

Knowledge Sharing Workshop on Springs and Springshed Management for Reviving Drying Springs



About ICIMOD

The International Centre for Integrated Mountain Development (ICIMOD) is a regional knowledge development and learning centre serving the eight regional member countries of the Hindu Kush Himalaya (HKH) – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan – based in Kathmandu, Nepal. Globalization and climate change have an increasing influence on the stability of fragile mountain ecosystems and the livelihoods of mountain people. ICIMOD aims to assist mountain people to understand these changes, adapt to them, and make the most of new opportunities, while addressing upstream and downstream issues. ICIMOD supports regional transboundary programmes through partnerships with regional partner institutions, facilitates the exchange of experiences, and serves as a regional knowledge hub. We strengthen networking among regional and global centres of excellence. Overall, we are working to develop economically and environmentally-sound mountain ecosystems to improve the living standards of mountain populations and to sustain vital ecosystem services for the billions of people living downstream – now and in the future.



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Workshop Report 2018

Knowledge Sharing Workshop
on
Springs and Springshed Management
for Reviving Drying Springs

15–18 November 2017

Thimphu, Bhutan

Organized by

Watershed Management Division (WMD)

Department of Forests and Park Services

Ministry of Agriculture and Forests

Royal Government of Bhutan

and

International Centre for Integrated Mountain Development (ICIMOD)

In collaboration with

National Environment Commission Secretariat (NECS), Royal Government of Bhutan

Advanced Center for Water Resources Development and Management (ACWADAM)

Rural Management & Development Department (RMDD), Government of Sikkim

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ICIMOD

Knowledge Sharing Workshop

Springs and Springshed Management for Reviving Drying Springs

15-18 November 2017, Thimphu, Bhutan

Organized by

Watershed Management Division (WMD), Department of Forest, Range & Park Services, Ministry of Agriculture & Forests, Royal Government of Bhutan

In Collaboration with

National Centre for Integrated Mountain Development (NCIMD)
National Environment Commission (NEC), Ministry of Environment & Forests, Royal Government of Bhutan
Advanced Centre for Water Resources Development & Management (ACWRDM), Pune, India
Soil Management and Development Institute, Government of India



1. Introduction

Mountain springs are the primary source of water for millions of people in the mid-hills of the Hindu Kush Himalaya (HKH). Both rural and urban communities depend on springs to meet their drinking, domestic, and agricultural water needs. Springs also contribute to the base flows of rivers in this region. There is increasing evidence of drying springs, decreasing spring discharge, and deteriorating spring water quality in many parts of the HKH. As a result, communities are facing unprecedented water stress. The exact extent of this problem is not well-known given that sufficient data on this problem has not been gathered.

The drying of springs is a regional phenomenon, and its consequences are felt across the HKH – from Afghanistan all the way to Myanmar. A few local and national organizations have started scientific studies and policy advocacy on springs, but more needs to be done, especially given the regional nature of the problem.

ICIMOD, as an inter-governmental organization, works in eight countries of the HKH (Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal and Pakistan), and conducts country consultations with governmental and other partner organizations in each of the Regional Member Countries (RMCs). In these consultations conducted in mid 2010, drying of spring water sources, especially in the mid hill regions, emerged as a common theme across all RMCs of ICIMOD. Drying up of springs has not only impacted everyday lives of people, but has also encouraged unsustainable practices like drilling of deep bore wells in fragile mountain aquifers. This stems from a lack of understanding of the uniqueness and fragility of mountain aquifers and is often a shortsighted response to acute water stress.

Under the scenario of acceleration of drying up of springs and the deterioration in spring water quality, the desirable policy response is to revive these springs using local as well as scientific hydrogeological knowledge.

In Bhutan, one of the RMCs, drying of springs has also been an issue of major concern and the Watershed Management Division (WMD) has been mandated to implement a plan and programmes related to springs and springshed management. In the forthcoming 12th Five Year Plan, WMD plans to undertake springs and springshed management as a major activity to address the issue of drying springs for better water security for mountain communities in Bhutan.

In this regard, a four-day 'Knowledge Sharing Workshop on Springs and Springshed Management for Reviving Drying Springs' was organized in Bhutan by the Watershed Management Division (WMD) of the Department of Forests and Park Services, Ministry of Agriculture & Forests, Royal Government of Bhutan, and the International Centre for Integrated Mountain Development (ICIMOD) in collaboration with the National Environment Commission Secretariat (NECS), Royal Government of Bhutan, Advanced Center for Water Resources Development and Management (ACWADAM), Pune, India and the Rural Management and Development Department (RM&DD), Government of Sikkim, India. This training workshop was held at City Hotel in Thimphu, Bhutan from 15-18 November 2017.

2. Objective of the Workshop

The main objective of the workshop was to share the '*Protocol for Reviving Springs in the Hindu Kush Himalaya*' by discussing a step-wise, systematic methodology for managing springs and springsheds and reviving drying springs. This methodology combines hydrogeology with social governance aspects for a comprehensive understanding of springs.

3. Participants of the Workshop

The workshop was attended by more than 40 participants from Bhutan representing various institutions. Institutions represented ranged from government departments/institutions, non-governmental organizations, local community organizations, local media, to academic institutions (Figure 1 and Annex 1). Resource persons of the workshop were from ACWADAM, ICIMOD, and RM&DD.

Figure 1: Participants of the workshop



4. Inaugural Session

The workshop began by Dr. Jigme Tenzin, Senior Forest Officer, WMD, welcoming all the participants, resource persons, media personnel and invitees to the inaugural session. Dr. Jigme Tenzin, during the welcome address, stated that springs and springshed management is one of the priority areas for the Watershed Management Division of the Department of Forests and Park Services, Ministry of Agriculture & Forests, Royal Government of Bhutan. He said that Dasho Secretary himself took the initiative to help organize this workshop, which in turn will help them prepare themselves for their forthcoming work on springs and springshed management. He briefly introduced the Watershed Management Division, its organogram, watershed management plan and programme, its approach and implementation. He also informed the participants that capacity building is a continuous process at WMD and this has become necessary with respect to emerging issues related to water resources and for the management of watersheds (Figure 2).



Figure 2: Dr. Jigme Tenzin welcomes the participants and introduces WMD

Presenting an overview of springs in the HKH, Dr. Aditi Mukherji, Theme Leader, Water and Air Theme of ICIMOD, informed the participants about country-wise stakeholders' consultation meetings held in the eight regional member countries of ICIMOD last year (Figure 3). Two main themes related to water that emerged during those meetings were i) increase in water scarcity and ii) issue of drying of springs, which is less understood. She emphasized that tackling the issue of drying springs in the HKH will contribute in the wellbeing of mountain communities. Learning from RM&DD's pioneering work for springs revival in Sikkim, pilot projects were implemented in Nepal through a stepwise approach of springs revival protocol. She also explained that the training workshop aimed to familiarize the participants with the stepwise approach and give them a sense of how to delineate the problem of springs drying and how to tackle the problems by applying the science of hydrogeology and social science.



Figure 3: Dr. Aditi Mukherji, Theme Leader, Water & Air Theme, ICIMOD highlights the workshop content and objectives

The opening session was graced by Hon. Secretary of the Ministry of Agriculture and Forests (MOAF) and Chair of ICIMOD Board of Governors, Dasho Rinzin Dorji. Delivering the opening remarks, Dasho Secretary Rinzin Dorji highlighted the importance of springs, the issue of drying springs in Bhutan and its impacts on the local mountain communities. Dasho Secretary expressed concerns that drying of springs is one of the most talked about problems in Bhutan and lack of expertise has caused difficulty in dealing with this problem (Figure 4). He also stressed that drying of springs and its adverse impacts on the mountain communities is not only a problem in Bhutan but in other



Figure 4: Dasho Rinzin Dorji (Secretary of the Bhutanese Ministry of Agriculture and Forests and Chair of ICIMOD Board of Governors) delivers the opening remarks

mountainous regions of the whole HKH and eight Regional Member Countries (RMC). In this regard, Dasho Secretary expressed willingness to strengthen the relationship with the partners and stakeholders in the area of water resource management in the region and advised the participants to make most of the four-day workshop and gain hands-on experience in springs and springshed management in order to identify problems and find solutions together.

He requested the resource persons to look at water from the village perspective and not only from the science perspective. He added that the issue of drying springs and its impact on the village communities has been identified as a major issue and the Ministry of Agriculture and Forests, through its Department, plans to prioritize this in the forthcoming 12th Five Year Plan.

Dasho Secretary pointed out that the Bhutan delegates' field exposure visit on springs revival actions in Sikkim has been very useful as he has learned from the participants. He added that it has brought them one step closer to collaborating to address the issue. He gave his best wishes for the success of the workshop.

5. Workshop Content

The four-day training workshop successfully familiarized the participants with the concept of springs and springshed management with special focus on the issue of springs revival. The training workshop followed the format of classroom style discussion with a lot of interaction. A one-day field visit in the Motithang area of Thimphu helped the participants learn about measurement and collection of data from the field and the importance of systematic field data collection. Demonstration of field skills and techniques during the field excursion was highly beneficial to the participants.

Overall the training workshop covered the geological context of the Himalaya, with special reference to Bhutan. Participants were introduced to the concepts of groundwater, aquifers, springs and springsheds, and conceptual differences between springsheds and watersheds were clarified. Lectures on issues of spring water quantity and quality, and needs assessment for spring revival based on village-level vulnerability assessment were also given. Most importantly, the participants were exposed to the various steps of the spring revival protocol in a stepwise manner starting from comprehensive mapping of springs and springsheds; setting up of data monitoring systems; understanding social and governance aspects; hydrogeological mapping; creating a conceptual hydrogeological layout; identification of recharge areas; developing springshed management protocol; and finally, to measuring hydrological and other impacts of spring revival.

6. Technical Sessions

Day 1 (15 November 2017)

During the first technical session, Kaka, Forestry Officer, WMD, presented issues related to springs and springshed management in Bhutan and pointed out that knowledge of hydrogeology has not been applied so far in understanding the behaviour of springs in Bhutan. Main issues that have been dealt with so far focused on water quality, social survey and climate change while implementing watershed management plans (Figure 5). For example, drying of five springs in Lower Shaba, Shaba and Lholing villages of Shaba Geog, Paro was attributed to forest fire and excessive use of forest resources, climate change, or developmental activities. Local communities abandoned Lholing village due to scarcity of water.

Drying of water sources in Zhemgang including reduced water in Dechugang stream, water scarcity in Dechheling or drying of Pelingtsho lake had not been looked at from a hydrogeological perspective. During discussion, participants raised questions about the drying up of springs in relation to earthquakes in Bhutan and noted that this issue needs to be considered. Presentation on a broad overview of Himalayan geology by Dr. Rajendra Shrestha with emphasis on the geology of Bhutan gave an overall picture of geological divisions and the relation between occurrences of springs and different geological divisions. The question of how and what kind of geological elements are relevant to springs revival was raised during the discussion.

Ms. Sarika Pradhan, Additional Secretary, RM&DD, Government of Sikkim, shared experiences from spring revival activities that applied the knowledge of hydrogeology and the story of the development of Dhara Vikas Initiative (Figure 6). She explained how Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) is linked to Dhara Vikas and how it has contributed to the success of the springs revival programme in Sikkim.

The second half of the day was allocated for the Technical Session-I during which a scientific background on springs and aquifers was delivered. This session was significant in a way as workshop participants who were primarily familiar with the watershed concept were exposed to the concept of springshed and the distinction between springshed and watershed. The session on groundwater quality demonstrated that physical and chemical parameters derived by testing water samples from



Figure 5: Deliberation on issues related to springs and springshed management in Bhutan



Figure 6: Ms. Sarika Pradhan, Additional Secretary, RM&DD, Government of Sikkim, shares the success story of springs revival in Sikkim

springs through various means not only indicate the quality of water in terms of health and sanitation but their linkages in understanding aquifers and their behavior. Dr. Subhash Dhakal gave a methodological presentation on the overall springs revival programme in Sikkim. His presentation focused on the general procedure of identifying vulnerable springs and understanding their hydrogeology, identification of recharge areas, cost estimate of revival measures and their implementation and impacts. Examples of springs and lake that were revived provided knowledge about the implementation of recharge measures.

Day 2 (16 November 2017)

The second day and fourth day of this training workshop were dedicated to covering the technical aspects of the HKH Springs Revival Protocol. During the first half of Day 2, Steps 1, 2, 3 and 4A were discussed. Early rounds of discussion focused on comprehensive mapping of springs and springsheds, with examples from Godavari area in Nepal, and delineation of springshed.

During the presentation and discussion on Step 2 – regarding setting up of a data monitoring system in a springshed – participants asked whether it is essential to set up rain gauge or even collect rainfall data. However, as the discussion went ahead, its importance was realized and participants reached a consensus that setting up rain gauge and discharge measurements are necessary for knowing the effectiveness of the spring revival programme.

Springs are also part of complex socio-technical and informal governance systems with pronounced gender and equity dimensions. Lack of understanding of these systems could lead to inappropriate policies and interventions. Therefore, a presentation was given and extensive discussion held on understanding social and governance aspects of springs. The participants were introduced to socio-economic PRA tools like Focused Group Discussion (FGD), Key Informant Interviews (KII) and questionnaire survey with respect to spring revival and springshed management. Example of application of such tools and findings of such studies in one of the pilot areas in Dailekh, western Nepal, were also shared to allow participants to understand the importance of Step 3 of the protocol.

Hydrogeological mapping (Step 4A) forms the basis of recharge area identification and as such the presentation was divided into two sections. The first section gave a theoretical background on geological formations and geological structures in the context of springs as groundwater. Rocks and their classification and primary and secondary structures that are important for groundwater accumulation and movement were discussed. With this theoretical background, the concept and process of geological mapping in relation to springs was presented. Orientation of rocks, their structures, and their measurement and presentation on maps was discussed in greater detail.

However, it was felt that this topic was somewhat technical and further training would be required to understand it better and apply this knowledge practically for springs revival. It was also realized that the field visit the following day would help the participants understand the concept of hydrogeological mapping.

Day 3 (15 November 2017)

The participants were taken for a field excursion on the third day instead of fourth day as planned. The field excursion was organized a day ahead so that participants could provide feedback on the last day and also to help them understand the following day's presentations better. The purpose of the field excursion was to make participants understand measurement and collection of data from the field and the importance of systematic field data collection. In the field, practical demonstrations of field skills and techniques were made. Participants were divided into three groups and each group was asked to collect and note down field data so that they could be used during practical exercise as well as for the presentation on Step 4B i.e., creation of a conceptual hydrogeological layout (Figures 7 and 8) on the following day.

Day 4 (15 November 2017)

Participants benefited from the content of the fourth day of the workshop as they gained practical knowledge on how to create a conceptual layout and identify or demarcate recharge areas of springs. Data collected from the field visit on the previous day was used during the demonstration. Participants were excited about the application of hydrogeological knowledge in springs revival and keen to receive further detailed training.

The technical session concluded with a presentation and discussion on spring types, their hydrographs and behavior in terms of storativity and transmissivity, and relationship with underlying aquifers (Figure 9). At the end, monitoring of springs and impact of spring revival activities were briefly discussed with examples.

The workshop concluded with remarks from the participants. Participants said that the training workshop had been very useful but that they would like to get further detailed training to become confident that they can implement the protocol in their working areas.

Closing the workshop, Dr. Pema Wangda, Chief Forestry Officer of Watershed Management Division, remarked that much can be done for springshed management in Bhutan. He stressed the importance of capacity building in this area. He thanked the National Environment Commission Secretariat (NECS), Royal Government of Bhutan, for collaborating in organizing the training workshop, and ICIMOD for initiating that activity and for all the support extended to WMD for organizing the workshop and field visit to springs revival sites in Sikkim. He stressed that this should lead to continued collaboration between ICIMOD, WMD and ACWADAM for the implementation of springs revival protocol in Bhutan in the near future. He said he looked forward to further collaboration between ICIMOD, WMD and ACWADAM for capacity building and training as well as for implementing the springs revival protocol starting with one or two pilot areas in Bhutan. He thanked all the participants for their enthusiasm and resource persons from ICIMOD, ACWADAM, and RM&DD for their deliberations and contributions.



Figure 7: Participants receive a general briefing during fieldwork in Motithang watershed



Figure 8: Demonstration on how to collect hydrogeological data in front of a rock outcrop



Figure 9: Final deliberation during the last technical session of the workshop

7. Summary

It was mentioned during and at the end of the workshop that the comprehensive technical and theoretical knowledge about hydrogeology and the socio-governance aspects of springs had enhanced the capacity of the participants. This would in turn contribute in improving springshed management practices in their respective areas.

This training workshop also contributed in framing a common understanding of springshed management research and implementation among key stakeholders in Bhutan.

It was realized that further detailed practical or on-the-job training targeting a smaller number of professionals is required so that those trainees will be able to train other professionals as well as implement the spring revival protocol in a systematic manner.

8. Way Forward

Dasho Secretary expressed his belief that the workshop had been useful and relevant to stakeholders who had participated in the event and that it had enhanced the network both within and outside the country. He said that this success story needs to be taken further. He added that conducting a Training of Trainers (ToT) on springs and springshed management should be followed with the development of an inventory and an assessment of springs and springsheds in Bhutan and priority should be placed on those that are to be taken up for revival.

With the understanding and realization that hydrogeological science should form the basis for further work related to springshed management or springs revival in Bhutan, a strong need has been felt for further capacity building at WMD. This is because the location and extent of recharge areas are purely governed by the local hydrogeology and not by administrative or socio-economic boundaries.

Therefore, the following approach was suggested as a way forward:

Plan a Training of Trainers (ToT) and conduct detailed training for potential young candidates from Bhutan so that they can take the springshed management plan and programme forward in the forthcoming 12th Five Year Plan as well as train others in Bhutan. And the number of trainees for the ToT should not be less than 5.

The next step is to conduct on-the-job training in one or two pre-identified pilot sites in Bhutan through a collaboration between ICIMOD, WMD and ACWADAM. This activity shall be conducted by systematically implementing 'Protocol for Reviving Springs in the Hindu Kush Himalayas' in a step-wise manner.

WMD and ICIMOD shall collaborate for both technical and financial support that will be required during the implementation of the springs revival protocol in Bhutan.

Annex 1: List of Participants

S. No.	Name	Designation/Agency
1	Sonam Zangmo	ICIMOD Desk, MoAF
2	Jayesh Desai	ACWADAM, India
3	Sarita Joshi	ICIMOD, Nepal
4	Kinley Dem	WMD
5	Tenzin Wangmo	CEO/NEC
6	Norbu Wangdi	DCFO, UWICER
7	Kelzang Tenzin	EE, AED, DoA
8	Kausila Timilsina	RTC, Thimphu
9	Tandin	FO/NCD/DoFPS
10	Tashi Wangdi	Sr.FO/MFD
11	Aditi Mukherji	Theme Leader, Water & Air, ICIMOD
12	Kaka	WMD
13	Samten Wangchuk	DCFO, WMD
14	Kuenzang Om	Sr. AO/ WMD
15	Sarika Pradhan	Additional Secretary, RM&DD, Sikkim
16	Dawa Yoezer	FO/UWICER
17	Jamyang Zangpo	Engineer/NCHM
18	Chimi Wangmo	WMD
19	Norbu Zangmo	FO/ZFD
20	Phuntsho Wangdi	EO/NEC
21	Tshering Dema	Engineer
22	Yeshi Jamtsho	A.E, NCHMS
23	Tilak Bhandari	FR II, DoFPS
24	Karma Tshithar	CE/DoA
25	Jambay	CNR, Lecturer
26	Tenzin Lekjay	AEO/NECS
27	Subash Dhakal	OSD-RMDD/Sikkim
28	Sherab Jamtsho	FR I, DoFPS
29	Tandin Wangchuk	FR I, DoFPS
30	Sangay Wangchuk	FR II, DoFPS
31	Dorji Tobgyel	FR II, DoFPS
32	Tashi Dhendup	Sr.FR III
33	Bago Dukpa	Ranger II
34	Rinchen Zangmo	Reporter/Kuensel
35	Jamyang Phuntsho	PO/Tarayana
36	Tsheten Dorji	Sr. PO/RSPN
37	Karna Bahadur Ghallay	FR
38	Cheki Wangdi	FR II, DoFPS
39	Pema Seldon Tshering	Reporter, BBS
40	Tshewang Nidup	FR I

41	Thinley Norbu	Camera man, BBS
42	Thinley Wangchuk	Camera man, BBS
43	Jigme Tenzin	Sr. FO, WMD
44	Nidup Tshering	WMD
45	Rixzin Wangchuk	SFED
46	Himanshu Kulkarni	ED/ACWADAM
47	Rajendra B. Shrestha	Geologist/ICIMOD
48	Ugyen Thinley	PHE/PHED/MoH
49	Ugyen Dema	WMD
50	Sonam Choden	WMD
51	Yogesh Chandra Barola	Researcher, ACWADAM
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