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Reviving Springs of the Himalayas

An Imperative for Policy Support

Springs serve as the primary sources of water for meeting household needs in the Himalayas.[6] The vital sources are disappearing at a faster pace throughout the Churia, mid hills and mountain of Nepal.[1,6]

A user searching for a disappeared spring at Ram Prasad Rai RM, Bhojpur

Detrimental impacts of climate change and land use change are spectacular on these natural sources. The drying or declining of spring sources have threatened livelihoods of a significant number of households, reduced economic opportunities, increased burden to women, disturbed the social fabric and increased ecological imbalances.[19] Therefore, spring rejuvenation and springshed* conservation require urgent policy interventions to minimize the impact by recharging the groundwater.

Importance

Springs are the primary sources of water for domestic use, livestock care, agriculture, and ecological and cultural value for the local communities.[8,12] Since ancient times, mountain communities have relied on spring water to meet most of their basic needs.[7] Springs are also major sources of non-snow-fed rivers for maintaining base flows[6] which contribute to water supply for the communities and environment during the lean season. 'Unlike the hill communities, those of plains and valleys can access water from both the surface sources and groundwater.[2,6] which occurs in natural hydrogeological settings. The towns and villages are located at the slope or top of the hills while river water flows in the valley. The people have to work against gravity to get the river water which is a difficult choice in terms

* The term "springshed" should not be mistaken with watershed. The former includes recharge zone and underground drainage pattern that might be different from the surface sources and associated catchment area. The latter one tends to take account of the surface water sources and associated catchment zone.

Key Messages

The Problems

- The natural springs across the Hindu Kush Himalaya serve as the lifeline of millions of the mountain dwellers.
- Recent studies revealed deteriorating situation of these vital sources, thus, jeopardizing the lives and livelihoods of the dependents.
- Rapid landuse change including road building and other infrastructures coupled with adverse impacts of changing precipitation pattern are identified as the primary factors affecting sustainability of springs.
- Inadequate knowledge on springshed and misplaced policy priority led to focus on watershed, thus, leaving the springshed issues unaddressed.

The Causes

- Existing integrated water resource management approach tends to oversee the springshed from top-down perspective while the springshed conservation requires bottom-up interventions with research and database building as entry points to overcome the aforementioned problems.
- The big technocratic projects of groundwater pumping approach to water provisioning are not only expensive, problematic and unsustainable but also jeopardize the community-led action and climate adaptive actions.

Recommended actions

- Springshed needs due recognition for developing new layer of scientific database and policy measures that are well aligned with the local development planning for sustaining water resources.
- The new policy framework should be founded on bottom-up approach that embodies gender responsive community, sustainable, climate-smart and regenerative practices while putting the nature-based solutions on the center stage.

of technology, investment capital and operational cost. Therefore, springs are the only accessible source of water for over 13 million (80% of the total population) people living in valleys, lower hills and mountains of Nepal.[11] Likewise, most of the piped water supply systems in Nepal's Churia, mid hills and mountains are fed by springs.

Current status

A key informant's survey conducted by Nepal Water Conservation Foundation (NWCF) in collaboration with International Center for Integrated Mountain Development (ICIMOD) in 2020 with local government officials from in Churia, mid hills and mountain regions (Figure 1) revealed that about 74% local governments of Nepal have experienced drying up springs.[10]

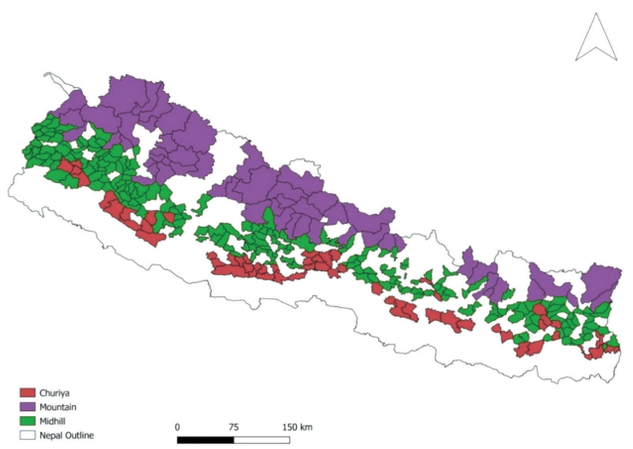

Figure 1 : Study area

Local governments of lower hills have experienced more (79%) incidences of drying up than (64%) of the higher altitudes (Figure 2).

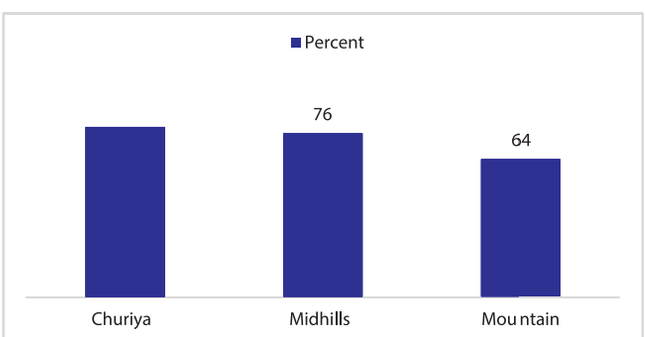

Figure 2: The scenario based on the ecological zones

Causes

The major factors contributing to reduce volume and converting the perennial one to seasonal springs have been identified as human interventions and climate changes.[12] Road constructions identified as the primary reason for drying or disappearance while natural causes like earthquake are also responsible for the springs drying up. Major reasons behind the spring decline are presented in the Figure 3.

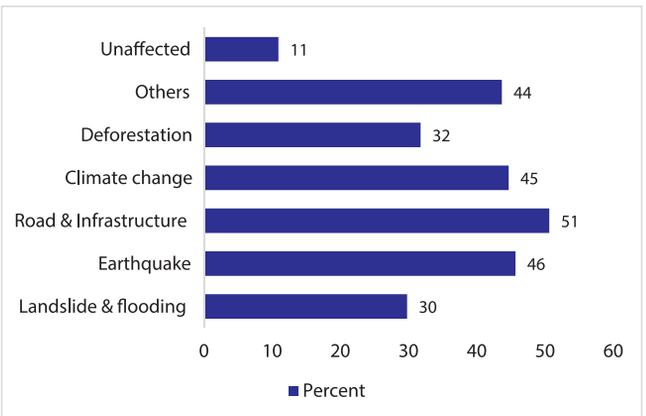

Figure 3: Primary causes

Coping strategy

Governments and users have adopted different strategies to cope the problem. One of the worst-case scenarios is out migration (Figure 4). Contrastingly, the installation of deep-water pumps (up to 300m) along the hills primarily for community supply, irrigation and hotels or commercial complex is an emerging trend. Issues have been raised over the sustainability of spring sources close to the pumping points. On top of this, some respondents of the nationwide survey revealed that a sense of competitions among the various groups of users such as domestic, irrigation and commercial over the common resource (aquifer) is steadily growing although only a few cases of visible conflicts are reported. This might lead to a conflict between two types of sources tapping the same aquifer in addition to affecting the sustainability of river flow. This paradox of sources and the resource is neither brought into improved practices of water management nor is it clearly mandated as a paradigm shift in the water policy

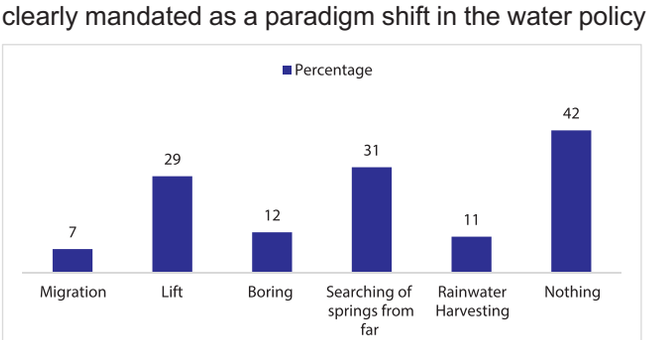

Figure 4 : Coping strategy

Majority of the municipalities have adopted a policy of 'One home, one tap' campaign in order to achieve target fully since the coverage of piped water supply to all households. To meet this target, they have identified groundwater as the major source followed by springs and rainwater harvesting (Figure 4). Interestingly, among the surveyed, 42% municipalities have not been able to identify the source for meeting the needs of drinking water supply.

Groundwater pumping: Counterproductive to springs

Although groundwater withdrawal is the top option of the municipalities, scientific knowledge about the aquifer and associated hydrology is limited. Studying spring sources along with associated aquifer is imperative to develop a comprehensive understanding of the water sources. The survey revealed that while municipalities are gearing for withdrawing a large volume of water from available springs and groundwater sources, they lack concrete policies to augment the supply capacity of the aquifer.

Inadequate science and capacity

Nepal has limited database, studies, and conservation activities on springs. Whatever available are inadequate in terms of science and policy implications. Critical water recharge zones, which can be instrumental to introduce immediate policy initiatives to augment water in springs are not identified. For instance, a focus on maintaining forest quality in critical water recharge zones of springs is of great significance. In the areas where aquifer recharge is high, local communities can be encouraged to reduce forest degradation. This will benefit recharge in these critical zones-while ensuring effective convergence. Identification of recharge zones of most critical springs is a technical exercise that needs scientific data and skills which may not be easily available at different levels of policy making and implementation as the spring conservation is itself in the governance transition under the new structure.

The impacts

Infrastructure development

Studies have reported a range of infrastructure development activities has led to change in land use patterns having detrimental impacts on hill aquifer systems[3]. Consequently, thousands of perennial springs are reported to be completely dried up or declined or became seasonal. This resulted in acute water shortages across the hilly settlements of the Himalayas, which is aptly known as 'the water tower of the Asia'. Additionally, the programmatic initiatives undertaken by agencies to manage natural resources sustainably over the last decades such as local and community adaptation proved either inadequate or ineffective to prevent the unintended effects of the infrastructural set up.

Socio-economic consequences

Consequences of the declining water supply from springs are more serious on the poor and marginalized communities in the hills. Consequently, communities are facing unprecedented water shortages-forcing them towards difficult choices of migration or expensive alternatives to access and manage water. With village springs depleting, women are forced to carry water from springs or streams below their village during lean seasons since over 80 percent female members hold the responsibility of collecting water from natural springs for their family needs especially in the hills, and some of them walk up to four hours for fetching water, thus, forcing women to bear the unfair burden of the water collection that increases their vulnerability.[12,14]

A college student spent four hours for fetching water and cleaning, Pouwadungma RM, Bhojpur

Moreover, children are compelled to compromise their school time to fetch water from distant water sources. In some cases, they walk for two hours for carrying water to meet the family needs of water (Field observation, Bhojpur). Anecdotal details from a recent field study in

Bhojpur and Dhankuta districts revealed that hundreds of hectares of fertile lands in Nepal are left barren due to the drying springs and water scarcity-the spring water is used for small-scale irrigation on hill slopes while in plains groundwater is pumped up using tube wells and bore wells.[6]

Once upon a time, Bhorleni was vibrant, now deserted due to water shortage; Ram Prasad Rai RM, Bhojpur

However, implications of the emerging water crisis may transcend beyond the mountain regions and affect to the downstream populations who depend on river flows supplied by mountain springs It finally results into out migration and poverty.

Ecological consequences

Consequences of spring depletion on forest and wildlife are getting severe as the majority of open freshwater sources have been increasingly tapped and diverted. Drying springs in the forest area increases the chances of forest fire and plight of wild animals for water. The deepening water table of churiya area of Nepal has forced wildlife to cross the traditional natural boundaries for water. Moreover, drying springs also trigger the losses of many aquatic organisms with their special character.[15] Minimizing risks of ecological damages due to spring losses lie on balanced act in the spirit of three international charters, namely, Sendai Framework, Paris Agreement and Sustainable Development Goals. Similarly, any actions employing the principle of nature-based solutions (NbS) may serve as remedy.

Knowledge

In absence of real time and updated database of spring sources, actionable policy research and decisions remain ineffective to respond the rapidly changing dynamics of water sources in the Himalaya. Importance of systematic collection of empirical information of spring sources in the region lies on its use for responding to the most affected communities and ecosystems. The absence of database was creating impediments for better policy decisions. An inventory of active spring sources and status of their performances are inevitable for understanding the issues and appropriate responses.

Policy space for springshed

An overview of the policies and plans relevant to the spring and springshed management are generally discussed in the initial part that follows with specific policies.

Under the state restructuring as provisioned by the Constitution of Nepal, the jurisdiction relating to policy formulation is divided among the three tiers. The state policies provide a framework to implement the fundamental right to access water, sanitation and health facilities, employment, food and dignified life to Nepali citizens. The Local Government Operation Act, 2017 is considered as a tool to implement the constitutional mandate, among others, for the formulation of policies, laws, standards and plans and implementation, monitoring and regulation relating to water, sanitation, health, agriculture, irrigation, food, biodiversity, environment, and climate change. Moreover, the local governments are empowered to formulate laws and policies related to development projects which are critically sensitive aspect of the current governance system, particularly where the physical infrastructure development like rural road construction, withdrawal of ground water using expensive boring and lifting have detrimental effect to spring sources. Looking at the rights and responsibilities entrusted to the local governments, it can be viewed that these roles must be matched with resources and capacities to implement the provisions. A higher level of sensitivity towards nature is expected. But the ground realities tell different stories where around 74 percent local governments have already experienced their spring sources drying up.[10]

The constitutional jurisdiction unbundling document has listed out the jurisdictions of three tiers of the state. It has assigned the responsibility of rural water resource management, small water resource structure reconstruction rehabilitation, maintenance and management to the local level. Likewise, the federal government is made responsible not only for land and watershed conservation and management, climate

change and environment related policy, strategy, law and standard making, but also conduct study, research, survey, demarcation and manage national databases. According to the standard relating to classification and distribution of development programs and projects between the federal, providential local level, 2076 BS, the provincial level is made responsible for land and watershed conservation, climate change mitigation and adaptation programs, while the local level is responsible for land and watershed conservation.

A transition is still on in terms of policy implementation under the federal system along with the devolution of the state powers to the lowest unit. There are overlapping jurisdiction and uncertainties in relation to the responsibilities of various levels of the governments. There is a noticeable disconnect between the policies and practice. Moreover, the policies indicate that either watershed or spring source protection and conservation are captured whereas springshed management is not envisioned.

Spring conservation: Suryodaya Municipality, Ilam

In the context of Climate Change Policy, 2019, mainstreaming adaptation program in the integrated water resource management (IWRM) has been envisioned where capacity building of local community on climate adaptation through inclusion of watershed and landscape management related best practices are mentioned. Considering the sensitivity of climate change effects in Chure and other vulnerable areas, the policy aims to address those effects through IWRM program. Additionally, construction of rain water harvesting ponds for groundwater recharge and multifarious use is also committed. These policy statements have considered climate change and infrastructure development as threats to water resources and incorporated policy measures to avoid and address the adverse impacts arising out of climate change as well as the infrastructure development activities. IWRM is considered to achieve the twin objectives, but it does not spell out springshed level of conservation i.e., a bottom-up approach whereas IWRM is a top-down approach. Water source protection has also received attention to increase access to clean drinking water and its availability.

The National Water Resources Policy, 2020 aims to integrate research, data, evidence in policy making and develop a system of coordination among the federal, provincial and local government in the conservation, development, management and regulation of water resources. This provision reiterates the need of collective and coordinated efforts from all level of governments on water resource conservation. The policy has introduced a new concept of basin level management of water resources which is complemented with IWRM. It commits to developed an integrated database and record keeping of all research, study among others of water resources sector. The identification of critical groundwater resources recharge zone is included where physical infrastructure development, settlement development and use of hazardous substances would be controlled. It aims to carry out recharge system to maintain ground water table and prevent discharge of drainage and dump solid waste in springs and other water bodies. It encourages rainwater harvesting, small pond construction techniques in combination with traditional and modern technology. Moreover, it promises to identify water resources like streams, rivers, springs, wetlands, lakes, ponds, stone spouts and conserve them.

The National Land Use Policy, 2015 and Land Use Act 2019 acknowledge the ecological degradation and imbalance in biodiversity, reduction in natural resources, including forests due to environmental pollution and climate changes escalating disaster-risks such as: soil erosion, floods, landslides and desertification, among others as problems. And in order to mitigate the impact of climate change, it is imperative to conserve, develop and manage forests and green-belts, places of entertainment, open spaces, water, watersheds or wetlands. It aims to ascertain environment friendly construction works by striking a balance between the environment and development. This provision can be instrumental to conserve springshed where the

haphazard construction works was found to be the major cause of spring depletion.[10] The classification of land adopting a land zoning concept is crucial. The Policy provisions 11 types of land zones whereas the Act classifies into 10 types. Moreover, there are four basis of land classification where geological composition is included but it does not primarily focus on springshed. These classifications bring huge potential in terms of springshed management preventing the haphazard use of land and natural resources if implemented scientifically. Additionally, special measures are also committed to conserve watersheds areas, wetland areas, reserves, intermediary areas, national parks and wildlife reserves and pasture areas. Works related to conservation, promotion and use of spoiled areas like lakes-reservoir, pond, rivers or rivulets/brooks or brooklets, wetlands, among others are also proposed. These policy statements can be utilized in springshed management through implementation.

Environmental Protection Act, 2019 pointed, environment impact assessment is the major tool to achieve environmental goals where watershed, springshed and water bodies are the major cursors of sensitivity in determining projects whether they are environmentally benign or destructive. This provision is instrumental to safeguard springshed from land use changes. It prohibits polluting substances to waterbodies like stream, river, waterfall, pond, lake pr any water sources.

The National Forest Policy, 2019 emphasizes on an integrated management of watershed area to conserve water and land while offering payments for ecosystem services (PES) model as a viable tool for integrating ecosystem and biodiversity for the upstream and downstream linkages of Chure Bhavar, thus, is compatible with the springsheds conservations.

National laws and policies related to land use, water resources, forest, environment, climate change, local governance have not prioritized the spring conservation adequately whereas springshed management is yet to get the attention.

Recommendations

The neglect of springs in the larger context of rivers, watersheds and aquifers is a reason for great concern as it has led to large gaps in policy and practice in developing any strategic national response to spring water management.[9] Therefore, programs aimed at conserving spring sources can involve the following policy options and activities at the local government as well as at national and provincial levels.

Establish spring inventory and data monitoring mechanism

In order to periodically evaluate the performances of the springs in time and space, this helps establish a practice ensuring sustained flow of information from one side and crucial guidance, facilitation and hand-holding from the others. For this, systematic monitoring and inventory of springs at micro level is needed which gives: locations and current status (healthy, missing after drying, dried), discharge, and water quality throughout the year.

Offer technical support for capacity building

Municipalities in dire need of technical support for developing and executing spring revival underlines for mainstreaming advanced scientific technologies into practice. This involves human resources, equipment, costing templates, training manuals with expertise and experience at the local level. Manuals like Recharge Ponds Handbook for water sanitation and hygiene (WASH) Program[5] and guide to reviving springs developed by ICIMOD[13] are essential for providing technical guideline. These manuals also provide the knowledge of geology and importance of recharge ponds and helps in planning, construction, and management at local governments in order to develop and construct structure like dug out ponds, with focus on recharging groundwater aquifer in water scarce areas, and to help stakeholders in understanding concepts to manage depleting water sources in the mountains, mid hills and Terai regions in the context of climate change.[8] As the technical guides like the Handbook have not captured the new federal structure as well as springshed management approach adequately, updating of these technical resources is essential.

Adopt springshed approach

The most interventions are currently based on watershed or surface intervention approach and overlook hydrogeology; institutions of governance are in need to look at springs as a common "resource" and not "source" with emphasis on participatory and decentralized approach and build on the heritage of springs which were governed by collective action; and the National Water and other policies with inadequate

or no stress on springshed management. Therefore, springshed management should be considered in the national and sub-national water and land management related policies/frameworks along with adequate financial as well as institutional priority.

Mainstreamize policy

Given the steady decline of spring sources across the Himalayas, no action or business-as-usual approach cannot be the option. This may worsen the situation of springsheds to the no return point with the construction of roads and unmonitored withdrawal of groundwater and may have accelerated maladaptation to the climate change. Synchronized interventions in the forms of spring conservation policy priority, leadership and demonstration of good practices at national, provincial, municipal and community levels are imperative for reversing the trend towards sustainable springshed management which well-defines institutional mandates, accountability and provision of financial resources. Mainstreaming of spring conservation policy at every tier of public and community institution guided by the principle of nature-based solutions will help achieve triple benefits of climate adaptations, SDG targets and disaster risk reductions.

Develop eco-friendly infrastructure

The studies indicate that most of the spring depletion or drying up were caused by the anthropogenic activities not by the natural causes like earthquake, flood and landslide. Local governments should, therefore, consider the fact seriously and come up with measures to reduce the haphazard activities through tools like eco-friendly infrastructure development guidelines.

Mobilize community participation

Rejuvenated spring and its use: Patale Dhara of Bajhapokhari, Namobudha, Kavre

Community-led spring revival initiatives are imperative as they are the immediate losers and winners of spring sources. The engagement process should be based on the principles of gender equity and social inclusion.

Women and marginalized communities must be actively involved in the springshed management, organizational structures and decision-making process. Groups in forest conservation through community forest program introduced and enforced through legal and policy framework is an appropriate example of Nepal where local users have excelled in preventing imminent disasters. Local water users can lead the initiative if they are convinced to partner with local governments and an enabling environment is created.

Ensure funding sources and convergence

Springshed management department or programme should be established at municipality level with allocation of funds for spring revival activities. Equally important is the convergence with existing departments/programs at local and provincial levels such as soil conservation and watershed management, forest, drinking water and sanitation and agriculture to leverage fund for springshed management. Contributions should be raised from communities or spring water users in repair and maintenance of implemented recharge measures and conservation of recharge zone. Economic model should be explored to create a win-win situation among upstream communities of recharge zone identified and downstream spring users community. Upstream should be supported through incentives or PES mechanisms.

Conclusion

Rethinking of water source protection through springshed management at the center of policy priority is imperative to respond to the growing water crisis in the Himalayas in general and hilly settlements in particular. Therefore, there is a need of mainstreaming policies for moving beyond the spring protection scale to spring conservation and springshed management scale. Opportunities lie on offering technical knowledge and innovations to the and communities and pave the way for institutionalizing climate and gender responsive models. Thus, a mosaic set of policies and practices that put the sustainability of the Himalayan spring sources at the center of planning could be a game changer in the future.

References

1 CBS, 2017. National Climate Change Impact Survey 2016. A Statistical Report. Central Bureau of Statistics, Kathmandu, Nepal

2 Chinnasamy, P., & Prathapar, S. A. (2016). *Methods to investigate the hydrology of the Himalayan springs: a review* (Vol. 169): International Water Management Institute (IWMI).

3 Dahal, N., Shrestha, U.B., Tuitui, A., Ojha, H.R. (2019). Temporal changes in precipitation and temperature and their implications on the streamflow of Rosi River, Central Nepal. *Climate* 2019, *7*(1), 3; https://doi.org/10.3390/cli7010003

4 Dhakal, M., Bhattarai, C., Thapa, B., Tiwari, S. (2020, December 10). Drying Springs: A Threat to Human Survival. Spotlight Nepal. Retrieved from https://www.spotlightnepal.com/2020/12/10/drying-springs-threat-human-survival/

5 GoN, (2013). *Recharge Ponds Handbook for WASH Programme*. Department of Local Infrastructure Development and Agricultural Roads (DoLIDAR), 2013. Ministry of Federal Affairs and Local Development, Government of Nepal, Kathmandu.

6 Gurung, A., Adhikari, S., Chauhan, R., Thakuri, S., Nakarmi, S., Ghale, S. & Rijal, D. (2019). Water crises in a water-rich country: case studies from rural watersheds of Nepal's mid-hills. *Water Policy, 21*(4), 826-847.

7 Mahamuni, K., & Kulkarni, H. (2012). Groundwater resources and spring hydrogeology in South Sikkim, with special reference to climate change. *Climate change in Sikkim-Patterns, impacts and initiatives*, 261-274.

8 Molden, D. (2020). Scarcity of water or scarcity of management? International Journal of Water Resources Development, 36(2-3), 258-268.

9 NITI Aayog. (2018). Report of the NITI Aayog *Working Group I: Inventory and Revival of Springs in the Himalayas for Water Security*. New Delhi: NITI Aayog, Government of India.

10 NWCF & ICIMOD (2020). *Preliminary research findings of national survey springs 2020.* Mainstreaming Spring Revival in HKH region: Policy Dialogue, Kathmandu. Paper presented at the Pani Satsang organized in Kathmandu by Nepal Water Conservation Foundation in partnership with ICIMOD. https://www.youtube.com/watch?v=Ncty805bF7s.

11 Poudel, D. D., & Duex, T. W. (2017). Vanishing springs in nepalese mountains: Assessment of water sources, farmers' perceptions, and climate change adaptation. *Mountain Research and Development, 37*(1), 35-46.

12 Sharma, B., Nepal, S., Gyawali, D., Pokharel, G.S., Wahid, S., Mukherji, S., Acharya, S. & Shrestha, A.B. (2016). *Springs, storage towers, and water conservation in the mid hills of Nepal.* ICIMOD Working Paper 2016/3. Kathmandu, International Centre for Integrated Mountain Development.

13 Shrestha, R. B., Desai, J., Mukherji, A., Dhakal, M., Kulkarni, H., Mahamuni, K., Bajracharya, S. (2018). *Protocol for reviving springs in the Hindu Kush Himalayas: A practitioner's manual*: International Centre for Integrated Mountain Development (ICIMOD).

14 Shrestha, S., Chapagain, P. S., Ghimire, M. (2019). Gender Perspective on Water Use and Management in the Context of Climate Change: A Case Study of Melamchi Watershed Area, Nepal. *SAGE journals*, 1-9.

15 Thapa, B., Pant R.R., Thakuri S., & Pond G. (2020*a*). Assessment of spring water quality in Jhimruk River Watershed, Lesser Himalaya, Nepal. *Environmental Earth Sciences,* 79:504, 1-14

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Authors

Dr. Ngamindra Dahal : Water, Climate & Disaster Risk Management Expert, Nepal Water Conservation Foundation

Dr. Chiranjibi Bhattarai : Law, Policy and Governance Expert, Nepal Water Conservation Foundation

Ms. Bhumika Thapa : Researcher, Nepal Water Conservation Foundation

Ms. Sushma Tiwari : Researcher, Nepal Water Conservation Foundation

Ms. Kanchan Shrestha : Program Coordinator (former), Koshi Basin Inititative, ICIMOD

Dr. Nand Kishor Agrawal : Programme Coordinator, Resilient Mountain Solutions Initiative, ICIMOD

Dr. Sanjeev Bhuchar : Senior Watershed Management Specialist, ICIMOD

Dr. Arun Bhakta Shrestha : Regional Progamme Manager, River Basins & Cryosphere, ICIMOD

Mr. Madhav Dhakal : Hydrological Analyst, ICIMOD

ICIMOD

अन्तर्राष्ट्रिय एकीकृत पर्वतीय विकास केन्द्र

International Center for Integrated Mountain Development

Khumaltar, Lalitpur Kathmandu, Nepal

Tel: (977) 1-527-5222, 5275223, Web : www.icimod.org

नेपाल पानी सदुपयोग फाउन्डेशन

NEPAL WATER CONSERVATION FOUNDATION (NWCF)

Chundevi, Maharajgunj, Kathmandu, Nepal

Tel : 977-1-4720667, 4720744, Website : www.nwcf.org.np