

## SPRINGSHED MANAGEMENT IN INDIAN HIMALAYAN REGION: A STUDY ON SPRING IN UTTARAKHAND HIMALAYAS

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### ABSTRACT

Springs are an indispensable source of freshwater for mountain communities in the Indian Himalayan Region (IHR). Owing to the synergistic impact of anthropogenic and climatic factors, numerous perennial springs and streams in the region, are either becoming ephemeral or drying out, thus impacting the local people. Water scarcity, poverty, and limited scope of alternate livelihoods further reduce the communities' resilience. Our focus is to assess the potential of reviving drying springs with the help of hydro-geological studies in water-scarce villages.

### 1. INTRODUCTION

The source of every major river in the country is symbolically represented by a system of springs that is often religiously revered. Springs are natural point sources of groundwater discharge. Although springs emerge onto the surface and may be treated as surface water after they discharge, they are part of a sub-surface system of aquifers that follows hydrogeological principles. Springs have been a vital source of groundwater in all the mountainous regions across the world. Millions of springs form the life-line for people in the Himalayan and sub-Himalayan regions, the Eastern and Western Ghats as well as in the smaller mountain ranges across the country. An increased demand in these regions has accompanied a decline in spring discharges, due to various factors, one of which is the change and variability in climate. A 'springshed' approach includes a combination of landscape, watershed and aquifer as units of springwater management and holds the potential to focus on groundwater management for the mountain regions that form such an integral component of India's diverse landscape.

### 2. LITERATURE REVIEW

In the article '**Achieving water security in rural Indian Himalayas: A participatory account of challenges and potential solutions**' (2019) Arun Kansal and Sudeshna Maya Sen explains that water security is multi dimensional and requires integrating multiple viewpoints for holistic mountain development. Springs are primary sources of water for mountain communities. Access to water is influenced by contextual, local and often manufactured drivers that need to be assessed. Social-cultural landscape plays an important role for achieving water security in the Himalayas.

In the article '**Application of high-frequency spring discharge data: A case study of Mathamali spring rejuvenation in the Garhwal Himalaya**' (2020) Kumar, V. & Paramanik, S. explains that water scarcity is becoming the biggest threat to the global population due to unpredictable rainfall, glaciers melt, and other anthropogenic activities. Their study focuses on the analysis of monitored high-frequency continuous spring discharge and rainfall data in the contact and fracture type Mathamali spring located in the Garhwal Himalaya. Discharge from the spring and its storage behavior has been studied by analyzing recession components and flow duration curves. Analyzed discharge data revealed that the spring can generate maximum volume during monsoon as compared to winter due to aquifer properties and tendencies to store and transmit water.

In the article '**Reviving Dying Springs: Climate Change Adaptation Experiments From the Sikkim Himalaya**' (2012) Sandeep Tambe, Ghanashyam Kharel, M.L. Arrawatia, Himanshu Kulkarni, Kaustubh Mahamuni and Anil K. Ganeriwala brings major focus on increasing instances of springs drying up or becoming seasonal. This has been attributed to growing impacts of population increase, erosion of the top soils, erratic rainfall patterns, deforestation, forest fires, and development activities (road building, building construction, etc) adversely impacting the spring catchments. Consequently, a limited amount of rainwater infiltrates to recharge the groundwater, thereby creating a hydrological imbalance.

In the article '**Environmental Crisis in the Eastern Himalayan Landscapes in India**' (2019) Sayan Bhattacharya explains the Eastern Himalayas in India demonstrate vast ecological diversity in its varied range of flora and fauna. The local communities also form an integral part of the ecological landscape, deriving various services from the forest and mountain ecosystems. Recently, however, due to severe anthropogenic pressure and unplanned developmental activities, the Eastern Himalayans have displayed signs of rapid habitat destruction.

In the article ‘Spring protection and management :Some case Histories from across India’s Mountainous Regions’ Jared Buono, Sunesh Sharma, Bhupal Bisht, Sivakumar Adiraju, Lam Shabong, Amrtha Kasturirangan brings the major focus on the combined efforts of NGOs, the state governments and communities to protect springsheds wherein studies of hydrogeological set up in identifying, protecting and augmenting groundwater recharge which may be proves as a better approach in the management of springs.

### 3. RESEARCH QUESTION

1. What is the role of government for the protection of springs in the Himalayan region?
2. What is the approach of local community people for the springshed management?
3. What are the different methods for the better management of the springs?

#### Objectives of the study

- To provide a better understanding of basic characteristics of springs.
- To prepare water balance for sample villages.
- To assess the impact of changing behaviour of precipitation on the springs.
- To understand impact on people due to drying up of springs based on perception analysis.

### 4. METHODOLOGY

In methodology we have used both the qualitative and quantitative methodology.

#### Data Collection

Both primary and secondary data will be collected for this study.

**Primary Data:** Primary data refers to the data collected by the researcher directly through the field. In my research also, primary data will be collected with the detailed questionnaire, observation method & survey method. Bimonthly discharge will be monitored for the springs by visiting villages and with the help of local people.

For the fulfilment of comprehensive mapping of springs I will use GPS device for locating the accurate location of the spring in the study area. To understand the basic characteristics of the spring we will need to identify the type of spring, amount of discharge, the nearby vegetation, type of slope near the spring.

**Secondary Data:** Secondary Data refers to the data collected by someone else not the user. Secondary Data for the study will be collected by official govt. website and some other authentic sources like IMD i.e. India Meteorological Department, Census, Government books and reports.

My research will consist of six chapters. In the first chapter ‘INTRODUCTION’ I will discuss the origin of springs and the importance of springs majorly for the local people. In the second chapter ‘COMPREHENSIVE MAPPING AND BASIC CHARACTERISTICS OF THE SPRINGS’ I will bring the major focus on the major factors affecting the characteristic of the springs, the geological impact on the springs. In the third chapter ‘IMPACT OF PRECIPITATION OF THE SPRINGS’ and for this I will analyse the changing behaviour of precipitation on the springs and also the factors affecting the precipitation. In the fourth chapter ‘Water balance’ i will discuss about the objective of the water balance and how to calculate the water balance. In the fifth chapter ‘IMPACT OF DRYING SPRING ON THE LOCAL PEOPLE’ I will analyse the socioeconomic dimension of the local people and what are their views about the drying springs. Last will be the conclusion chapter which will summarize the whole research briefly.

### 5. CONCLUSION

The main objective of the study is to assess the impact of changing behaviour pattern of the spring in the sample villages. Springs will be geotagged and the discharge data will be also gather bimonthly in the pre and post monsoon season period. And for that hydrograph will be prepared for analyzing the balance between the demand and supply of dharas in villages.

As the spring is the major source of water for Indian Himalayan region it becomes a major issue in relation with its vulnerability rate. Local people face the problem of scarcity and especially women are in the centre of the problem as they have to do all the household work and then fetch water in the season of low water supply. And all these problems have arise mainly due to anthropogenic activities which includes public construction, local road development and poor water conservation.

My research will contribute in the welfare of the people facing the problem of water scarcity and other water related problems.

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