SPRINGSHED DEVELOPMENT
A HYDRO-GEOLOGICAL APPROACH

IBDLP
MEGHALAYA

सत्यमेव जयते

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Context

Water is the primary life-giving resource. Its availability is an essential component in socio-economic development and poverty reduction. Though the Himalayan range is a source of countless perennial rivers, paradoxically the mountain people depend largely on spring water for their sustenance. The mountain springs, are the natural discharges of groundwater from various aquifers, in most cases unconfined.

Mountain springs emanating naturally from unconfined aquifers are the primary source of water for a large number of rural households in the State of Meghalaya. The rural landscape of the State of Meghalaya are often dotted by a network of micro-springs occurring largely in farmers' fields and community land and are generally community-owned and community managed. Meghalaya is known to have over 60,000 perennial springs that had for generations provided drinking water to nearly all the 6,800 villages and feed several rivers in the Brahmaputra and Barak basins. Over 5,000 villages are known to be heavily dependent on spring-shed for their household use and irrigation.

This makes spring-shed development an extremely important concern in the context of Meghalaya.

Challenge

- The many springs in Meghalaya indicate increasing instances of perennial 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. Over the years, communities living near springs have witness the degradation which often results in decrease water discharge or contamination due to algae growth. In some instances there is a decrease in biological diversity that may stem from degraded water quality. A sample survey of 714 springs (MINR, 2015) has revealed that over 54% of the springs have either dried or water discharge from them has significantly reduced (<50%). Impaired springs have caused widespread water stress in the rural landscape, adversely affecting agriculture, livestock and other allied livelihood activities of the people and causing hardship and drudgery.

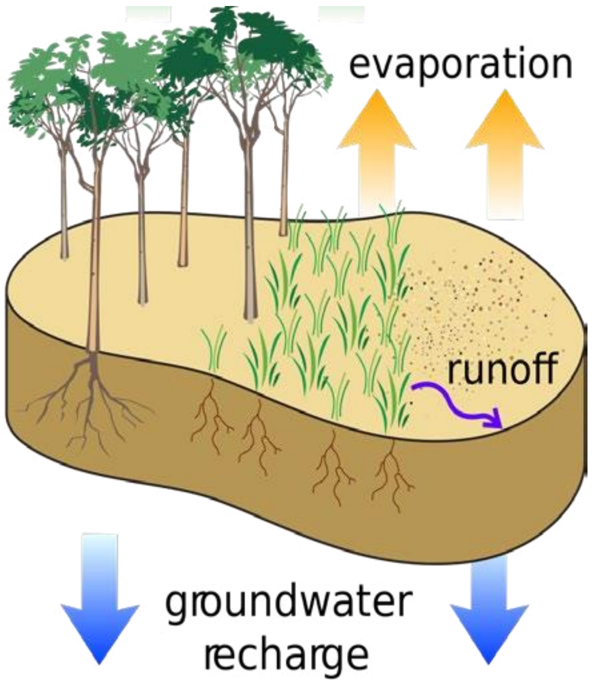
- The problem of dying springs is being increasingly felt across the State. While catchment degradation has been identified as the main cause for the drying up of the springs in the last century, climate change is now emerging as the new threat in the 21st century. Drying up of mountain springs adversely impacts rural water security, and women have to reduce domestic use of water and travel longer distances to fetch water. Drying of springs also impacts the ability of communities to diversify their livelihoods options. Seasonal vegetables, animal husbandry and other livelihood options which have huge potential to uplift the economy of the rural community has been affected immensely.

- There is an urgent need to create a mass awareness on the importance of springs and to build capacities across various levels to protect and develop spring-sheds across the State.

SPRINGSHED DEVELOPMENT: The Approach and Process

The springshed development approach further refines the spring sanctuary approach in using the underlying geology to identify the recharge area (known as the spring-shed), which often does not follow catchment or administrative boundaries. It involves mapping of the hydrogeological layout of the spring along with the conceptual model of the spring recharge area and aquifer. This spring-shed is then developed by artificial rainwater harvesting works to reduce the surface runoff and increase infiltration, thereby resulting in improved recharging of the spring aquifer.

Reduced sponge action of the land owing to the changing climate and geological and anthropogenic reasons have reduced the recharge of rainwater into the ground. As 85% of rainwater runs off the surface down the mountains, not much is left to recharge the springs in some of the watersheds.

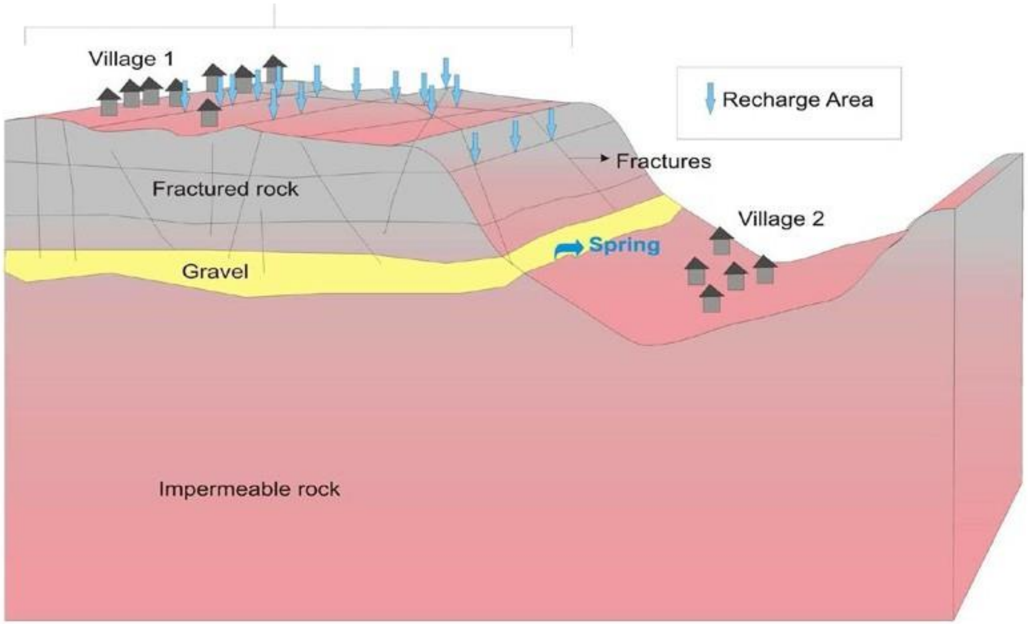


Steps to Recharging

1. secondary data collection and interpretation
2. hydrogeological mapping of the springshed
3. Classification and conceptual layout of the spring
4. delineation of the mountain aquifer
5. identification of recharge area based on local geology and its structural setting
6. planning of treatment measures in the recharge area with the help of community participation
7. setting up of a monitoring system for periodic spring discharge data collection

secondary data collection and interpretation	interpretation of base maps like SOI toposheets at various scales, GSI, district resource maps, satellite imageries, Google Earth images and weather data interpretation of land use data, forest cover maps, slope maps, geomorphological maps
hydrogeological mapping of the springshed	study of rocks in the area, their attitude, openings present, different structural features, movement of groundwater. study of dip and strike of different types of rocks Reference of base map of area
Classification and conceptual layout of the spring	springs classified into different types based on their hydrogeology and the rock structure which leads to the formation of the spring (depression, contact, fracture, karst and fault springs) classification is critical in the study of springs as the recharge areas and the discharge mechanism are highly dependent on the type of the spring.
delineation of the mountain aquifer	Using tools like Google Earth, a hydrogeological setting at regional level can be understand Understanding the hydrogeological setting of the area Toposheet, GSI map, and field visit are the source of information for aquifer delineation

identification of recharge area based on local geology and its structural setting	• understanding the basis of formation of springs in an area is the key principle for identification of recharge area of the springs • for this purpose delineation of aquifer is necessary • study of regional geology combined with local hydrogeological to mark non-recharge zones, direct recharge zones for soil-water conservation etc. • mapping of recharge zones on available base maps or good spring-shed photographs used by implementing agencies
planning of treatment measures in the recharge area with the help of community participation	• social mobilisation in case of community and private lands, interaction with different departments in case of common lands or forest areas main part of spring recharge activity • define strategy for implementation of recharge measures - recharge areas are not dependant on administrative or socio-economic • undertake artificial recharge works such as staggered contour trenches, percolation pits, etc. • understand the existing water resource management, water distribution mechanism in the village • participatory planning on water conservation and management
setting up of a monitoring system for periodic spring discharge data collection	• monitoring of spring discharge data at the point of spring emergence • regular and timely data collection (weekly, monthly or seasonal) to understand different hydrogeological characteristics of the aquifer • regular monitoring of pre and post implementation of recharge measures used to show the impact of recharge activities • data collection to support classification of the springs into different types



GIZ Support

- **Capacity Building:** Over 60 officers from across the Region with 20 officers from Meghalaya trained and exposed to initiative through trainings and exposure visits to Sikkim.

- **Upscaling:** Replication and piloting of the Sikkim initiative in State of Meghalaya and Mizoram

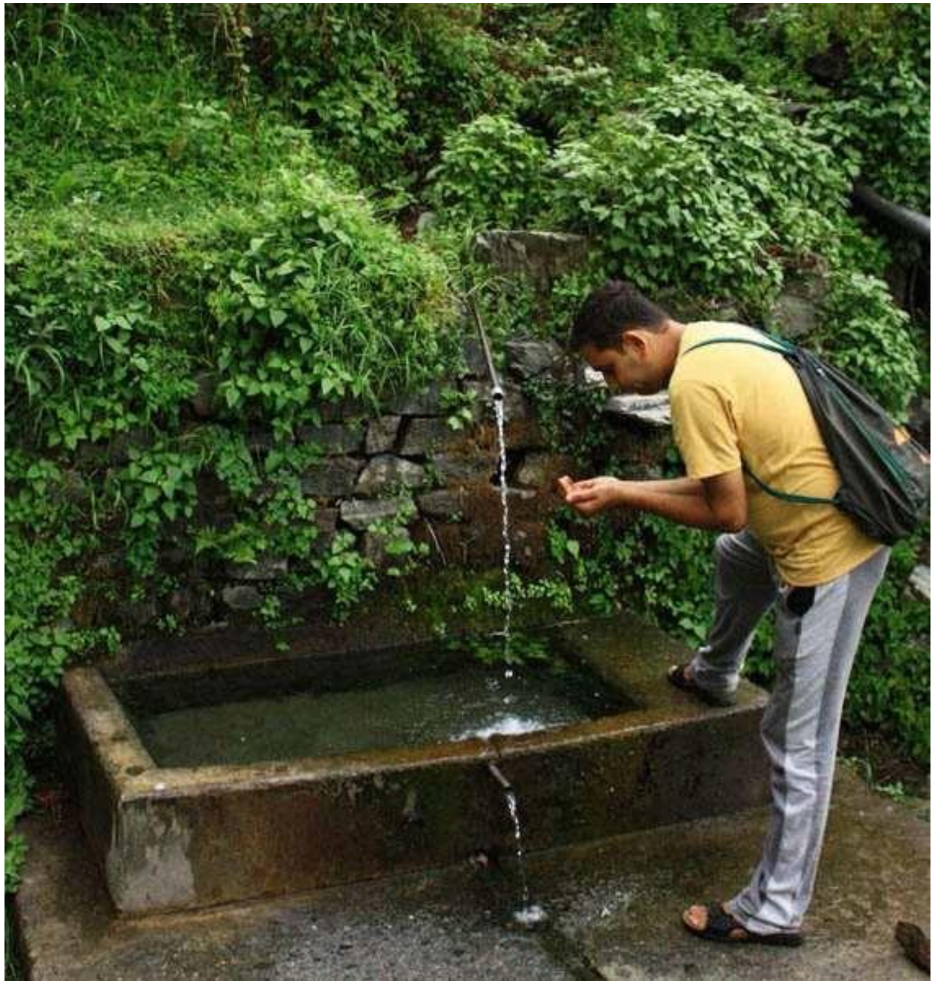
- **Implementation support:** Development of user manual on techniques of spring recharge, adaptation into local dialects of the Region

Recharging of the Tendong Mountain Range: Results and Lessons Learnt

- The Tendong Mountain is located at an elevation ranging from 6000 ft to 8500 ft in the southern part of Sikkim having a total area of around 1000 Ha. Perennial streams from Tendong mountain catchment are important for ensuring the rural water security in the scattered villages and some eventually join the Teesta and Rangit River. The streams from Tendong Mountain are a source of drinking water for the communities living in these five administrative blocks. These administrative blocks receive only half of the rainfall compared to the average state rainfall, this making the area a water deficient region. With the growth of population, the demand of water is increasing rapidly. Many of the drinking water sources like springs and streams are drying up due to the impact of climate change and other anthropogenic factors.

- Intervention: A decision to address the water scarcity of the Tendong Range by means of recharging the springs located within the Tendong Range was jointly undertaken by the Rural Management and Development Department, Government of Sikkim and GIZ. A cadre of field-based Master Trainer were oriented to understand the recharge phenomenon of springs in the hilly terrain and trained to undertake hydrogeological assessment. These Master Trainers besides driving the initiative in Sikkim are presently travelling across the North Eastern Region to provide technical support to the other States.

- As a pilot initiative, the hydrogeological assessment and mapping of the Tendong hills was undertaken and this assisted in the demarcation of precise, site-specific recharge area and protection area. This exercise also resulted in reducing down the treatment area to 70 Ha as probable recharge area out of the total area of 1000Ha. A convergence with the national flagship program MGNREGA facilitated investments in creating artificial rainwater harvesting works like trenches and ponds to reduce the surface runoff and increase infiltration, thereby resulting in improved recharging of the spring aquifer. Harvesting the runoff in form of ponds and trenches has helped to supplement ground water recharge resulting to longer duration of water flow in lean season in most of the springs and streams. A robust monitoring of the spring discharge, seasonality and sustainability of key springs was put in place to quantify the result of the recharge works in the top of the Tendong hill. A monitoring of 23 springs discharge shows an average 70% increase in the discharge of the springs during the lean season with just one year of treatment. Along with the community, the Village Water Security Plans were prepared which aided in efficient water resource planning and mobilization for the villages. This increase in discharge have provided the communities with options to diversify their livelihood activities. Communities are presently cultivating seasonal vegetables, raising livestock and investing in fishery activities.



Lessons Learnt :

- Given the importance of aquifers in understanding springs, a hydrogeological approach should be a prerequisite for any spring-shed development work. Hydrogeology enables classification of springs in any area. All springs can be classified and named.
- Recharge areas should be demarcated based on the hydrogeology.
- Sustained monitoring imperatives must be added and retained in such programmes.
- Sensitization of the local community regarding role of hydrogeology governing recharge areas, protection of recharge areas, importance of springwater data collection etc. is necessary, almost as a non-negotiable aspect of post-programme efforts.
- Concrete paving of dried up lakes should be discourage as it prevents recharge of springwater inflows in to the lake.
- The location an extent of recharge areas are purely governed by the local hydrogeology and not by administrative or socio-economic boundaries.
- To cope up with the increasing demand and the changing climate a participatory community based approach based on scientific observations needs to be built into all such programmes

Wah Shari Spring: The Meghalaya Experience

ABSTRACT:

"Wah Shari Spring" is one of the few perennial water sources in the vicinity of Sohra, located on the Southern edge of Khasi Hills, at an altitude of 4823 ft. (1484 m). Though the region receives over 11,000 mm annually the region is known to face water scarcity during the lean season. This paradoxical situation of continued water shortage albeit abundant rainfall prompted the Meghalaya Basin Development Authority to demonstrate effective measures in revising the springs of the areas and protection of its catchment.

The area is devoid of any vegetation and the top soil is completely eroded with only skeletal remains of gravel and sand. The land is severely degraded due to mining activities and as a result water sources are affected leading to water scarcity during the dry season. The discharge of the spring which served as a drinking water supply source is 5 litres/ minute as on March 2015.

Intervention

The primary intervention undertaken was to mobilise the community to ensure active participation aimed at inviting efforts to prevent the catchment area from mining activities. Series of capacity building and training of the local community were organized. Village based Barefoot Environmental Educators (BEES) were identified to act as whistle blower for forest fires and unwanted grazing.

These activities were followed by creation of soil and moisture conservation measures like silt retention dam, staggered boulder bunds, box terraces, contour trenches and afforestation with local indigenous species in the entire degraded catchment areas. Water harvesting structures integrating with it filtration tank, storage tank and fencing of the catchment were built.

RESULTS:

The local population general awareness about preserving the water catchment areas have been sensitized and livelihood has improved as more time can be devoted to other activities other than collecting water especially amongst the women folks. Water security is ensured all year round for about 225 households as the discharged has been enhanced from 5.1 lit/min to 500 lit/min.

The entire catchment area has been brought under trenching and vegetative cover by planting local species. As a result erosion and soil loss have been controlled and water conserved as can be seen from the increased discharge of springs in the low line areas. Monthly discharge of the spring are being continuously mapped and monitor to actually compared with the flow rate before and after the Springs rejuvenation works for impact assessment of the different interventions taken up for which data will be published.

References:

Kaustubh Mahamuni and Devdutt Upasani Springs: A Common Source of a Common Resource

Sandeep Tambe, Ghanashyam Kharel, M. L. Arrawatia, Himanshu Kulkarni, Kaustubh Mahamuni and A. K. Ganeriwala Reviving Dying Springs: Climate Change Adaptation Experiments from the Sikkim Himalaya

MEGHALAYA BASIN DEVELOPMENT AUTHORITY

mbdashillong@gmail.com
phone no : 0364-2502577
phone no : 0364-2522905
MBDA.GOV.IN