

Building Training Capacities for Reviving Springs in the Mid-Hills of Hindu Kush Himalaya (HKH), with a Special Focus on Bhutan

2–12 May 2018, ICIMOD Godavari Knowledge Park



Background

Springs are the main source of water for millions of people in the mid-hills of the Hindu Kush Himalaya (HKH), on which both rural and urban communities depend for their domestic and agricultural needs. Springs also provide base flow to river systems, regulate ecosystems, and have cultural value. Despite being a vital resource, they have been poorly studied, resulting in a significant data gap on the dynamics of spring water flow, characteristics of local springs, and hydrogeology governing the occurrence and movement of water in underground aquifers in the mountains. Springs are also part of complex socio-technical and informal governance systems with pronounced gender, equity, and cultural dimensions, which are also not well understood. This has led to ineffective policies and misguided interventions.

There is mounting anecdotal evidence that springs across the HKH are drying up, causing unprecedented water stress on communities. It is widely believed that changing land use, infrastructure development, and climate change are affecting spring flow, but the extent of this problem is not well known. In its 12th Five Year Plan (2018–2023), the Watershed Management Division (WMD) of Bhutan's Department of Forest and Park Services plans to undertake spring and springshed management as a major activity. As part of this initiative, a four day workshop on "Springs and Springshed Management for Reviving Drying Springs" was organized in Thimphu in November 2017, which helped frame a common understanding of springshed management research and implementation. WMD officials realized that further detailed practical or on-the-job training is required for field technicians and implementers.

Training on Springshed Revival

In response to the request from the WMD, to organize hands-on training for spring revival, ICIMOD, together with Advanced Centre for Water Resources Development and Management (ACWADAM), has developed a research-cum-implementation and capacity building program. A protocol for reviving springs was developed and tested at several pilot sites in India and Nepal. A detailed technical manual was published by ICIMOD and ACWADAM in 2018, which will form the basic textbook for training on spring revival.

Objective

The overall objective of the training is to build the capacity of practitioners responsible for field implementation to revive drying springs in Bhutan by imparting skills and understanding of springshed management.

Detailed Objectives and Outcomes

Day	Objective (theory)	Objective (practical)	Outcome
Day 1 2 May	Introduction to the six-step spring revival protocol	Introduction to different types of springs in and around the Godavari landscape	Broadly understand course content and workload
Day 2 3 May	Understand basic theories of geology, hydrogeology, and mountain groundwater	Identify rock types and formations and understand how these control groundwater systems	Understand the importance of geology in managing groundwater in the mountains
Day 3 4 May	<p>Step 1: Understand the types of data that need to be collected, including web-based maps, GPS data, and basic socio-economic information</p> <p>Step 2: Understand how to set up a long-term monitoring system to capture spring discharge data, water quality information, and rainfall data by setting up instruments and data monitoring systems with the help of local communities</p>	<p>Step 1: Understand basics of hydrogeological analysis (drainage maps and geological maps) and how surface hydrology and geology interact to create sub-surface aquifers</p> <p>Step 2: Understand practical aspects of data collection, cleaning, and recording for long-term spring monitoring purposes</p>	<p>Understand the tools and techniques needed to assess springs in their respective study/action area</p> <p>Understand the tools and techniques needed to set up a long-term data monitoring network</p>
Day 4 5 May	Step 3: Understand how to analyse current water use patterns, its socio-economic implications, and the institutions and governance systems that are in place for managing springs	Understand the basics of crafting of socio-economic data collection instruments and qualitative data collection through Focus Group Discussions and Key Informant Interviews	Understand the need to work closely with communities and benefit from their knowledge while planning spring revival work

Days 5 to 8 7 – 10 May	Step 4 (sub-steps 4a, 4b, and 4c): Understand how to identify recharge areas by studying local hydrogeology through field mapping of geology, and hydrogeological conceptual layout development of spring and springshed	Learn to create geological maps using field geology data and transfer it to Google Earth, create 3-D conceptual layouts using CorelDRAW, and identify recharge areas based on 3-D layout and spatially locate recharge and protection areas on Google Earth	Learn to identify and map recharge areas based on field geology
Day 9 11 May	Step 5: Understand ways to enhance recharge by developing springshed management and governance protocols	Learn how to locate and construct a simple recharge structure based on slope, topography, land use, and land ownership criteria	Understand various methods of recharge and their suitability under different land use and land type conditions. Learn to design simple recharge structures
Day 10 12 May	Step 6: Understand the importance of monitoring impacts of spring revival activities and how to do so systematically and scientifically	Learn to calculate increases in spring discharge during lean season; calculate the increase in discharge per unit of rain and translate these into increase in water volume for human consumption	Learn to measure the impact of spring revival-related interventions on local communities

Training Schedule

Time	Topic	Resource person(s)	Reading materials, assignments and logistics notes
DAY 1: 2 May, Wednesday, Hkakabo Razi Room, Godawari Knowledge Park			
8:30–9:00	Registration by participants	<i>Sarita Joshi</i> , ICIMOD	
9:00–9:30	Welcome address	<i>Eklabya Sharma</i> , DDG ICIMOD <i>Vinayakrao Peshwa</i> , ACWADAM <i>Tashi Dorji</i> , Bhutan Focal Person, ICIMOD	
9:30– 9:50	Introduction to the two week course including course objectives and outcomes	<i>Aditi Mukherji</i> , ICIMOD	
9:50–10:10	Short survey to gauge participants skills and interest	<i>Jayesh Desai</i> , ACWADAM and <i>Rajendra Shrestha</i> , ICIMOD	Basic questions on springshed management will be provided to participants
10:10–10:30	Formation of groups for work assignments and distribution of assignment files to each group	<i>Aditi Mukherji</i> , ICIMOD	A total of 5 groups (with 4-6 members) will be formed for group work and assignments
10:30–11:00	Group Photograph and Tea Break		
11:00–12:30	<i>Theory</i> : Introductory lecture on the six step spring revival protocol using examples from adjoining Godavari springshed, Nepal	<i>Jayesh Desai</i> , ACWADAM	Report on Godavari Springshed prepared by ACWADAM and ICIMOD
12:30–13:30	Lunch Break		
13:30–17:00	<i>Practical</i> : Field visit to three nearby springs – Naudhara, Godavari Kunda and Thulo Sim	<i>Rajendra Shrestha</i> , <i>Madhav Dhakal</i> , ICIMOD and <i>Imran Siddique</i> , <i>Jayesh Desai</i> , ACWADAM	Participants will walk to the spring, and at 17:00 hour, they would be picked up by an ICIMOD vehicle and taken to their hotel

DAY 2: 2 May, Thursday, Hkakabo Razi Room, Godawari Knowledge Park			
9:00–9:10	Reflections from Day 1		One group will present the major highlights and reflections from the previous day.
9:10– 12:30 (30 min tea break in between)	<i>Theory:</i> Basic concepts in Hydrogeology	<i>Jayesh Desai, ACWADAM and Rajendra Shrestha, ICIMOD</i>	Spring revival protocol manual, sections of chapter 2.
12:30–13:30	Lunch Break		
13:30–17:00	<i>Practical</i> - Field visit to nearby marble quarry and Phulchowki to understand geology, rocks, and rock types	<i>Jayesh Desai and Imran Siddique, ACWADAM, Rajendra Shrestha, ICIMOD</i>	Participants will be picked up from the training venue and taken to the field site in jeeps and will be later dropped at their hotel

DAY 3: 4 May, Friday, Hkakabo Razi Room, Godawari Knowledge Park			
9:00–9:10	Reflections from Day 2		One group will present the major highlights and reflections from the previous day
9:10–10:45	<i>Theory: Step 1: Comprehensive mapping of springs and springsheds</i>	<i>Imran Siddique, ACWADAM</i>	Spring revival protocol manual Chapter 4, Step 1
10:45–11:00	Tea Break		
11:00–12:30	<i>Theory: Step 2: Setting up a data monitoring system</i>	<i>Madhav Dhakal, ICIMOD</i>	Spring revival protocol manual, Chapter 5, Step 2
12:30–13:30	Lunch Break		
13:30–14:30	<i>Practical exercise for Step 1: Drainage analysis; watershed demarcation; and demarcation of springshed using concepts of geology</i>	<i>Jayesh Desai, ACWADAM</i>	Each group will be given the materials and instructions needed for this exercise
14:30–15:00	Theory session on relation between drainage, geology and springs	<i>Jayesh Desai, ACWADAM</i>	Use of drainage analysis to decipher hydrogeological conditions.
15:00–15:15	Tea Break		
15:15–17:00	<i>Practical exercise for Step 2: Conversion of units; discharge calculation from various types of springs; plotting of rainfall and spring discharge</i>	<i>Madhav Dhakal, ICIMOD</i>	Each group will be given raw data pertaining to their spring for this classroom exercise. In addition, they would be given data from another spring as a home assignment

DAY 4: 5 May Saturday, Hkakabo Razi Room, Godawari Knowledge Park			
9:00–9:10	Reflections from Day 3		One group will present the major highlights and reflections from the previous day. Each group will also submit their assignment in soft copy
9:10– 10:45	<i>Theory:</i> Step 3: Understanding current social and governance systems of spring	<i>Aditi Mukherji, ICIMOD</i>	Spring revival protocol manual Chapter 6, Step 3 plus additional reading materials which will be distributed on the 1 st day of training
10:45–11:00	Tea Break		
11:00–12:30	<i>Theory:</i> Step 3: CHIRAG model of community mobilization	<i>Bishan Singh Raikwal, CHIRAG</i>	Same as above
12:30–13:30	Lunch Break		
13:30–14:30	<i>Practical exercise I for Step 3:</i> Design interview checklist	<i>Aditi Mukherji, ICIMOD</i>	Each group will design a checklist for conducting a Focus Group Information and Key Informant Information
14:30–14:45	Tea Break		
14:45–17:00	Demonstration of Hydrogeological and Contaminant transport models.	<i>Jitendra Singh Bisht, CHIRAG</i>	Concept, design and utility of both models will be explained in two groups.

DAY 5: 7 May, Monday, Hkakabo Razi Room, Godawari Knowledge Park

9:00–9:10	Reflections from Day 4		One group will present the major highlights and reflections from the previous day. Each group will also submit their assignment in soft copy
9:10–10:45	<i>Theory: Step 4A: Hydrogeological mapping</i>	<i>Rajendra Shrestha, ICIMOD</i>	Spring revival protocol manual, Chapter 7, Step 4A
10:45–11:00	Tea Break		
11:00–12:30	<i>Theory: Step 4B: Creating a conceptual hydrological layout of a springshed</i>	<i>Jayesh Desai, ACWADAM</i>	Spring revival protocol manual, Chapter 7, Step 4B
12:30–13:30	Lunch Break		
13:30–15:00	<i>Practical exercise I for Step 4 A: Creating geological maps and cross sections using conventional methods</i>	<i>Rajendra Shrestha, ICIMOD</i>	Each group will be provided with geological data, which they will have to plot using toposheets and draw a cross section
15:00–15:15	Tea Break		
15:15–17:00	<i>Practical exercise II for Step 4B: Interpretation from the map and cross sections in context of springs and aquifers</i>	<i>Jayesh Desai, ACWADAM and Rajendra Shrestha, ICIMOD</i>	Each group will draw interpretations from their maps and cross sections to understand spring hydrogeology

DAY 6: 8 May, Tuesday, Field Work in an Around Godavari Area

9:00–17:00	Field work for Steps 4A and 4B	ICIMOD and ACWADAM <i>(Rajendra Shrestha, Jayesh Desai, Bhargavi Thorve, Himanshu Kulkarni)</i>	Instruments: Brunton compass, measuring tape, Hammer, Toposheets and GPS Packed lunch will be provided Groups will visit their assigned springs for mapping
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DAY 7: 9 May, Wednesday, Everest Room, ICIMOD			
9:00–9:10	Reflections from Days 5 and 6		Two groups will present the major highlights and reflections from the previous day. Each group will also submit their assignment in soft copy
9:10–11:00 (with 15 min tea break in between)	<i>Theory: Step 4C: Classification of spring type, identifying mountain aquifer and delineating recharge area</i>	<i>Himanshu Kulkarni, ACWADAM</i>	Spring revival protocol manual, Chapter 7, Step 4C
11:00–12:30	Demonstration on using Google Earth to create maps and 3D conceptual layouts and demarcating recharge areas	<i>Jayesh Desai, ACWADAM</i>	Resource person will demonstrate the whole process of plotting data in Google Earth and creating 3D conceptual layouts
12:30–13:30	Lunch Break		
13:30–17:00	<i>Practical exercises for Step 4C: Developing 3D conceptual layouts to delineate aquifers and identify recharge areas.</i>	<i>Jayesh Desai and Bhargavi Thorve, ACWADAM</i>	Computers with Google Earth and Corel Draw software will be provided to participants for these practical exercises

DAY 8: 10 May, Thursday, Everest Room, ICIMOD			
9:00–9:10	Reflections from Day 7		One member from each group will present the major highlights and reflections from the previous day. Each group will also submit their assignment in soft copy
9:10–10:30	Groundwater quality	<i>Himanshu Kulkarni, ACWADAM</i>	
10:30–11:00	Tea Break		
11:00–12:30	<i>Practical exercise for Steps 4 C: Continued from Day 7</i>	<i>Jayesh Desai and Bhargavi Thorve, ACWADAM</i>	Participants practice the skills they learnt the previous day and continue to work with Google Earth and CorelDRAW
12:30–13:30	Lunch Break		
13:30–17:00 (with tea break)	<i>Practical exercise for Steps 4C: Continued</i>	<i>Jayesh Desai and Bhargavi Thorve, ACWADAM</i>	Participants practice the skills they learnt the previous day and continue to work with Google Earth and CorelDRAW

DAY 9: 11 May, Friday, Hkakabo Razi Room, Godawari Knowledge Park

9:00–9:10	Reflections from Day 8		One group will present the major highlights and reflections from the previous day. Each group will also submit their assignment in soft copy
9:10–10:45	<i>Theory:</i> Step 5: Developing springshed management and governance protocols (physical and social)	<i>Madhav Dhakal, ICIMOD and Himanshu Kulkarni, ACWADAM</i>	Spring revival protocol manual, Chapter 8, Step 5
10:45–11:00	Tea Break		
11:00–12:30	<i>Theory:</i> Step 6: Measuring hydrological and other impacts of spring revival activities	<i>Himanshu Kulkarni, ACWADAM</i>	Spring revival protocol manual, Chapter 9, Step 6 In addition, each of the groups will hand over the soft copy of their project reports
12:30–13:30	Lunch Break		
13:30–17:00 (with 15 min tea break inbetween)	<p><i>Practical exercise:</i> Step 5</p> <p><i>Calculation:</i> Intervals between two trenches/bunds/Hedgerows for different slope, rainfall and infiltration categories</p> <p>Calculation of dimension of a recharge pond and contour trench.</p>	<p><i>Madhav Dhakal, ICIMOD</i></p> <p>1 hour</p> <p>2 hour</p>	<p>A question for each group with information on slope, rainfall and infiltration capacity of soil with equation will be provided</p> <p>A question for each group with information on catchment area, rainfall, rainy days runoff coefficient and step by step process will be provided</p>

DAY 10: 12 May, Saturday, Hkakabo Razi Room, Godawari Knowledge Park	
9:00–9:30	Reflections from Day 9
9:30– 10:00	<i>Project Report Presentation by Group 1</i>
10:00–10:30	<i>Project Report Presentation by Group 2</i>
10:30–11:00	<i>Project Report Presentation by Group 3</i>
11:00–11:30	Tea Break
11:30–12:00	<i>Project Report Presentation by Group 4</i>
12:00–12:30	<i>Project Report Presentation by Group 5</i>
12:30–13:30	Lunch Break
13:30–14:30	<i>Concluding Remarks and Award of Certificate Ceremony</i>