapping. The team decided to focus on QGIS in future meetings due to its open-source nature and ease of use.

She clarified the correlation between GIS, GPS, and RS and how GIS integrates location and data for visualization and interactivity. Explaining with examples she correlated the application with the recent fieldwork done in Dhulikhel and how GIS will be useful. She also talked about how a resource mapping project involving villages, focusing on identifying and documenting spring water resources can be added to GIS and becomes much more accessible and meaningful. While analysing the qualitative data from the field, the team plans to use satellite imagery and participatory GIS to strengthen their research work.

The speaker shared a google document with open access spatial and non-spatial data for Nepal, including administrative boundaries and water-related information and asked fellows from other countries to contribute to the list by adding open access data pertaining to their countries.

#### Virtual learning session9-2| 26February 2024 | Ms.Suchita Jain **Geospatial Techniques – part 2**

Ms. Suchita carried forward from the last session and explained the 5 components of GIS. She also discussed the process of collecting, storing, manipulating, retrieving, and transforming data in GIS. The session discussed GIS concepts including data representation formats, projection systems, and thematic maps.

Ms. Suchita discussed the concept of geographic and projected coordinate systems. She explained how the geographic coordinate system defines the location of data on the earth's surface, while the projected coordinate system is used to plot data on a flat surface. She also distinguished between cylindrical and UTM projections, and touched on the use of tools such as Google Earth or OpenStreetMap to assign coordinate information to data.

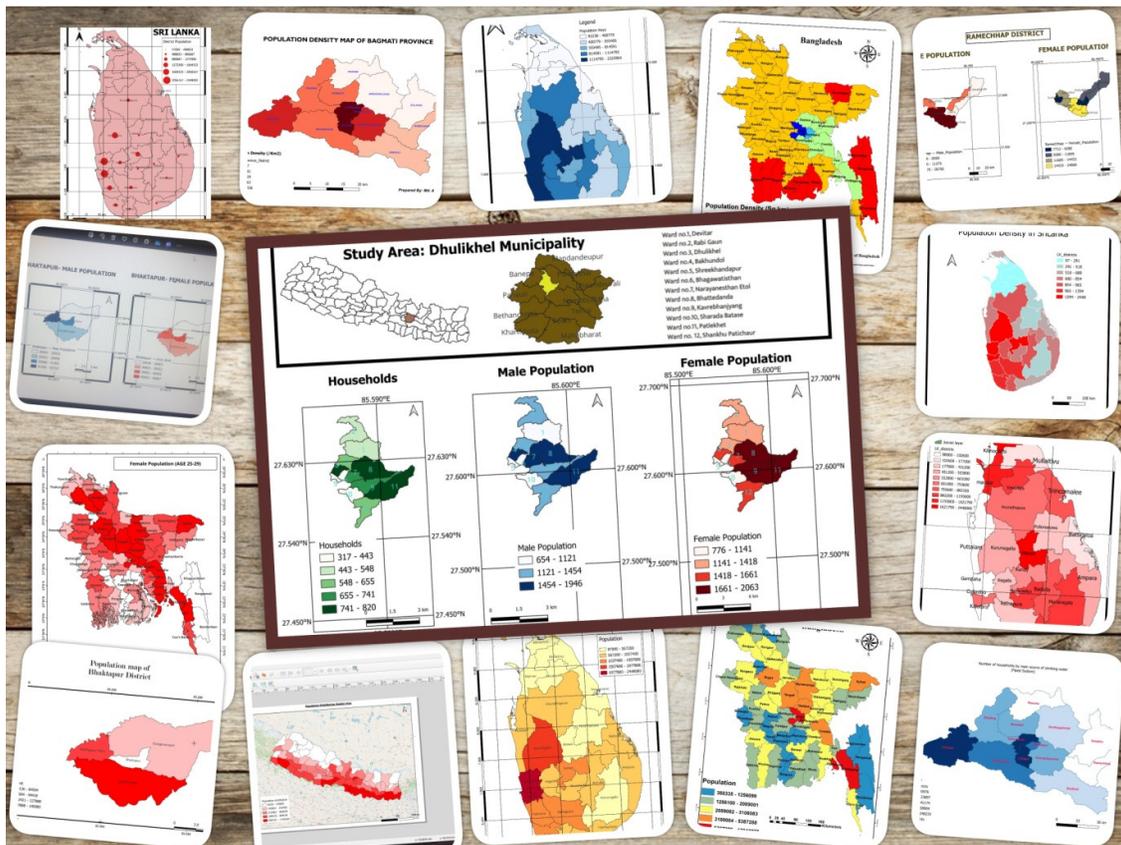
Suchita gave a detailed explanation about points, lines, and polygons as geographical features. She explained the importance of scale and the variable nature of vectors at different scale with an example of cities could be displayed as points at small scale while as polygon at large scale maps. She demonstrated how different scales offer different levels of detail, with larger scales providing a broader overview but less detail, and smaller scales offering more detailed information.

She also discussed the possibility of converting these features from vectors to raster and vice versa. Furthermore, she mentioned different file formats that can be used to represent these features. Suchita discussed the different types of maps used to represent single variable data and multivariable data, emphasizing that the choice of map depends on the type of data and the desired information. She also highlighted the importance of map cosmetics, including the data frame, legend, title, and scale bar, but noted that missing coordinate information can be a problem.

The QGIS hands-on was also part of this session starting from basics such as opening a vector data, applying symbology and working with attributes. Some administrative spatial data was shared with the fellows and they were suggested to prepare and submit maps using QGIS before the next session.

#### Virtual learning session9-3| 29February 2024 | Ms. Suchita Jain **Geospatial Techniques – part 3**

This session started with the discussion on the maps prepared by the fellows where the importance of user-friendly maps and ways to improve the submitted maps was explained by the instructor. Furthermore, the process of linking data in QGIS, emphasizing the use of unique identifiers and saving data as a CSV file explained. Suchita led a discussion on data visualization and map creation, detailing how to adjust the scale, insert a grid, and modify the coordinate precision. She also explained how to add and modify legends and save changes.



*A collage of map prepared by fellows using Open GIS source software QGIS*

Ms. Suchita presented on the topic of remote sensing highlighting how remote sensing works, noting that it uses reflected light from the Earth's surface. The conversation also included a discussion on the electromagnetic spectrum used in satellite remote sensing. Later, she emphasized the significance of conducting a land use and land cover change analysis to comprehend the threats against various types of land, the need for forest protection, and the direction of urban expansion. She underscored the impacts of land use changes on the atmosphere and local water sources, providing the example of Hyderabad's urbanization and sewage dumping leading to the drying up of lakes. While talking about the advantages of remote sensing over traditional field-based techniques for land use analysis she also explained that remote sensing provides a comprehensive picture of large areas, is less expensive and time-consuming, and is not affected by bad weather or inaccessible terrain. She further explained.

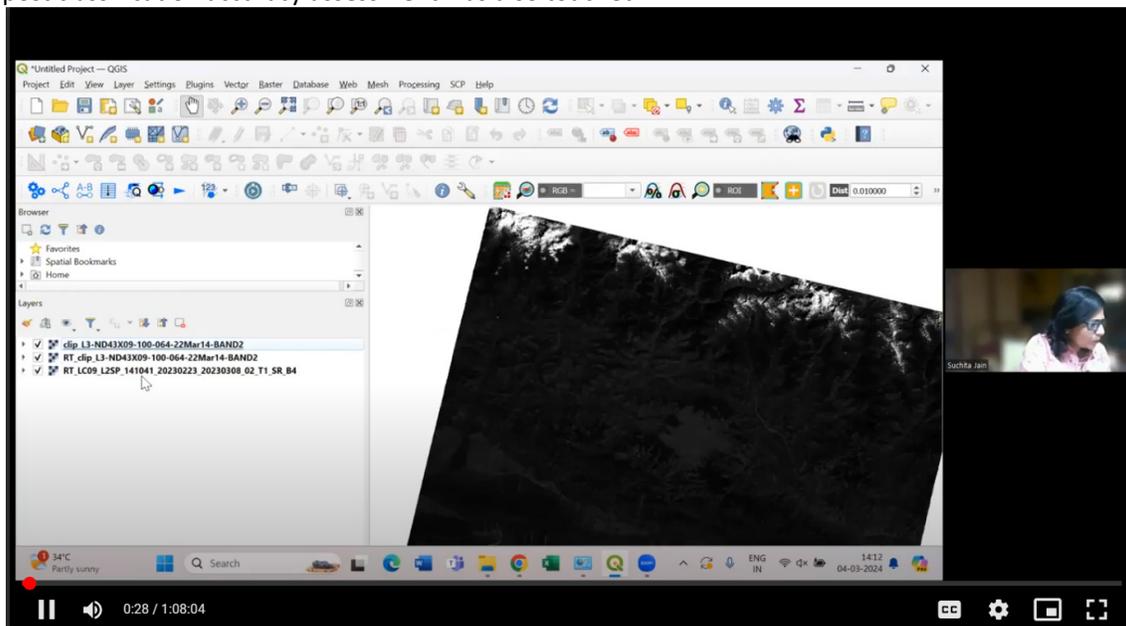
Suchita also discussed the different types of resolutions in satellite imagery, including spatial, spectral, temporal, and radiometric resolution and suggested that the choice of resolution depends on the scale of the area being mapped, with high-resolution suitable for small areas and low-resolution for larger areas. She also noted the potential use of drone mapping for smaller areas as it

is more cost-effective. She emphasized the importance of not merging bands of different resolutions and explained the classification of land use in India using a three-tier system. She also discussed the possible changes in land use and land cover, including increases and decreases in area, and changes from one class to another.

During the later part of the session Ms. Suchita led a discussion on how to download and process satellite images in QGIS software. She demonstrated how to create an area of interest and showed the various tools under the Semi-Automatic Classification plugin. She concluded by promising to upload a satellite image for the next class.

Virtual learning session9-4 | 04March 2024 | Ms.Suchita Jain  
**Geospatial Techniques – part 4**

To perform landuse/landcover classification on a satellite image, this last session was focused on learning semi-automated classification plugin. Preprocessing and preparation of the image i.e. merging the separate monochromatic bands to generate false colour composite, clipping/stitching the image according to the study area were performed using the plugin during the class. The classification techniques were shown over a LISS III satellite image and the signature selection process under each macro and sub-class were taught. After completing the selection of signatures procedure, the automated classification was performed over the satellite image. Very briefly the post classification accuracy assessment was also touched.



Apart from the GIS sessions, around 5 more online sessions are planned to teach the data analysis and writing part but were put- on-hold due to the semester exams for fellows.

Virtual learning session10 | 04June 2024 | Prof. Vishal Narain  
**Analysing Qualitative Data**

This session introduced students to how qualitative data is analysed. The session started with some reflections on the students' recent experience with collecting qualitative data during their fieldwork in Kathmandu; students were encouraged to share their experiences with conducting qualitative interviews and taking field notes and to contrast it with their experiences in conducting structured surveys. They were then got introduced to the epistemological foundations of analysing

qualitative data: in this context, they revisited the paradigm of interpretivism and social constructivism. In order to understand the larger uses to which analysing qualitative data may be put; students were oriented to the case study method, the premise of analytic generalisation and the premise of grounded theory. Prof Vishal shared a field note and started the session with following questions:

1. What does this note tell you about how qualitative data is collected and stored?
2. How is it different from treating quantitative data?
3. What are the three most important things to keep in mind?

Prof. Vishal discussed the importance of qualitative data in water research, particularly in observing and documenting water collection activities and social dynamics around water sources. He emphasized that observations around water collection points, such as hand pumps or standpoints, can provide valuable insights into water accessibility and social relations. He also highlighted the significance of recording personal anecdotes, socialization experiences, and spontaneous observations during fieldwork as qualitative data. He stressed that direct observation is necessary to understand conflicts and power dynamics accurately. Furthermore, he noted that different types of qualitative data, including semi-structured interviews, key informant interviews, and transcribed observations of events, can enrich water research.

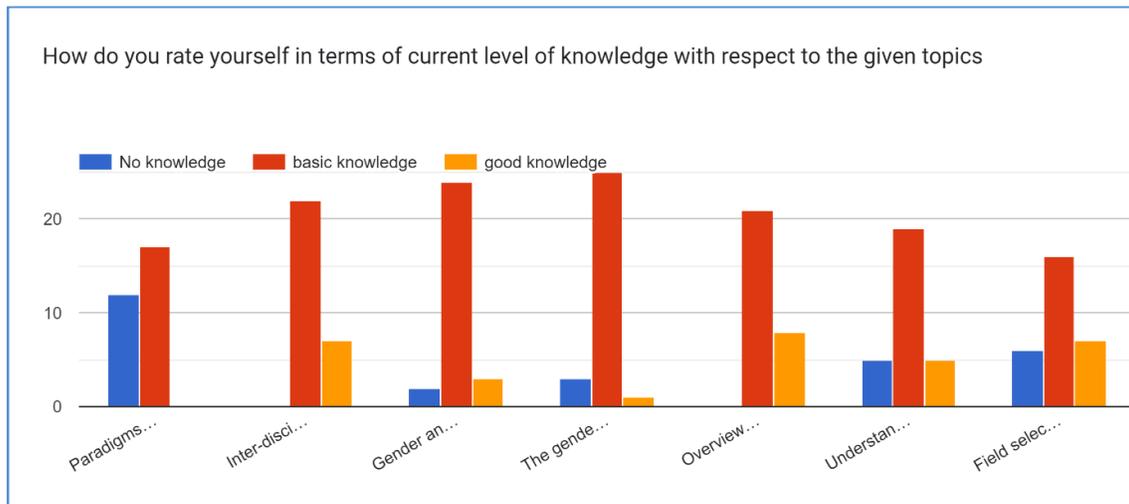
Prof Vishal discussed the process of classifying and synthesizing data using keywords and concepts to gain insights on various topics. He illustrated this method using examples from different fields and emphasized the importance of this process in organizing data and understanding respective topics. Furthermore, he highlighted the significance of second-order classification by concepts and discussed the importance of qualitative data analysis. Lastly, he recommended the use of Excel or similar software for managing and retrieving data and stressed the importance of understanding the generic principles of analyzing qualitative data.

Another session on scientific writing will be conducted during the next month.

# Feedback and outcome

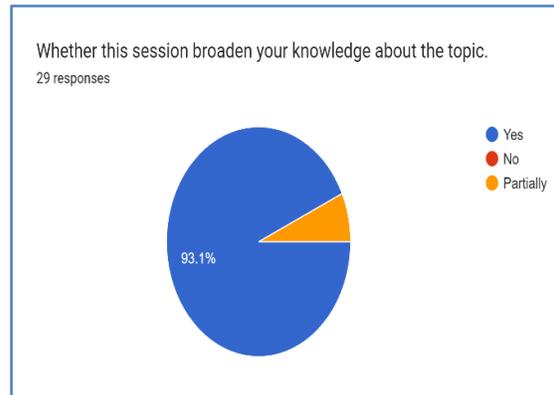
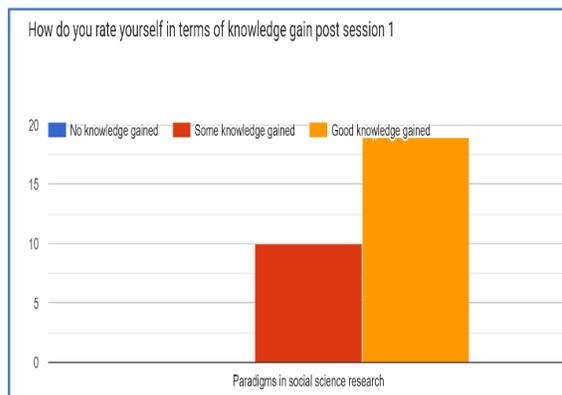
## Feedback from pre and post workshop online sessions

Student opinions were collected through a survey using the google form. The pre-workshop feedback was collected for the online sessions to understand their current level of knowledge pertaining to the specific topics and get a sense of their expectations to maximise the benefit of the training program. With respect to the initially proposed online sessions the students filled their existing level of knowledge in terms of – No knowledge, basic knowledge and good knowledge and the below graph shows the responses from 29 students including first cohort from PGIA and both the cohorts from BUET and *nec*.



Since the online session were planned on weekly basis there was a possibility to collect the feedback after each session so that the suggestions and comments feed into the next session. It helped the instructor customising the next session as per the students’ requirement or mould the teaching methods to maximise the gain for the students.

Post online session 1 around 65% fellows gained good knowledge and around 93% said that the session broadened their understanding about the topic while previously none of them had good knowledge.



All the fellows said that the teaching methods, the presentation content and the language adopted during the presentation was appropriate and many of them found the session very effective. Few of them suggested to share the presentation and recording after the session and some other suggestions to make the session more effective were:

- incorporating more of real-life experiences, practical applications or case studies and scenarios to illustrate how researchers practically navigate these paradigms.
- Ideas & way of method to conduct such research activities in field
- A short break in the middle of the two-hour session
- Include more graphics

Similarly the feedback was gathered after each and every session to be implemented during the next session. This method of collecting feedback was very effective and by the end of the online sessions in January nearly 85% participants told that the current teaching method is perfectly appropriate for them and did not have any further recommendation to improve the same.

Though this online mode of teaching is very convenient but there are always challenges associated such as poor network connectivity for some of the fellows. However, by sharing the session recordings it was ensured that everyone is getting equally benefitted with this training program.

### **Feedback from offline sessions**

The two sessions from Prof. Peter Mollinga and one session from Prof. Vishal Narain received great response from the first cohort fellows who attended the offline workshop. It was suggested to conduct more such offline sessions since it is very effective to learn and interact with the instructor in person.

At the end of the training program, the feedback about the field work and the overall workshop was also shared by a few fellows. They expressed that they found this training program very interesting and learnt many more new things about incorporating Interdisciplinary and Gender to their respective research. However, many of them felt that a little longer duration of field work would have been better in terms of learning field research methods.

### **Outcome**

Such trainings specially using hybrid mode are effective and by the end of the training fellows were trained in interdisciplinary methods and gender analysis in water and climate science research. Student felt confident about interacting with community and employing qualitative research tools to conduct an Interdisciplinary research focusing gender component. The training will be helpful understanding importance of interdisciplinarity and to incorporate gender part to their respective dissertation/thesis research.

# Annex 1

## REGIONAL CAPACITY BUILDING TRAINING GENDERING WATER AND CLIMATE SCIENCE RESEARCH IN SOUTH ASIA (Funded by IDRC, 2022-2025)

4-8 February 2024  
Hotel Manaslu, Kathmandu, Nepal

### Agenda

#### Day 1: 04 February 2024

##### Introductory session

9:30-9:35	Welcome Address	<b>Mr. Durga Prasad Bhandari</b> Principal, <i>nec</i>
9:35-9:40	About the SAWA program	<b>Dr. Sreenita Mondal</b> Regional Research Lead
9:40-9:50	Inaugural Address	<b>Dr. Katie Bryant,</b> Program officer, IDRC
9:50 - 9:55	Country profile - Nepal	<b>Mr. Robert Dongol</b> Associate Professor, <i>nec</i>
9:55-10:00	Country profile- SL	<b>Prof. Dhammika Dayawansa</b> Professor, Faculty of Agriculture, UoP
10:00 – 10:05	County profile - BD	<b>Prof. M. Shahjahan Mondal</b> Professor, IWFM, BUET
10:05 - 10:10	Vote of Thanks	<b>Ms. Suchita Jain,</b> Regional Research & Training Coordinator

##### 10:10-10:30 **Tea break**

##### Training Session

10:30-12:30	Session on Interdisciplinary Research methods	<b>Prof. Peter Mollinga</b> Professor, SOAS, University of London
12:30- 01:30	<b>Lunch</b>	
01:30 - 03:00	Doing fieldwork around water	<b>Prof. Vishal Narain</b> Professor, MDI
03:00-3:30	<b>Tea break</b>	
03:30-05:00	Field research methods	<b>Dr. Sreenita Mondal &amp; Ms. Suchita Jain</b>
5:00 - 5:15	Wrap up	

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# REGIONAL CAPACITY BUILDING TRAINING

## GENDERING WATER AND CLIMATE SCIENCE RESEARCH IN SOUTH ASIA

(Funded by IDRC, 2022-2025)

4-8 February 2024  
Hotel Manaslu, Kathmandu, Nepal

### Day 2: 05 February 2024

	Parallel session - 1	Parallel session - 2
09:30 - 12:30	Session on Interdisciplinary Research methods conti. - Prof. Peter Mollinga	Interviewing SAWA alumni from Nepal (Dr. Sreenita, Dr. Vishal, Ms. Suchita)
12:30 - 01:30	<b>Lunch</b>	
01:30 - 02:30	Listening experiences from SAWA Alumni	
02:30 - 03:30	Students will preparing for the field work starting from the next day onwards	<b>Panel discussion on</b> Understanding the gap in gendering Water and Climate Science and engineering education, research and professional realm: A Glocal perspective
03:30 - 04:00	<b>Tea break</b>	
04:00 - 05:00		<b>Panel discussion continued</b>

### Day 3-5 (06-08 February 2024)

Participants will be involved in the field work at site- Dhulikhel (30 kms away from Kathmandu)

## Reach out to us

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# Annex 2

## Doctorate fellows

### Bangladesh University of Engineering & Technology (BUET), Bangladesh

#### 1. Ms. Lamiya Sharmeen Jaren



Despite being a Civil Engineering graduate, Lamiya is a relentless promoter for water resources development and environmental sustainability. She pursued her M.Sc. degree in Water Resources Development at IWFM, BUET and was honoured with the esteemed South Asian Water (SAWA) Fellowship. With a heart for empowering socioeconomically disadvantaged communities, she is formally trained in interdisciplinary water studies and currently delving into my Ph.D. research on water storage vulnerability assessment and gender inequalities in Bangladesh, a country grappling with climate challenges and water scarcity.

Apart from her academic journey, she is also working as a deputy lead for the Youth Policy Forum's environment and climate change network and hope to inspire a new generation of environmentally conscious leaders. Notably, she gained invaluable experience as a young professional and gained immense knowledge on water security and transboundary river management while working with the Bangladesh Water Partnership, a country chapter of Global Water Partnership.

#### 2. Ms. Shamsunnahar Runu



Shamsunnahar completed her B.Sc. in Environmental Science from Khulna University and M. Sc. from IWFM, BUET in 2009. During her M. Sc. the research topic was 'Water Poverty Status in Selected Small-Scale Water Resources Projects in Bangladesh'. While pursuing M. Sc. she had worked as a 'Research Assistant' with a research project titled 'Survey & Mapping of Environmental Pollution from Industries in Greater Dhaka' at the Department of Environment(DoE) funded by UNEP and also had experience working with an NGO for nearly 6 years as 'Program Officer' in the past.

Currently she is enrolled for Ph. D. with research topic on 'Developing a Gender Sensitive Water Security Index for Urban Slums of Dhaka City'. Her future career plan is to involve with work related with water, sanitation & Hygiene and develop my career as a researcher.

### Post graduate Institute of Agriculture, University of Peradeniya, Sri Lanka

#### 3. Mr Gamaralalage Dilan Dileepa Jayarathne Bandara

Dilan holds both a Bachelor of Science Honours in Environmental Science and a Master of Science in Environmental Science from the University of Peradeniya, Sri Lanka. With a profound dedication to environmental research, Dilan has concentrated his efforts on biogeochemical cycles of inland freshwater wetlands. Presently, Dilan is pursuing a Doctor of Philosophy at the Postgraduate Institute of Agriculture, University of Peradeniya, Sri Lanka. His doctoral research aims to develop a comprehensive understanding of the carbon flux in tropical freshwater wetlands, providing critical insights that can inform conservation and water resource management strategies in the context of climate change.



#### 4. Ms Mohamed Subair Fathima Husna



Fathima Husna successfully completed her Basic Special Degree B.Sc in Food Production and Technology Management, Specialized in Livestock and Avian Sciences in Wayamba University of Sri Lanka in 2015 and Master Degree M.Sc in Animal Science at PGIA, University of Peradeniya in 2018. Additionally, she holds Certificate in Journalism & Certificate in Counseling and Human Development in the Department of Extramural Studies Unit, Eastern University of SL in 2022. Currently, Ms. Husna is working as a Ph.D Fellow for SAWA/IDRC Project under the supervision of Department of Agriculture Engineering, PGIA, University of Peradeniya. She is interested in studying Climate Hazard impact assessment, IWRM and Gender inequalities etc.

#### 5. Ms Weerasooriya Mudiyanseelage Nisansala Lakmali Weerassoriya



Nisansala Lakmali Weerasooriya holds a Bachelor of Science (Hons) Degree in Food Science and Nutrition, specializing in Food Science and Technology from Wayamba University of Sri Lanka in 2017 and she has completed her Masters Degree in Food Science and Technology at PGIA, with in-depth knowledge and extensive skills in food processing, safety, and innovation, preparing them to address complex challenges in the food industry. Currently, she is expanding her expertise as a Doctoral student, focusing on advanced research on the impact of water acquisition and divestment practices of the Food and Beverage manufacturing industry on Natural Water balance under SAWA IDRC project at University of Peradeniya.

## Fellows pursuing Masters

### Bangladesh University of Engineering & Technology (BUET), Bangladesh

#### 1. Mr. Raiyan Mannan



Raiyan is a graduate from the department of Civil and Environmental Engineering from Islamic University of Technology (IUT), Dhaka. He majored in geotechnical engineering during his undergraduate program and is currently pursuing a master's degree in Water Resource Development from the Institute of Water and Flood Management (IWFM) of Bangladesh University of Engineering and Technology (BUET). He is consistently in the process of learning new things and has a very keen interest in doing projects related to Data Science. He presented his research work titled "Comparative Analysis of Machine Learning Algorithms for Predicting Compressive Strength of Concrete Containing Silica Fume and Metakaolin" in the Second International Conference on Advances in Civil Infrastructure and Construction Materials in July, 2023.

#### 2. Ms. Sayma Ahamed



Sayma is currently pursuing her M.Sc. from IWFM, BUET after completing her B.Sc. with distinction in Environmental Science and Disaster Management from Patuakhali Science and Technology University. Her research interest focuses on urban water management, water sanitation and hygiene, gender and water, disaster management and vulnerability analysis, climate change adaptation. She has previously worked as Research Consultant in Centre for Environment and Geographic Information Services (CEGIS). She later joined as Research Planner in Bangladesh Network Office for Urban Safety-BNUS, BUET. She presented her research work on "flood vulnerability assessment and mapping" in International Conference on Water and Flood Management in January 2023. She also presented another work in 1st International student seminar on One health, One world on "landslide susceptibility mapping using Analytical Hierarchy Process (AHP)" in December 2021. She has 02 publications in Springer (Pure and Applied Geophysics and Natural Hazards).

### Nepal Engineering college (nec), Nepal

#### 3. Mr Jenish Maharjan

Jenish Maharjan, a Civil Engineering graduate from Kantipur Engineering College, Tribhuvan University, is currently shaping his expertise in water resources through M.Sc. in Interdisciplinary Water Resources Management (IWRM) at Nepal Engineering College, Pokhara University, since 2022. His journey in the water sector began in 2019, and he is presently serving as a water supply designer at a well-regarded company. His commitment to water resources, climate change, and gender equality is further highlighted by his role as an IDRC SAWA fellow. His passion and hands-on experience make him a dedicated professional contributing to the field of water management.



#### 4. Mr Md. Akhtar Ali



Md. Akhtar Ali, a Civil Engineering graduate from Visvesvaraya Technological University (VTU), India. He's been actively involved in the water resources field since 2018, showing a strong commitment to understanding and addressing water-related challenges. His academic and practical experiences have equipped him with diverse skills to contribute effectively to the advancement of water resource management practices. Md. Akhtar Ali's dedication and expertise have been acknowledged through his selection as an IDRC-SAWA Fellow, highlighting his potential to make significant contributions to the field. As a Fellow, he continues to deepen his understanding of water resource management and seeks innovative solutions to pressing challenges, aiming to create a positive impact on communities and the environment.

## 5. Mr Sabin Pahari



Sabin Pahari is a civil engineering professional with his bachelor's degree completed from National College of Engineering (NCE) affiliated to Tribhuvan University in year 2019. With the extensive experience in the field of water resources engineering, he has established himself as trusted expert in design and implementation aspect of water resource engineering. Sabin exhibits a commendable proficiency in the academic endeavors and is gaining valuable insights regarding the water resource management sector. His proficiency and dedication in academics have been recognized with the selection for a fellowship under IDRC-SAWA, where he seeks to improve his intellectual prowess and pursue excellence in the field of water resources engineering and management

## 1. Mr Samir Shrestha

Sameer Shrestha is an Agriculture Engineering graduate from Tribhuvan University, Institute of Engineering. He is working in Prime Minister Agriculture Modernization Project (PMAMP) since 2016 as an agricultural engineer since last seven years. The principle thematic area under his current job is planning, designing and implementing of modern, climate-smart and proven agricultural technologies via water management, agricultural mechanization and resources conservation.



## 2. Mr Sapan Thapa Magar



Sapan Thapa Magar is an Agriculture Engineering graduate from Tribhuvan University (Institute of Engineering). He has worked as a site engineer in the Integrated Water Resource Management Project (IWRMP Component-B) under the Department of Irrigation, Nepal, in the Sunsari Morang Irrigation Project. Currently working as an agriculture engineer the overall goal of his professional development plan is to continue growing as a water expert by adding real-world experiences in the areas of interdisciplinary water resource management, climate change, flood management, and gender issues in the water sector.

## 3. Ms Sangita Neupane

Sangita Neupane holds a Bachelor's Degree in Civil and Rural Engineering. She works in Department of Hydrology and Meteorology (DHM), Nepal. She has accumulated valuable experience in flood management and data analysis. She is dedicated to addressing water challenges through interdisciplinary approaches, aiming to enhance her expertise in water resource management, flood management, climate change and gender issues within the water sector through real-world experiences.



## 4. Ms Urmila Shrestha



Urmila Shrestha holds a Bachelor's degree in Civil Engineering from Nepal Engineering College, Bhaktapur. Urmila aims to leverage her academic background and contribute significantly to water-related projects. With a keen interest in sustainable water management practices, she aspires to make a positive impact on communities by addressing water challenges and promoting conservation efforts.

## Post graduate Institute of Agriculture, University of Peradeniya, Sri Lanka

### 5. Mr Gunawardhanage Kasun Lakmal Wickramasinghe

Kasun Lakmal Wickramasinghe completed his Bachelor's (Hons) degree in Environmental Science and Natural Resource Management from Sabaragamuwa University of Sri Lanka. During his undergraduate studies, he developed a strong interest in environmental issues related to water and land pollution, as well as the movement of trace metals in nature and their removal processes. Currently, he is pursuing an M.Sc. in Integrated Water Resource Management at the University of Peradeniya. His primary areas of interest include catchment management, stream ecology, and monitoring riverine ecosystem health.



### 6. Ms Doowage Sandya Kumari Susanthika Perera



Sandya Perera successfully completed her Bachelor's (Hons) degree in Agriculture, specialising in Agricultural Engineering, from the University of Jaffna in 2022. She developed an interest in the field of Water Resource Management (IWRM). She is currently pursuing an M.Sc. in Integrated Water Resources Management at the University of Peradeniya. She is interested in studying more about water conservation in focused reservoir irrigation systems.

### 7. Ms Paranamana Sachini Madara Sarathchandra

Sachini Sarathchandra successfully completed her Bachelor's (Hons) degree in Engineering, specializing in Civil Engineering from the University of Peradeniya in 2023. She developed an interest in the field of Water Resources Engineering and Management during her undergraduate studies. She is currently pursuing an M.Sc. in Integrated Water Resources Management at the University of Peradeniya. Her interests lie in water supply engineering, irrigation engineering and watershed management.



### 8. Ms Wikramasinghe moolacharige madumane gedara chandima jeewanthi ariyarathe



Chandima Ariyarathe successfully completed her Bachelor's (Hons) degree in Agriculture, specializing in Agricultural Engineering, from the University of Jaffna in 2022. She developed an interest in the field of Integrated Water Resources Management (IWRM). She is currently pursuing an M.Sc. in Integrated Water Resources Management at the University of Peradeniya. She is interested in studying more about utilizing water resource management to enhance the quality of people's lives and the environment.

## Annex 3

### Prof. Peter P Mollinga



Prof. Mollinga is Senior Researcher at the Centre for Development Studies (ZEF) in Bonn, Germany. Prior to this, he was Associate Professor at the Irrigation and Water Engineering group at Wageningen Agricultural University, The Netherlands. He is also the Convener of SasiWATERS (South Asia Consortium for Interdisciplinary Water Resources Studies), Hyderabad, India. He has worked on irrigation management and reform, and more generally on the politics of water. He is presently involved in land and water management-related research in Uzbekistan, Afghanistan and India. His academic interest lies in the integration of natural and social science perspectives through the interdisciplinary study of water resources.

### Dr. Anushiya Shrestha



Dr. Shrestha holds a PhD in Social Sciences from the Wageningen University, The Netherlands and Master's in Environmental Science from Tribhuvan University. She has over a decade of research experience exploring various aspects of water (in)security issues in the context of intensifying urban expansion and changing climate. Her expertise lies in engaged research at the interface of policies and practices around changing (land and) water uses, access, rights and water-related conflicts and cooperation in the context of increasing urbanization and changing climate. She is particularly interested in understanding and unfolding policy-practice interface with a focus on changing use, access and governance of land and water resources and the implications these changes have for the marginalized communities in the context of changing climate and “inclusive” policy environment.

### Prof. Vishal Narain



Prof. Vishal holds a PhD from Wageningen University, the Netherlands. He is an inter-disciplinary water researcher and his work cuts across the frontiers of the natural and social sciences, with a specific interest in institutions, governance and policy. His teaching and academic interests are in the inter-disciplinary analyses of public policy processes and institutions, water governance, gender, rights and equity analyses in water management, peri-urban issues and vulnerability and adaptation to environmental change. He received the SR Sen Prize for the best book on

Agricultural Economics and Rural Development (2002-03) conferred by the Indian Society of Agricultural Economics.

### **Dr. Sreenita Mondal**



Dr. Sreenita Mondal is a Gender and Social Inclusion researcher, holding an M.Phil and a Ph.D. in Human Geography from Jawaharlal Nehru University in New Delhi, India. Currently, she is associated with the Gendering Water and Climate Science in South Asia project as a regional research lead. She has been working in the areas of water resource management, water-based livelihoods, and community engagement applying a gender lens to it. She has worked with various national and international organizations such as SaciWATERS, Centre de Sciences and Humaines, and GenUrb. Recognizing her achievements, Dr.

Mondal was spotlighted as a Young Indian Gender Researcher in the quarterly magazine "Partners: in Research for Development" by the ACIAR.

### **Ms. Suchita Jain**



Ms. Suchita Jain is trained in Applied Geology and geospatial techniques and carries nearly two decades of experience in employing geospatial tools for the integrated water resource management while working with various government and non-government organisations. She is well-versed in quantitative analytical research using ArcGIS, Erdas, Envy and QGIS and has expertise in advanced satellite image processing, land-cover mapping and time-series analysis. As an interdisciplinary researcher she carries experience in qualitative research as well. At present, she is associated as a Regional research and training coordinator with Gendering Water and Climate Science in South Asia project funded by IDRC, Canada.

# Annex 4

## Case I: Dhulikhel water supply project site visit report

**Location:** Dhulikhel (20 km from Kathmandu)

**Date:** October 20, 2023

**Participants:** Robert Dongol and Jyoti Dahal

**Description:** The project started in 1989 as a component of Dhulikhel Development Project, and was completed in 1994 under financial and technical assistance from the German government. The water supply scheme currently fulfills about 80 % of the water demand of the town. Before its implementation, people used localized springs and streams as their drinking water sources. The system is fully managed by a User's Committee of 15 members (among which 6 are women). The Committee entirely makes all the decisions regarding operation and management. The technical unit has a civil engineer with subordinate staff who was recruited to look after all the technical matters.



Interaction with the Chairperson, engineer, Audit committee member and general members (men and women) – in order to have a quick information about the historical development of water supply system, a brief interaction with the key informants was conducted. The informants

generously explained the then water woes in Dhulikhel, the support from the German Government and subsequent development and conflicts then after.

After the interaction with them, a brief excursion to treatment system was made along with one of the representatives of the system.



### Pertinent Issues:

- i. Conflict between users and non-users of drinking water within the municipality (the problem has been said to be solved with the installation of 3 new water supply systems in the area unserved by the system), however the people in the community do have some issues with the two systems leading to the second conflict. The people within the same municipality have different quality of water – one is completely treated and distributed through pipelines, whereas another is the water straight supplied from the dug wells.
- ii. Conflict between users of the new system and the old system:

It was found that wards 3,4,5,6,7,8 receive water from the Dhulikhel water supply project, which is the old system, and wards 1,9,10,11,12 receive water from the new

systems and are operating under its own community water supply groups. The old system however has water treatment systems and the new one only collects and distributes water, both systems are under the Dhulikhel Municipality. Quality issues with water used by the different wards within the same municipality is one of the major topics of concern. Bias within the same municipality where wards are receiving water from different water supply services is of major concern.

- iii. Identification of sustainable solutions to the water quality issues within the municipality would be beneficial to the water supply system.
- iv. The probable impacts of climate change and its solutions for the sustainability of the water supply system and its source would be beneficial in the long run to the system.
- v. Further the Kavre Valley Integrated Water Supply project is under construction and its supply area also includes Dhulikhel, however the Dhulikhel water supply project has agreement to work independently.

The system seems to be working properly and the officials of the water supply are satisfied with its performance, it would be beneficial to know the response of the other side of the project- the consumers.

The site is near the main city and access to the source and treatment plant is knowledgeable and enlightening. The system seems to have set an example for proper operation and maintenance in the municipality, finding out any more issues with the system from the consumer side and identifying the probable solutions for the conflicts could be beneficial for the student team. Still, when most of the water supply systems in the country are not functioning, this 30-year-old system has a remarkable working system.

#### **Case II: Matatirtha – Commercial groundwater extraction and its implication**

Commercial water extractors have been extracting groundwater unscientifically in the groundwater potential area jeopardizing the livelihood of the local people in terms of access to water resources, which is prominently spelled out in the Constitution of Nepal. Groundwater depletion resulting from massive extraction and associated impacts of climate change have increased the water hardship for the people especially for those who are solely dependent on the native sources as a result of unaffordability for water in the proximity. Since water collection and management at the households are the primary job of women and children who are severely affected by water scarcity, they have to travel more distance for water. Depleting water sources have generated contestation with the commercial water extractors and the local people as depicted in many cases in and around the valley. Shrestha (2019) stated these conflicts/contestations and increasing water insecurities in the peri-urban areas are less manifested, given the underlying socio-political and economic power differences, indifference of governing bodies. Rapid population growth and urbanization accompanied by escalating urban water demand is increasing water transfer from rural and peri-urban areas to urban areas.

**Location:** Matatirtha is a well-known pilgrimage place located in Chandragiri Municipality of Kathmandu District and is situated at a distance of approximately 22 km from Kathmandu. The total area of the municipality is 43.92 km<sup>2</sup>. The place is well-known for its naturally occurring spring water.

Few local residents and the ward member of Chandragiri Municipality were interviewed during the preliminary field work. The representative from one of the water supply systems in the municipality was consulted, along with water entrepreneurs of the area.

Matatirtha is also facing rapid population growth resulting in an increase in water demand. The major concern in Matatirtha is the increasing competition over water resources for domestic, industrial and commercial purposes and declining of water resources in the existing eight water supply schemes (Shrestha & Sada, 2013). With such circumstances, there is a growing realization and

acceptance that water supply constraint would increase in future as a consequence of massive water extraction for the commercial urban water supply and growing commercial activities in the area with the increasing demand at the household levels. According to Matatirtha VDC profile (2010), around 170 trips of water supply by water tanker that approximates to 1.2 million liters of water is supplied to different places of Kathmandu Metropolis as well as other parts of Kathmandu Valley on daily basis. The earning income from the groundwater and spring sources from the area without any concern for groundwater recharge and spring protection for sustainable water use in the proposed study area is the major concern as the land owner who leases out the land for water extractors received NRs. 200 and 400 for every 6,000 and 12,000 liters of water respectively. With the construction of a bottling facility next to the site in the early 2000s, commercial groundwater extraction at Matatirtha began. The facility draws water from Matatirtha's natural spring and bottles it for sale in the markets. Up to 10,000 liters of water extracted from the ground per hour by the plant (Khanal, 2016). Similarly, the nearby town Satungal receives water free of cost from Matatirtha driven by the social value associated with water considered as social good and serving this precious resource was considered as an auspicious activity. The water demand of Satungal is increasing over the period of time as reported by the installation of increasing pipe diameter to divert water. The role of water tanker operation and other forms of private water service providers are expected to grow in future with much pronounced groundwater extraction which needs to be regulated by the government. In addition to this, the impact of climate change pulls the situation into a more dramatic level.

Commercial groundwater extraction has been taking place in Matatirtha, which has prompted worries about the impacts it would have on the neighborhood and the environment. The environmental effects of the commercial groundwater extraction in Matatirtha have sparked worries. The area's groundwater is already under stress as a result of rising water demand and declining recharge. The problem was made worse by the bottling plant's water extraction, which also caused the water table to drop (Nepal, 2019). Local farmers who used the spring water for irrigation were forced to relocate due to the bottling facility. The facility has also reduced the amount of water available for home usage, forcing locals to rely on alternative water sources like boreholes (Khanal, 2016).

In Nepal, there are a number of regulatory frameworks in place to control groundwater exploitation. The Department of Water Supply and Sewerage (DWSS) is in charge of regulating groundwater extraction for industrial purposes. Yet, there have been cases of unlawful groundwater extraction due to enforcement of these rules (Nepal, 2019). Concerns have been made concerning the effects of Matatirtha's commercial groundwater extraction on the neighborhood and the environment. The extraction has caused the water table to drop, impacting the supply of water for home and agricultural use.

# Annex 5

Set of questions for the fieldwork in Dhulikhel.

## **1. Land use change and water security: How does land use change around Dhulikhel affect the water security of the people of Dhulikhel ?**

Possible sub-questions:

- a) what kind of land use change has occurred in and around Dhulikhel ?
- b) what effects has this had on water use and allocation practices ?
- c) how have the residents of dhulikhel adapted to these changes ?
- d) how are the effects of these changes aggravated by climatic change?
- e) how do the residents of Dhulikhel adapt to these changes ? is there a difference between their adaptation and coping ?

## **2. Water conflicts, co-operation and governance: what forms of water conflicts and co-operation are seen in and around Dhulikhel**

Possible sub-questions:

- a) what kind of water conflicts are experienced in and around Dhulikhel (upstream/downstream).
- b) Why do these conflicts arise ?
- c) what kind of mechanisms exist to resolve them ? are they statutory/non-statutory?
- d) is there evidence of new forms of co-operation around water ?

## **3. Gender, water security and climate change: What are the gendered dimensions of water security and climate change in Dhulikhel**

Possible sub-questions

- a) how are gender roles defined around water in particular and in agriculture more broadly ?
- b) are these gender roles changing ? what is causing these roles to change ?
- c) is there evidence of male migration ? what does this mean for how agriculture is carried out ?
- d) how do men and women perceive a changing climate ? how do they adapt to these changes ?

## **4. What are the forms of collective action around water in dhulikhel and how have they changed over time ?**

Possible sub questions:

- 1) what forms of collective action have existed around water in dhulikhel historically eg did Guthis exist in dhulikhel and did they give a role in water management ?
- 2) how has the nature of collective action changed over time ?
- 3) how were traditional water sources managed in dhulikhel ? What were the norms associated with them ?
- 4) what new forms of collective action have emerged ? Eg water user associations?
- 5) what role are they playing ? Which social Groups dominate the decision making ?

## **5. Waste water treatment and water quality**

Big resorts - Community role in wastewater treatment

Sub questions

1. How wastewater is being managed at present and what could be the future direction towards improvement?
2. Community perspective and behavior towards waste water and faecal sludge management
3. How knowledge, attitude and other factors influence decision making?
4. How are the defunct waste water treatment systems affecting the quality of surface and groundwater?
5. Whether the climate variability is linked to the dysfunction of the wastewater treatment systems?

## Household Questionnaire

### Association between land use and water security in Dhulikhel

(collect data from the head of the HH, in case of unavailability the next responsible person)

#### Section 01: General Information

**1. Respondent details:**

- a. Name: \_\_\_\_\_
- b. Residence Ward no: \_\_\_\_\_
- c. HH number: \_\_\_\_\_
- d. Caste: \_\_\_\_\_ (Bramhan, Chettri, Newar, Janajati, Dalit, Other-specify)
- e. Are you household head? \* Y    \* N  
If not, then the relation with household head \_\_\_\_\_
- f. Age: \_\_\_\_\_ Sex: \* M \* F \* Other
- g. Duration of living here: \_\_\_\_\_ years
- h. House ownership: \* Owned \* Rented
- i. Main source of HH income:
- j. Secondary source of HH income:
- k. Monthly average household income:

<b>2. Details of the household members</b>							
Sr.	Name of the family member	Relation with the head of the HH	Age	Sex	Education	Occupation	Staying with family
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

**Section 02: Land use change**

- 2. Are you aware of any recent changes (last 10 year) in land use in and around Dhulikhel?

Y     N     No idea

3. Please describe the types of land use changes you have observed or are aware of

Land type	Change type – No change/increase/decrease	Reason – Urbanisation/increase in population/commercialization/climate change/policy issues/others (write in detail)	Impact on surface water <input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> No idea	Impact on surface water <input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> No idea
Wetland				
Agriculture				
Built up area				
Forest				
Wasteland				
Grazing land				
Others				

4. What is your opinion about community is being adequately involved in decisions related to land use changes?

5. Are there any concerns or challenges you foresee with ongoing or potential land use changes?

6. Do you or your family own any land in this area?  Y     N

7. Land use type - Agricultural/Residential plots/Commercial/kitchen garden/Wasteland/other (specify)

8. Whether land use type changed in past 10 years?  Y     N

i. If yes, What was the change \_\_\_\_\_

### Section 03: Water usage

### Section 04: Water Access for drinking and domestic purposes

9. What type of water source you are using for domestic and drinking water consumption?

Type of water source (Spring water/Dug well/Borewells/Piped water supply/community water source/other-specify- Bottled water etc.)			
	During Summer	During winter	During Monsoon
At present			
Previously (before 10 years)			

10. Whether the source of water for drinking and domestic purposes is:  
 ✕ Within the premises ✕ Away from premises
11. If away from premises how far it is?
12. Whether the distance of source of water is increased/decreased in last 10 years.
13. If source is away then
- Who takes the responsibility of collecting water? (Male/Female/Girl child/boy child)
  - What is the frequency of fetching water? (times per week)
  - What is the carrying quantity? (liters)
14. If getting piped water then what is the duration of piped water supply? (hours per week)
15. What is the amount of money spent to get drinking and domestic water? (rupees per week)
16. Apart from cooking and other domestic use do you follow any other practices which requires water?  
 Such as kitchen gardening/live stock rearing etc. (No/Yes - Specify)
17. If yes what is the quantity of water required? (liters per week)

<b>18. Water quantity availability</b>				
	Status (Sufficient/not adequate/no idea)	Change over last 10 years (Increased/Decrease/No change/No idea)	Reason if changed	How managing if decreased
Source 1				
Source 2				
Source 3				

<b>19. Water quality Status</b>				
	Status	Change over last 10 years	Reason if	How managing if

	(Good/poor/no idea)	(Improved/Deteriorated/No change/No idea)	changed	deteriorated?
Source 1				
Source 2				
Source 3				

**Section 04: Water Access for agricultural purposes**  
(Only applicable if they have any agricultural land)

20. What type of water source you are using for agricultural practices?

Type of water source (Spring water/Dug well/Tubewell/Pond/Lake/canal etc)			
	For Summer crop	For winter crop	For Monsoon crop
At present			
Previously (before 10 years)			

<b>21. Water quantity availability for irrigation</b>				
	Status (Sufficient/not adequate/no idea)	Change over last 10 years (Increased/Decrease/No change/No idea)	Reason if changed	How managing if decreased
Source 1				
Source 2				
Source 3				

Scale A

*This scale consists of a number of words that describe different levels of importance. For each attribute of drinking water quality indicate to what extent you have importance for it. Write a number from 1 to 5 on the line next to each item from question 13 through 17.*

**Never Rarely Sometimes Often**

**1 2 3 4**

1. \_\_\_\_\_ How often did you worry that your household would not have enough water?
2. \_\_\_\_\_ How often did you or your household members use just a little water day after day because of a lack of resources?
3. \_\_\_\_\_ How often were you or your household members not able to maintain good hygiene because of a lack of resources?
4. \_\_\_\_\_ How often did you or your household members drink poor quality water because of a lack of resources to obtain other types of water sources?
5. \_\_\_\_\_ How often did you or your household members become sick because of a lack of clean water supply?

**Section 04: Effects of land use change on water allocation**

6. Have you noticed any changes in the availability of water in your area over the past few years?  
\* Y \* N
7. Have land use changes influenced the quality of water in your area? \* Y \* N
8. In your opinion, how have changes in land use patterns affected water availability and quality?  
\_\_\_\_\_
9. Have changes in land use, especially in agriculture, affected water usage patterns? \* Y \* N
10. How has urbanization influenced water usage and allocation in Dhulikhel?  
\_\_\_\_\_
11. Is there a community-based water management system in place? \* Y \* N
12. Are there any concerns or challenges related to water usage and allocation that you have observed or experienced? \_\_\_\_\_

**Section 04: Land use change and climate change**

13. Have you observed any specific changes in the local environment that could be attributed to both land use changes and climate change? \* Y \* N
14. How have extreme weather events, such as floods, droughts or landslides affected the area considering the recent land use changes? \* A lot \* Somewhat \* Not at all
15. Are there any land use practices that have been adopted in response to changing climate conditions? \* Y \* N
16. How have land use changes and climate change collectively affected local agriculture and crop patterns? \* A lot \* Somewhat \* Not at all

### Section 05: Adaptation strategies

17. Have you made any adjustments in your land use practices or activities in response to recent changes? \* Y \* N  
 a. If yes, what are they? \_\_\_\_\_
18. If applicable, have you adopted different agricultural practices due to changes in climate or land use? \* Y \* N
19. In the face of sudden challenges or disruptions, what immediate actions do you take to cope with the situation? \_\_\_\_\_
20. How does the community come together to provide support during challenging times?  
 \_\_\_\_\_
21. In your opinion, how effective has the government been in supporting adaptive measures and coping mechanisms in Dhulikhel? \* A lot \* Somewhat \* Not at all
22. Are there any community-led initiatives or organizations that support residents in adapting to changes and coping with challenges? \* Y \* N
23. Do you have any recommendations for government or community actions to better support residents in adapting to changes?  
 \_\_\_\_\_

## KII

### Association between land use and water security in Dhulikhel

(collect data from the head of the HH, in case of unavailability the next responsible person)

#### Section 01: General Information

##### 1. Respondent details:

- a. Name: \_\_\_\_\_
- b. Residence Ward no: \_\_\_\_\_
- c. HH number: \_\_\_\_\_
- d. Caste: \_\_\_\_\_ (Bramhan, Chettri, Newar, Janajati, Dalit, Other-specify)
- e. Are you household head? \* Y \* N  
 If not, then the relation with household head \_\_\_\_\_
- f. Age: \_\_\_\_\_ Sex: \* M \* F \* Other
- g. Duration of living here: \_\_\_\_\_ years
- h. House ownership: \* Owned \* Rented

2. Details of the household members							
Sr.	Name of the family member	Relation with the head of the HH	Age	Sex	Education	Occupation	Staying with family
1							
2							
3							
4							

5							
6							
7							
8							
9							
10							

**Section 03: Land use change**

1. Do you own any land?
2. What is the land use type?
3. Whether the land use type changed for your land in last 10 years? if yes then what is the change?
4. What kind of changes (last 10 year) have you noticed in land use in and around Dhulikhel?
5. What is your opinion about the following?

<b>Land type</b>	<b>Change type – No change/increase/decrease</b>	<b>Reason – Urbanisation/increase in population/commercialization/climate change/policy issues/others (write in detail)</b>
Wetland		
Agriculture		
Built up area		
Forest		
Wasteland		
Grazing land		
Others		

6. Do you think these changes had any impacts on the groundwater/ surface water of the region? If yes? (In terms of Quality and Quantity) / How has urbanization influenced water usage and allocation in Dhulikhel?

7. Whether you or any other known person was involved in decisions related to land use changes (New commercial properties are coming up in the area)?

8. Are there any concerns or challenges you foresee with ongoing or potential land use changes?

**Section 04: Water Uses/ Quality/ Quantity**

9. What is the source of water for household water consumption ? (Primary and Secondary)

Surface water (from rivers, streams, lakes)  
Groundwater (from borewells, handpumps, open wells)  
Communal water (from government taps, hand pumps, etc)  
Rain water (from rainwater harvesting structures)  
Overhead tank water (Government/ Local committees/ Personal/ NGO/ Others)

10. What is the source of water as per the water usage for different purposes? Do they use the same source of water for all the activities or it varies as per different activities such as washing vessels, bathing, cooking etc.
  11. In case they are bringing water from far then who plays that role- male/female?
  12. Could you please explain the pipeline supply (who owns it, maintains it, how often maintenance, underground or aboveground, quality of pipe, etc)?
  13. What are the major concerns around water quantity in your household?
  14. Are you satisfied with the amount of water that is received for domestic purposes in a day/month? If not satisfied, why?
  15. What do you do when there is a water shortage in your house? How often do you face household water quantity issues?
    16. Do you think water demand (quantity of water used) has increased in the past 10 years in your household and in this area? Do you think the household water supply (quantity of water delivered) has also increased in the past 10 years in your household and in this area? explain what are the changes in household demand and supply that you have observed, in the past 10 years?
  17. Does water availability (both supplied water-piped and other sources) vary depending on seasons? Why do you think about water availability changes seasonally?
  18. Have the government/local committees taken any action to reduce water scarcity if you face any? If Yes, explain
  19. Are you okay with the water charges? If not, why?
  20. What water sources are used for the agriculture/ kitchen gardening/ cattle rearing activities if you do any of these ?
  21. Have you ever fell sick due to poor water quality in your area?
1. Do you have any recommendations for government or community actions to better support residents in adapting to changes?

## FGD

### Association between land use and water security in Dhulikhel

#### Section 01: Details of the members: FGD/ KPI (Ward No.....)

Sr No	Name	Age	Sex

#### Section 02: Village profile

Caste - Caste structures

Livelihoods - and what are the changes in livelihood in the last 10 years.

Agricultural details - crop types, irrigation and who does what (male and female)

At household levels - what are the responsibilities of males and females

Migration scenario of the area

#### Section 03: Land use change

1. What kind of changes (last 10 year) have you noticed in land use in and around Dhulikhel?

2. What is your opinion about the following?

Land type	Change type – No change/increase/decrease	Reason – Urbanisation/increase in population/commercialization/climate change/policy issues/others (write in detail)
Wetland		
Agriculture		
Built up area		
Forest		
Wasteland		
Grazing land		
Others		

3. Do you think these changes had any impacts on the groundwater/ surface water of the region? If yes? (In terms of Quality and Quantity) / How has urbanization influenced water usage and allocation in Dhulikhel?

4. What is your opinion about the community being adequately involved in decisions related to land use changes (New commercial properties are coming up in the area)?

5. Are there any concerns or challenges you foresee with ongoing or potential land use changes?

**Section 04: Water Uses/ Quality/ Quantity**

6. What are the major sources of water for household water usage in your area?  
Surface water (from rivers, streams, lakes)  
Groundwater (from borewells, handpumps, open wells)  
Communal water (from government taps, hand pumps, etc)  
Rain water (from rainwater harvesting structures)  
Overhead tank water (Government/ Local committees/ Personal/ NGO/ Others)
7. Could you please explain the pipeline supply (who owns it, maintains it, how often maintenance, underground or aboveground, quality of pipe, etc)?
8. What are the major concerns around water quantity in your area?
9. Do you think communities are satisfied with the amount of water that is received for domestic purposes in a day/month? If not satisfied, why?
10. What do most households do when there is a water shortage in their houses? How often do communities face household water quantity issues?
11. Do you think water demand (quantity of water used) has increased in the past 10 years in this area? Do you think the household water supply (quantity of water delivered) has also increased in the past 10 years in this area? explain what are the changes in household demand and supply that you have observed in your area, in the past 10 years?
12. Does water availability (both supplied water-piped and other sources) vary depending on seasons? Why do you think about water availability changes seasonally in your area?
13. Have the government/local committees taken any action to reduce water scarcity in your area? If Yes, explain
14. Do you think the communities are happy with the water charges? If not, why?
15. What water sources are used for the agriculture/ kitchen gardening/ cattle rearing activities in your area?
16. Do you think people are falling sick due to poor water quality in your area?
1. Do you have any recommendations for government or community actions to better support residents in adapting to changes?

# Annex 6

## Agenda for the Geospatial training

Day 1: 19<sup>th</sup> February 2024, Monday (1 hr)

### Theory

- Introduction to Geospatial technology- Different terms and meaning (GIS, RS, GPS etc.),
- Its purpose and importance
- Applications- specifically for Natural Resources Management

### Practice

- Getting acquainted with different GIS softwares QGIS, ARC GIS, and other open source GIS softwares
- Various sources to download free spatial database
- Link to download QGIS and opening the software  
(Software can be pre-installed using this link  
<https://www.qgis.org/en/site/forusers/download.html>)

Day 2: 26<sup>th</sup> February 2024, Monday (1.5 hr)

### Theory

- Concept of Scale
- Data representation format – Vector and Raster
- Various file format
- Data attributes
- Different types of Thematic Maps- selection and purpose

### Practice

- Opening shapefiles and other files in QGIS
- Working with attribute table
- Data linking
- Creating and modifying vector files
- working with symbology
- Creating Thematic Maps in QGIS (Choropleth, Isoline etc.)
- Preparing map layouts

Day 3: 29<sup>th</sup> February 2024, Thursday (1.5 hr)

### Theory

- Introduction to Remote Sensing
- Electromagnetic spectrum
- Types of resolution
- Various types of satellite images and reading signatures
- Landuse/Land cover mapping and its importance
- Automated, Semi-Automated classification and visual interpretation

### Practice

- Downlodng Satellite images and toposheets
- Preparing the raster data for analysis
- Defining area of interest and data clipping

Day 3: 4<sup>th</sup> March 2024, Monday (1.5 hr)

### Practice

- Satellite image classification using SCP tool



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# REGIONAL CAPACITY BUILDING TRAINING PROGRAMME 2024



**VISHAI**

**SUCHITA**

**PETER**

**DAMI**

**SHAJAHAN**

**SREENITA**

**ROBERT**

**JYOTI**

**AKHTAR**

**DILAN**

**RIYAN**

**FATIMA**

**SACHINI**

**SAYMA**

**CHANDIMA**

**SANGITA**

**SABIN**

**URMILA**

**SAPAN**

**SINORA**

**SAMEER**

**SANDYA**

**LAMIYA**