REVIVING DRYING WATER SOURCES THROUGH AQUIFER-CENTRIC APPROACHES BASED ON THE GEOLITHOLOGICAL AND GEOHYDROLOGICAL STUDIES IN THE EASTERN HIMALAYA

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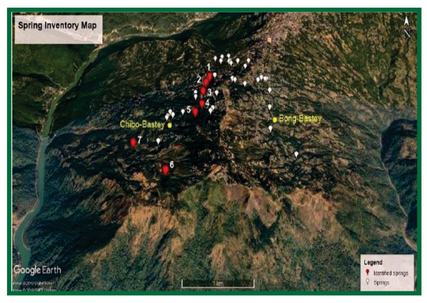
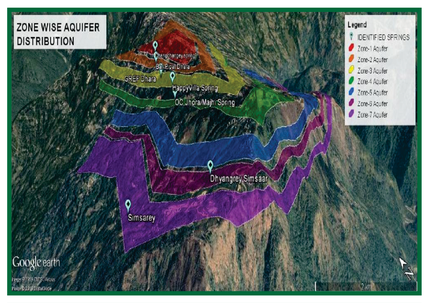
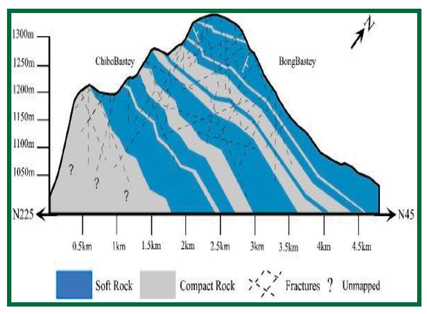
Introduction

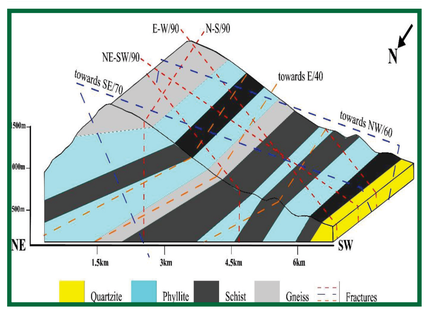
Springs are the most important source of water for millions of people in the Himalayas. Both rural and urban communities depend on springs for meeting their drinking, domestic, and agroforestry water needs. There is now increasing evidence of springs drying up or their discharge reducing, as a result of which communities and their agroforestry are facing water stress. The exact extent of this problem is not well known given that there is dearth of scientific studies on linkages between rainfall.

Given the widespread evidence that springs are drying up in many parts of Hindu Kush Himalaya, several institution and their partners have been undertaking training, capacity building on hydrogeology and piloting springshed research to build socio-ecological resilience in Bhutan, India, Nepal and Pakistan.

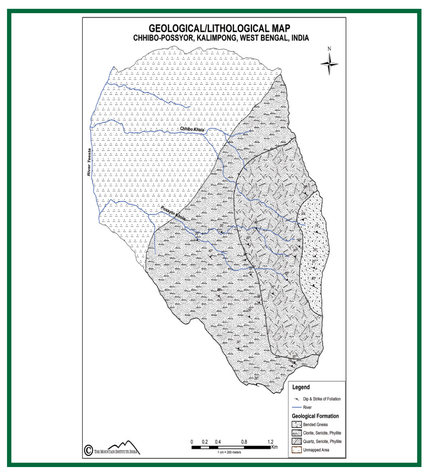


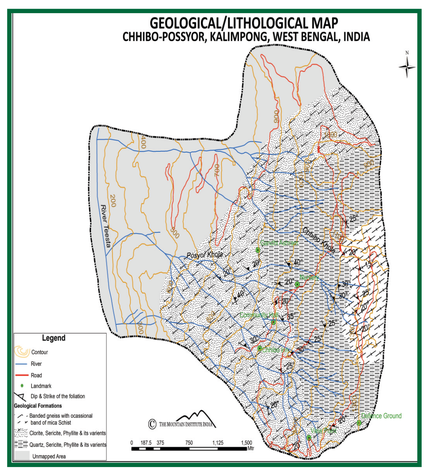


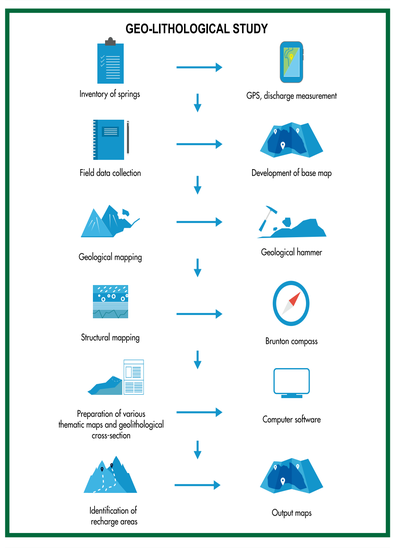


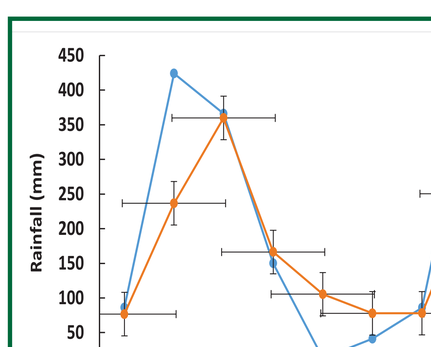


Geological conceptual layout of Kalimpong and Pendem region showing spatial orientation of litho-units and dominant fracture sets

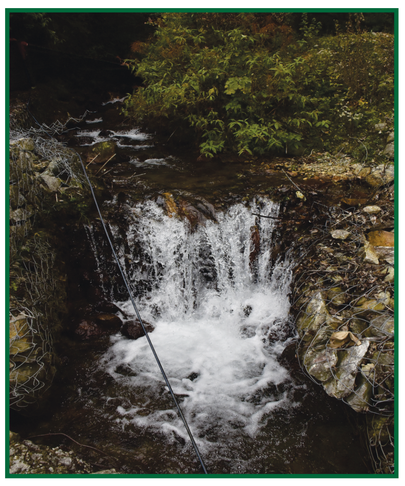


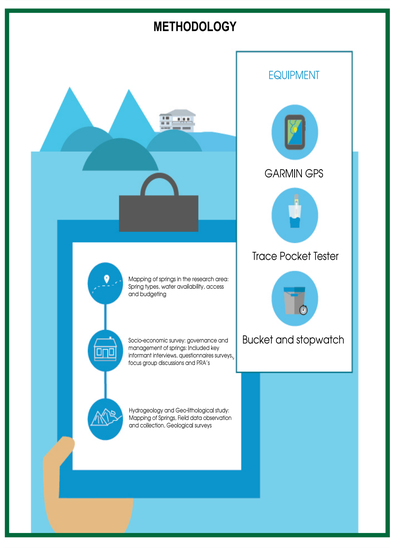






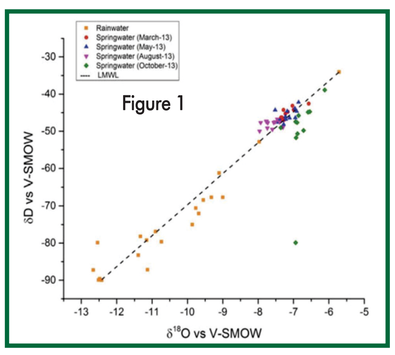
Mountain aquifers are connected by fractures, having multiple recharge and discharge points along the elevation gradient. These rain-fed aquifers are sensitive to rainfall patterns as they do not have the capacity for multi-year storage. Landscape-level recharge projects on hilltop forests benefitted springs higher and prolonged discharge even during dry seasons, and an intensive socio-economic assessment further reinforced the theory of connected aquifers. Scaling up spring revival, by graduating from 'spring-centric' to 'aquifer-centric' approaches has been initiated.

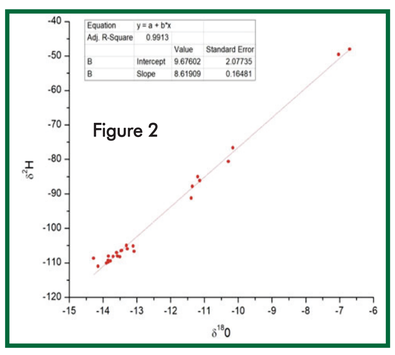




Results of the study and interventions

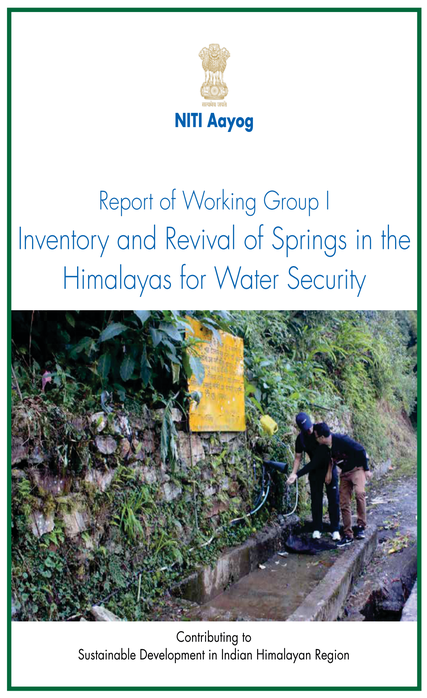
Springs are the main source of water for millions of people in the mid hills and mountains of the Hindu Kush Himalayas (HKH). Both rural and urban communities depend on springs for meeting their drinking, domestic and agricultural water needs. There is increasing evidence that springs are drying up or their discharge is reducing all throughout the HKH and as a result communities are facing unprecedented water stress. The exact extent of this problem is not well known given that there is dearth of scientific studies on linkages between rainfall, infiltration and hydrogeology (groundwater).





The clustering of isotopes values of spring water sample of 13 springs across the elevation gradient of 700-1600 m in 5 villages indicated that the aquifer is common for all springs with mixing of water taking place from various recharge elevations (Figure 1).

The clustering of isotope values of spring water sample for the spatial distribution of spring (spring density 2.5 spring/sq. km) indicated that the aquifer for all springs is recharged by precipitation with mixing of water taking place from various recharge elevations (Figure 2).



Conclusion

This initiative has provided a number of learning experiences that can be learned and replicated in the other parts of the mountain areas of the world where the springs are drying.

Demystifying the science of hydrogeology and providing intervention methods to revive these springs have been highlighted for stakeholders such as administrators, policy makers, practitioners and community members.