Policy Brief

March 2019

Towards Local Water Security

A Practical and Institutional Response to Revitalize Drying Springs in the Himalaya

Kamal Devkota, Roshan M. Bajracharya, KaustuvR. Neupane, Suchita Shrestha, Ngamindra Dahal and Chandra L. Pandey

Introduction

Water supply in hill towns of the Himalaya depends upon the natural springs, streams fed by seasonal rainfall and snowfall. The water sources collectively referred to as Critical Urban Water Zones (CUWZ) that supply essential water to these towns are under threat as rainfall patterns become erratic and unpredictable, and human activities are affecting their integrity. Due to the impacts of climate change on precipitation patterns, such as, rise in rainfall intensity, reduction in its temporal distribution, and a marked decline in winter rain, coupled with other anthropogenic causes, the problem of dying springs is being increasingly felt across this region. For instance, about one third of natural springs in upper Koshi catchment have dried out during the last 30 years. This has created scarcity of water for drinking, sanitation, as well as, crop production, and this situation often become worst during the dry season. This trend revealed that the Himalayan region is facing water insecurity which is likely to intensify in the future. However, communities and water management authorities are slow to develop adaptation strategies. Therefore, the situation demands either revitalization of existing drying springs or finding alternative sources of water whose feasibility is limited.

This policy brief highlights the practical and institutional approaches that were applied while reviving the drying springs in Dhulikhel of Kavre district in Nepal. Remarkable insights have been collected while intervening for the revitalization of drying springs in collaboration with the local government and community based water users committee. The experiences revealed that collective efforts of responsible authorities, communities and the results of action research can have a crucial role to play in evidence-based planning and implementation at the local level to generate impact both in practice and institutional aspects. Also the practices of retaining rainwater in small ponds and trenches allowing infiltration into the ground will ultimately contribute to revitalize the drying springs down-slope of the ponds.

KEY MESSAGES

- Local springs and streams have traditionally been the main source of water for the communities in many mid hill towns of Nepal, but there is no adequate attention to conserve and sustain those sources by the users and authorities.
- Haphazard construction of rural roads and trails, ignorance of traditional ponds, and destruction of indigenous water conservation and management practices are threatening these local water sources.
- Rehabilitation of existing ponds and construction of new recharge ponds along with contour trenches on hill slopes can contribute to revitalize the drying springs.
- Communities whose livelihoods are directly linked with the springs are the key actors who can play a pivotal role in conserving local water sources.
- The synergy among local governments, communities and experts can create impact from evidence to local policy and practices.

Methods

This policy brief is based on three years of research and engagement with the local government, community organizations and limited private sector organizations in Dhulikhel Municipality of Nepal. The information and data were gathered from field survey, individual interaction, water forum,[1] meeting with local government, water user committees and private sector organizations. We conducted 210 HH surveys, more than 20 individual interviews, five water forums, and series of formal and informal meeting individually and collectively with local government, water user committees and private sector organizations specifically the hotel and party palace owners who use more water than the general public. As a part of participatory action research, we piloted some action interventions and carefully documented them. We constructed a series of recharge ponds and contour trenches (Figure 3) following the guideline by Department of Local Infrastructure, identified springs sources around and below the ponds and regularly measured them (Figure 4) so as to test the correlation between recharge ponds and springs. Following sections of this brief explain how the idea of recharge pond emerged, how it came into operation and what are the lessons and key policy messages from the piloting activities.

Recharge ponds to revitalize springs

Our initial activity under the research started with the city scale inception workshop where more than 35 people representing government, community and private sector organizations actively

[1] Water forum (Pani Chautari) is an informal platform where stakeholders come together and discuss on water related problems and explore solutions, it is a unique practice of engaging with research users at local level so as to create impact from the ongoing research.

engaged to identify the water management issues in the city. Participants highlighted that in the past, the indigenous practices of constructing ponds for various purposes within and near by the settlements, were common. They were built for religious, sanitary, irrigation or other livelihood activities. Those ponds used to contribute to recharge the ground water, particularly the local aquifers, which ultimately used to contribute to sustain the local springs. Such indigenous traditional ponds and series of contour trenches have numerous benefits.

However, over time, many of these traditional ponds have dried out or been abandoned due to natural and human induced activities like encroachment, haphazard construction of roads, and other infrastructures. Along with this, local springs and small streams have gradually dried or diminished. They have identified drying sources of water as one of the key issues that needed to be resolved soon.

The conservation of water sources and revitalizing springs were the solutions they proposed in the workshop. The idea of water recharge ponds to revitalize local springs was initiated from Dhulikhel Water Forum II held on Feb 2017. Participants in that forum raised concerns about the need to increase water yields in the drying springs of the community. Some of the participants suggested the possibility of recharge ponds.

We explored the possible ways through review and consultations with water managers and users. Our review revealed that the recharge ponds have the following benefits:

- Contour trenches trap downward flowing water and sediment on sloping lands.
- A series of recharge ponds connected by a network of contour trenches recharge the surrounding ground which in turn improves soil moisture.
- They improve and mitigate against drought and ultimately increase the volume of water in springs.
- In the long-run, they can contribute to recharging shallow wells, boreholes and springs, and reduce salinity in groundwater within the Critical Urban Water Zones (CUWZ).

In the particular case of Dhulikhel, the following points provided the rationale to promote recharge ponds as one of the key measures to increase water yields in the local springs.

- The idea of recharge ponds initially emerged from the stakeholders (water managers and users) themselves.
- Our brief review of literature and consultation with local water managers and experts suggested that recharge ponds are viable and one of the best practices that contribute to enhancing water volume of drying springs and streams.
- A report on an assessment of ground water potentials in Dhulikhel recommended water recharge ponds while installing the deep boring to extract ground water.
- A collective field study by researchers and local water users and managers to a neighboring village revealed that a similar practice successfully revitalized the local springs.
- A rapid analytical study by geo – hydrologist in the proposed location (Thuloban Community Forest) in Dhulikhel also recommended appropriate types of recharge ponds.

We followed a participatory and collaborative approach among the concerned stakeholders specifically the local government (Dhulikhel municipality), community organizations (Dhulikhel Drinking Water and Sanitation Users Committee DDWSUC), forest and soil conservation offices in the district while conducting study and piloting the actions. The willingness of local government and community organization to financially contribute to construct the recharge ponds made it more feasible. Finally, we opted to pilot recharge ponds connected by contour trenches across sloping land that were expected to contribute to increasing water yield in the springs.

Strategies adopted in construction of the recharge pond network

Once the construction of recharge ponds connected by a network of contour trenches to revitalize the springs was decided, we adopted multiple strategies to construct these ponds. A combination of technical and local expertise was used on establishing the forest - water relationship by blending ideas of both biophysical and social aspects. We also considered the threat of disaster (e.g. landslide) and ecosystem damage while identifying the location for recharge ponds. Through a rapid, but analytically focused, field study along with local experts and geo-hydrologist, we selected drying springs and appropriate locations for the construction of recharge ponds. We also identified several springs that are expected to be revived by the ponds by preparing a micro catchment map to check the drainage flow of rain water.

Figure 1: Map of micro catchment and recharge ponds located in Thuloban, Dhulikhel

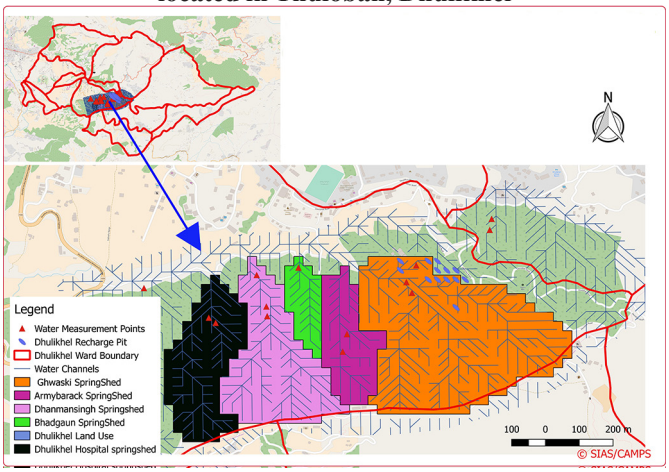
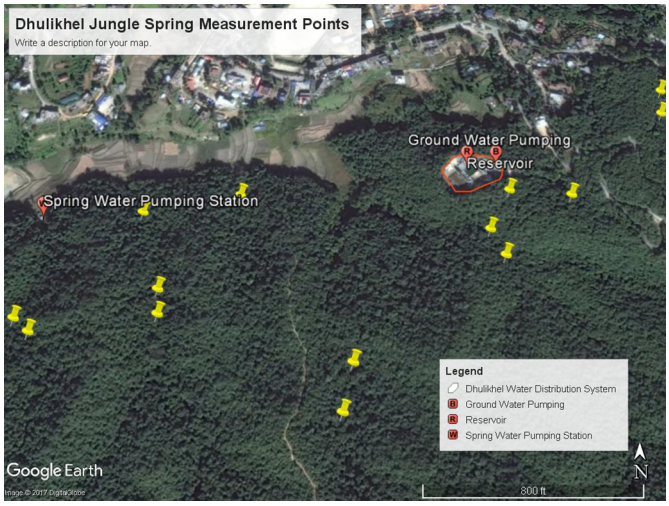


Figure 2: Locations of spring monitoring points in Thuloban, Dhulikhel



Financially, the research project allocated a seed fund as part of piloting the action and consultation with the stakeholders. We had rigorous discussion with institutions and stakeholders for their contributions while constructing the recharge ponds. While municipality agreed to allocate part of budget DDWSUC made technical and in-kind contributions to construct the recharge ponds. We followed the government's guideline prepared by Department of Local Infrastructure Development and Roads (DOLIDAR) while constructing recharge ponds. Initially, there were 24 recharge ponds constructed in the stage I and 40 more were constructed in stage II with the funds allocated by the municipality.

Figure 3: Different types of recharge ponds constructed in Thuloban, Dhulikhel

Three types of recharge ponds, namely, excavated ponds, embankment ponds and contour trenches were built based on the geographical location. In terms of size, the ponds ranged from 3.45 m^3 to 35.69 m^3. On average it costs approximately Nepalese rupees 8500 to construct a pond of 7 cubic meter including materials like stone, gabion wire and labor cost.

Table 1. Volume of recharge ponds excavated in stage I.

SN	Recharge Pond (RP)	Vol (m^3)	SN	Recharge Pond (RP)	Vol (m^3)
1.	RP 1	7.06	14.	RP 13	9.06
2.	RP 2	17.99	15.	RP 14	16.14
3.	RP 3	10.52	16.	RP 15	7.43
4.	RP 4	6.05	17.	RP 16	5.10
5.	RP 5	6.42	18.	RP 17	5.55
6.	RP 6 A	3.45	19.	RP 18	6.63
7.	RP 6 B	8.92	20.	RP 19	34.69
8.	RP 7	7.36	21.	RP 20	7.17
9.	RP 8	3.44	22.	RP 21	4.42
10.	RP 9	7.08	23.	RP 22	24.78
11.	RP 10	15.65	24.	RP 23	5.52
12.	RP 11	13.08	25.	RP 24	10.70
13.	RP 12	14.87		Total	259.07

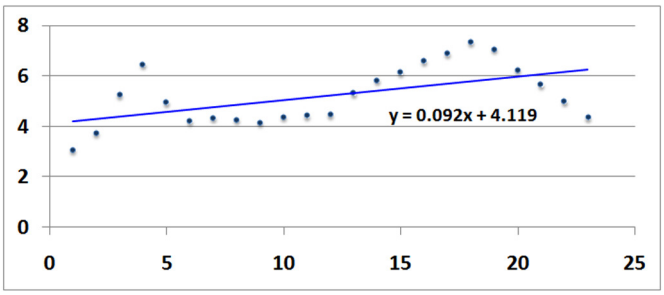
We also identified 10 springs below the recharge pond construction area that were expected to revitalize and continuously monitored their discharge using a simple bucket method.

Results

Steady increase in water discharge volume from 10 local springs

Bi-weekly monitoring of ten local springs and streams in the vicinity of the recharge pond network from May 2017 through January 2019 indicated a general gradual increase in the average total flow volume from these water sources. Although there is a seasonal fluctuation in the average flow, the overall trend is of gradual increase over the monitoring period as shown in Figure 4. While it may not be possible to attribute the increased flow volume entirely to the recharge pond-contour trench network, it is likely that some contribution to the spring and stream flow was due to the piloting activity.

Figure 4: Trend of water discharge in the springs



Adoption of a new policy of promoting local recharge ponds by the Municipality

With the initial result from these recharge ponds, Dhulikhel municipality has now appreciated this idea and started promoting recharge ponds to enhance the discharge of water

in the springs in other locations as well. The up-scaling of recharge ponds to different wards of the municipality has been started. In the municipal policy and programs of the fiscal year 2074/75, the municipality has sufficiently recognized the benefits of recharge pond. Specifically, it has adopted the policy of revitalizing existing and building new ponds in each wards considering climate change impact on ground water and small springs to conserve existing ponds, wells, and taps. The municipality is now planning to adopt a public private partnership approach to promote recharge ponds integrating tourism and other livelihood activities. Its ultimate target is to assure access to safe drinking water to all the residents of the municipality. It has allocated Nepalese rupees 1.75 million for wells, ponds and tap conservation during the fiscal year 2074/75.

Conclusion and policy recommendation

There used to be several traditional ponds possibly built to catch rainwater and used for domestic, agricultural or livestock-rearing purposes in the past. Along with land use change over time such ponds have been ignored and converted into built up areas like roads, play grounds and public buildings. With the loss of traditional ponds, small springs below them have been gradually drying. Our insights from the recharge ponds piloting work to date revealed that, revitalizing the drying springs is not only a biophysical or technical process but can also be an institutional response by the local authorities and communities.

Recharge ponds are one of the simplest and low cost alternatives to revitalize the drying springs in the mid hill region like Dhulikhel. A network of contour trenches connected with a series of small ponds constructed across the slopes of hills has been shown to be effective in increasing water recharge while also trapping downward moving sediment and preventing soil erosion. Local governments need to prioritize building new or reviving old recharge ponds during their annual planning and allocating budget for sustainable water management. This can be done in collaboration with local communities who are the primary users of springs. However, further methodologically sound research may need to establish linkages among hydrology, recharge ponds and spring water flow under the ground.

References

Chapagain, P.S., Ghimire, M.L. and Shrestha, S., 2016. Situation of springs, groundwater spring potentiality and gender roles in water management: a study of melamchi area, sindhupalchok, Nepal. *Research briefs*, National Academy of Science and Technology.

GoN, 2013. Recharge Ponds Handbook For WASH Programme, DOLIDAR.

Joshi, B. and Tiwari, P.C., 2014. Land-use changes and their impact on water resources in Himalaya. In Environmental Deterioration and Human Health (pp. 389-399). Springer, Dordrecht.

lCIMOD, 2015. Reviving the Drying Springs: Reinforcing Social Development and Economic Growth in the Midhills of Nepal (Issue Brief), ICIMOD, Kathmandu.

Merz, J., Nakarmi, G., and Weingartner, R., 2003. Potential Solutions to Water Scarcity in the Rural Watersheds of Nepal's Middle Mountains. *Mountain Research and Development* 23(1), pp. 14-18.

Tambe, S., Kharel, G., Arrawatia, M.L., Kulkarni, H., Mahamuni, K. and Ganeriwala, A.K., 2012. Reviving dying springs: climate change adaptation experiments from the Sikkim Himalaya. *Mountain Research and Development*, 32(1), pp.62-72.

Acknowledgements

Southasia Institute of Advanced Studies gratefully acknowledges the support of International Development Research Centre (IDRC) through the Climate Adaptive Water Management Plans for Cities in South Asia (CAMPS) project for enabling this pilot action research. We also extend our gratitude to the local authorities in Dhulikhel (Municipality, Dhulikhel Drinking Water and Sanitation Users Committee, District Forest Office, District Soil Conservation Office, Gaukhureshwor Community Forest Users Committee, and all water stakeholders) for their valuable inputs and cooperation.

Published by

Southasia Institute of Advanced Studies (SIAS)
PO Box 23499, NK Singh Marg –306
Min Bhawan, Kathmandu
Phone: +977-1-4469801

Supported by

International Development Research Centre
Centre de recherches pour le développement international

International Development Research Centre (IDRC)
PO Box 8500 Ottawa, Ontario
Canada K1G 3H9
Phone: +1- 613-236-6163

For more information, please contact:
Kamal Devkota (kamal@sias-southasia.org)
Roshan Man Bajracharya (roshan@sias-southasia.org)