NITI Aayog

"Good Practices in water conservation and supply in hilly area of Uttarakhand with a focus on water scarcity, climate change and springshade rejuvenation and spring as part of culture and heritage"

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NITI Aayog identified five thematic areas for deliberations.

- Revival of Springs;
- Sustainable Tourism;
- Transforming Shifting Cultivation;
- Building Skill and Entrepreneurship Landscape; and
- Data for Informed Decision Making.

The Indian Himalayan Region (IHR) is spread across

- 10 States
- 4 hill districts
- Stretching across a length of 2,500 km and width of 250 to 300 km
- Home to over 50 million people
- Most of northern India’s river systems originate in the Himalayan region, fed either by glacial melt or the many springs that dot the mountainous landscape.
- The Himalayas, known as **‘the water tower of the earth’,** are therefore a major source of fresh water for perennial rivers such as the Indus, the Ganga and the Brahmaputra.

A dried-up spring during lean summer season

Spring-fed spouts inside a temple in Kathmandu

Spring in Ladakh with a symbol of its worship

Magnitude of the Problem

- it is believed that nearly half of the perennial springs have already dried up or have become seasonal and tens of thousands of villages are currently facing acute water shortage for drinking and other domestic purposes.
- Nearly 60% of low- discharge springs that provided water to small habitations in the Himalayan region have reported clear decline during the last couple of decades.
- The number of functional springs in the Almora region, for example, has gone down from 360 to 60 over the last 150 years, a reduction to one-sixth, clearly a cause of grave concern.

Significance of springs in maintaining flows in the rivers throughout the year – Spiti Valley

Drudgery to women for collecting water from springs

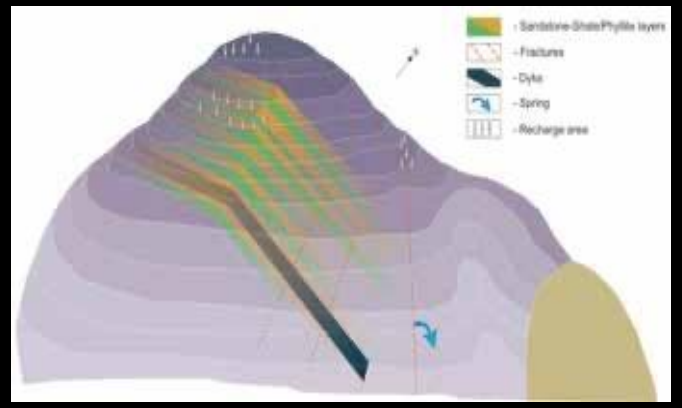
Spring quality

- In recent years, there has been increasing concern about the quality of spring water, but as with the rest of spring related issues, there is very little documentation regarding contamination of springs.

- For example, coliform bacteria in spring water may be derived from septic tanks, household wastewater, livestock facilities, and manure lagoons in the source area or in the aquifers feeding springs.

Regional springs of the Himalayan Region

The mapping and description of springsheds leads to the demarcation of recharge zones for aquifers feeding springs



Representative illustrations of a few key steps in springshed management – clockwise from lower left – a Para hydrogeologist at a rock exposure, conceptual layout of a springshed, a contour infiltration trench as part of spring-water recharge and the polygons for recharge and protection measures in a springshed

The following table displays impact in a few springs in terms of improved spring discharge, Sikkim:

Name of Springs	Discharge March 2010 in Lpm	Discharge in March 2011 in Lpm	Increase in Discharge
Malagiri Dhara, Lungchok	7.5	15	Two times
Aitbarey Dhara, Kaluk	2	6	Three times
Dokung Dhara, Kaluk	8	30	Nearly four times
Nunthaley Dhara, Kaluk	2	10	Five times
Kharkharey Dhara, Kaluk	1	5	Five times
Chukudum Dhara, Ravangla	45	60	One and a half times
Results of springshed management under Dhara Vika			

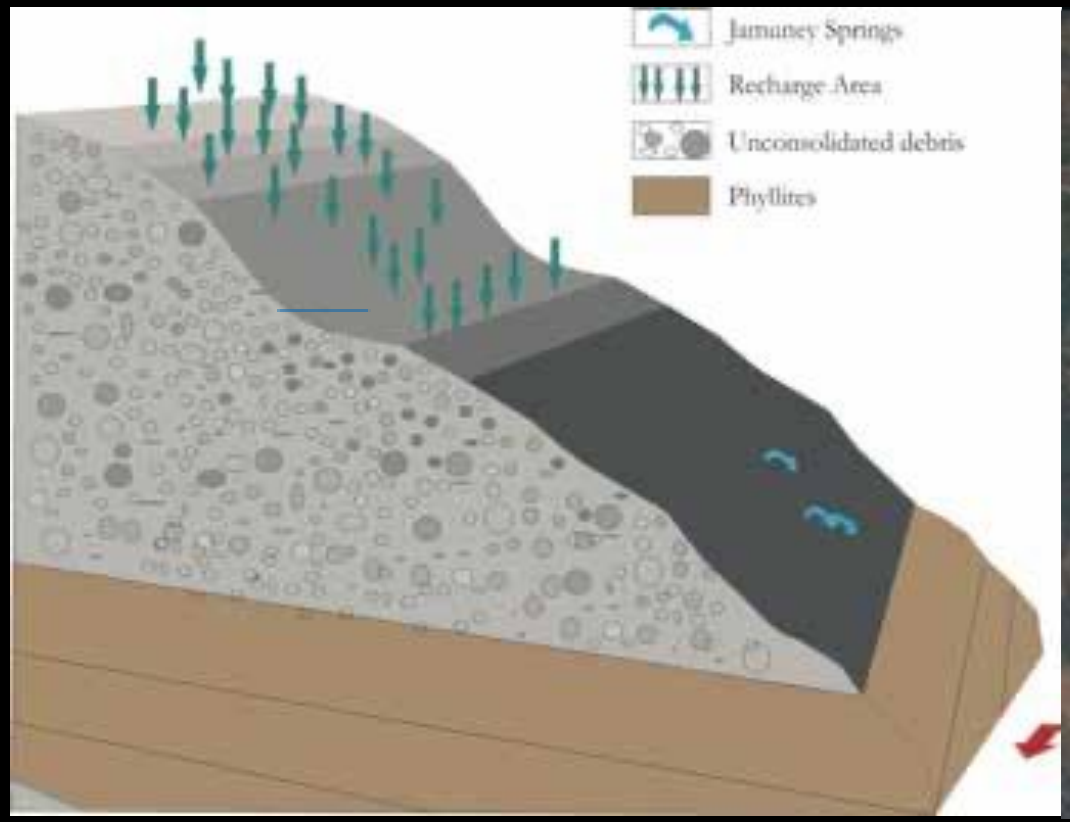
People working

- People’s Science Institute from Dehradun has used the concept of Participatory Groundwater Management (PGWM) to manage spring water in the Thanakasoga – Luhali Panchayat.
- Springs Revival through Para-hydrogeology Central Himalayan Rural Action Group (CHIRAG).
- Mission Spring Revival – Scaling up the Hydrogeology based Model, HIMMOTHAN, a society under Sir Ratan Tata Trust, Dehradun.
- Campaign for Springs: Himalaya Seva Sangh (HSS).
- Dhara Vikas and MGNREGS – Convergence with Mainstream: Rural Management and Development Department (RM&DD), Government of Sikkim.

People working

- Demonstration, Piloting and Potential in Scaling Out: Eleuthrian Christian Society (ECS) was instrumental in piloting springshed management through a programme support by Tata Trusts that led to improved water security in more than 10 locations in the two most challenged districts of Nagaland.
- Land Resources Department (Tasked With Watershed Management), Rural Development Department and the Soil and Water Conservation Department of the State of Nagaland.
- Building Capacities at Scale for Spring Revival: Government of Meghalaya (through the Meghalaya Basin Development Authority (MBDA) began work on mission mode to map 60,000 springs and create a first-cut plan for spring water management of 5,000 springs in 11 districts.

Hydrogeological layout of Jamuney spring Recharge area identification and demarcation



General Recommendations

A. Mapping Springs

- Systematic mapping of springs across the Himalayas is critical, as springs can provide 20% of the water in mountains and support vital ecosystem services.
- Creation of a web-enabled database/web portal on which the springs can be mapped/tagged. All State Government Departments, R&D institutions and NGOs working on springs and springshed management will upload data on the webportal.
    - Mapping to include detailed hydrological, geo-tectonic, morphological, meteorological, land use and demographic details.
    - Follow a selective methodology – based on current approaches including the 8-step methodology and more recent protocol of approaches. Application of isotopes to identify origin/source of springs can be an important tool. Hot-spot analysis to identify vulnerable springs must also be included.
    - Aquifer mapping should be undertaken by CGWB in regions where springs are prominent. Customisation of aquifer mapping approaches may also be necessary, including making the process more participatory.

A. Mapping Springs

- Use high frequency sampling of spring discharge to extract diurnal cycle due to evapotranspiration as a basis for land-cover interventions.
- Flow duration curves of springs can be a simple and effective method for typology of aquifer heterogeneity and pathways.
- Involvement of local community, NGOs and State Agencies in the process of mapping to make it a participatory process.
- Establishment of a national registry of springs.

- Synergies between R&D Institutions/Universities and community based Non-Governmental Organisations to provide assistance for scientific assessments both during the planning and impact phases.

B. Implementing Revival of Springs

- Reviving springs and sustaining them requires a combination of scientific knowledge (hydro-geology) and community ownership of the resource.
- Focus on ‘aquifer’ as the unit for planning and integrate watersheds and aquifers for a ‘springshed’ approach.
- Recharge area protection/source area protection in the form of “spring sanctuaries’’ including measures prohibiting land use change in recharge/source area. Enhance understanding of correlation between recharge and utilisation of forest land, soil, agriculture and water.
- Basic engineering measures and structures combined with vegetative measures and management are need for revival.
- Identification of local level management practices/traditional knowledge (and practices) for springs is needed to strengthen the plans for springshed management.
- Snow retention and snow meltwater collection is an effective means of spring recharge in high altitude

C. Capacity Building

- Create a cadre of young professionals and community-based resource persons (para-hydrologists) through training and capacity building programmes. This will help in efficient use of resources allocated for springshed management.
- BARC can provide training in the field of isotope hydrology.

C. Capacity Building

- Capacity building at the community level, including for PRIs (water committee), on springshed management is essential to improve groundwater literacy, and help in long term management of
- springs and sustainability of interventions.
- The community based organisations should take lead in generating awareness amongst communities

D. Policy

- A status report on Himalayan springs including inventory and current status of springs, reasons for depletion/drying and spring revival initiatives across Himalayan States should be produced.
- The Government should identify a nodal R&D institution/University for carrying out mapping exercise and developing approaches for springshed management.
- The subject of springs transcends several ministries. The Ministry of Water Resources has been envisioned to be the nodal agency but in our understanding Ministry of Environment, Forests and Climate Change (MoEF&CC), Ministry of Tribal Affairs, Ministry of Rural Development, Ministry of Drinking Water and Sanitation, and key institutions like State government groundwater agencies may have a larger role to play for taking the work forward. Hence, there is a need for inter-ministerial coordination.

D. Policy

- Policy should also look at meeting water demand in the mountains which cannot be fulfilled by springs alone. This is particularly true of the pre-monsoon/summer season when demand is highest due to tourism and spring discharge is at its lowest. In addition, forest fires are more frequent during this season.
- The question of forest and private lands and their location in the springshed becomes important because large parts of the recharge zones of springs often fall within forests and springshed-related activities cannot be taken up without the co-operation of the Forest Department.

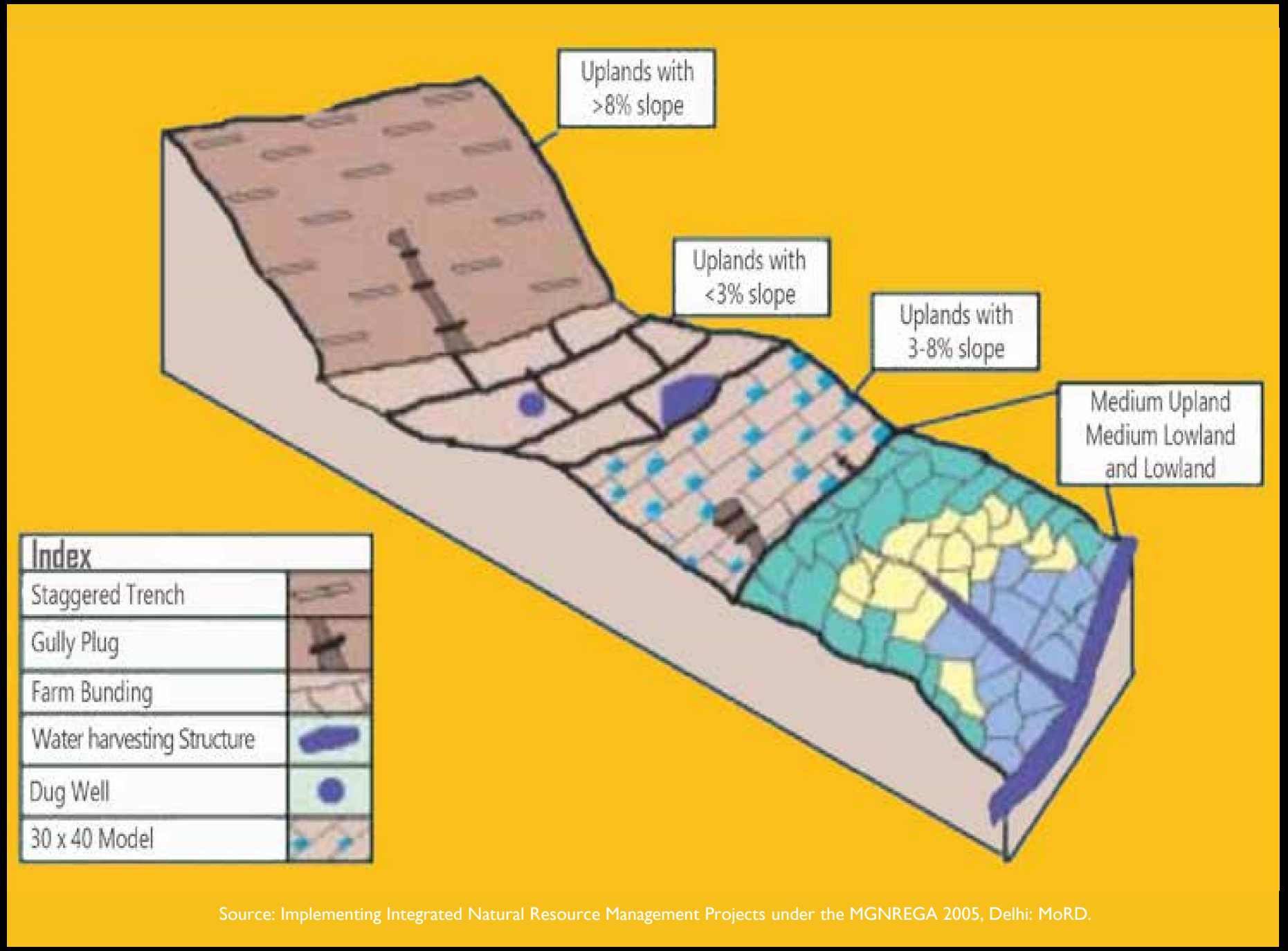
E. Cross-Cutting Issues

- Scientific knowledge from assessments on status of springs and techniques of springshed management need to be translated into simple language and communicated for policymaking and development of climate adaptation projects.
- Understand effects of mining, infrastructure development and urbanisation on the springs. This should be integrated with Environmental Impact Assessment and Environmental Management Plan.

Springshed trenches complemented by vegetative

SLOPE	PROBLEM	TREATMENT
>8% Slope	High erosion, very shallow soil depth	Staggered trenches, Contour trenches, Bunding, Plantation
3-8% slope	Shallow topsoil, low in organic matter, low moisture retention	30x40 Model Plantation
<3% Slope	Moderate soil depth, land use below potential Scope for both harvesting and Infiltration	5% Farm Ponds Chain of Farm ponds along drainage Village Taalab

30x40 Model-It is a method of in-situ soil and water conservation. A patch of uplands is divided into small plots of 30x40 ft; 30 ft along the slope and 40ft across the slope, starting from the ridgeline. This is followed by digging 3-ft deep pits at the lowest point in each plot and bunding the plots by using the soil dug out of the pits. The pits measure 7x7 ft at the top and 5x5 ft at the bottom.



Source: Implementing Integrated Natural Resource Management Projects under the MGNREGA 2005, Delhi: MoRD.

HALMA

Shivganga Samagra Vikas Parishad, a Jhabua, MP

IMPACT NUMBERS

Water

Talaab: **65**

Water storage capacity:
450 crore litre

Contour Trenhces:
1,41,000

Other Water harvesting structures:
4,500

Forest

Mata nu Van: **120**

Plantation:
1,10,000
Saplings

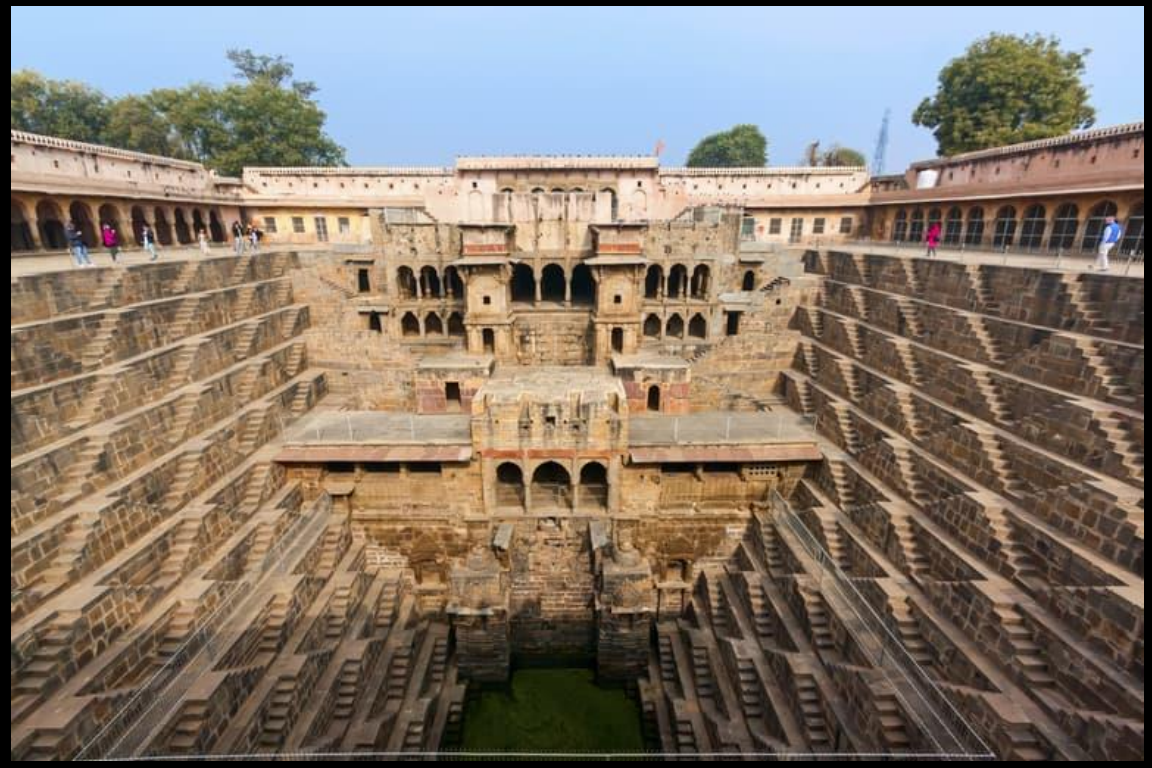
People

Gram Engineers trained
12,000

Women trained
900

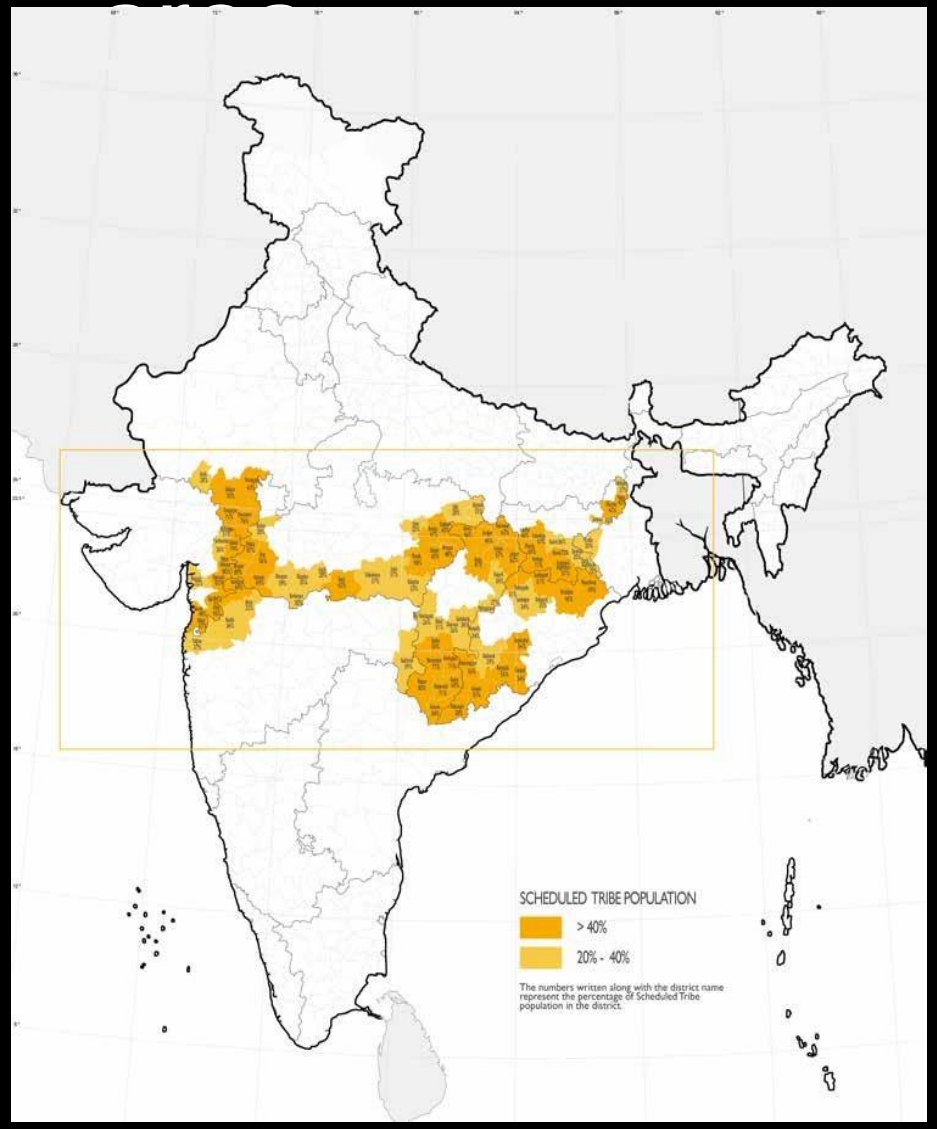
Tank rehabilitation old tradition in India

Amrut Sarovar scheme is also example of water conservation



Step wells in Rajasthan

Water conservation best practices in tribal



support of Axis Bank and Axis Bank Foundation in tribal area

At a Glance	
Intervention	Spring-based Water Supply Systems
Location	Mandla and Dindori districts, Madhya Pradesh
Implementation	WaterAid and National Institute for Women, Child and Youth Development (NIWCYD)
Period	2018 - Ongoing
Unit Cost	Rs. 2,50,000 (Total cost); Rs. 35,000 (Community Contribution)

Spring emerging out at an altitude of roughly 4,000 masl in Spiti valley

Traditional methods of water conservation in Uttarakhand

Many traditional systems like:

- *Naula* (little depression aquifer),
- *Dhara* (springs),
- *Gadhera* (small river tributaries),
- *Gul* (traditional irrigation canals),
- *Chal* and *Khal* (artificial ponds on hilltops)

to collect and supply water still persist in the villages of Uttarakhand.

Naula and *Dhara* are the most important and are still used as the prime source of drinking water in many hilly areas of Uttarakhand, especially in the Kumaon division.

Cultural Significance

- All important Hindu rituals like weddings and *Namkaran* (‘naming ceremony’) were linked with the *Naula* or *Dhara* to maintain their sanctity.
- For instance, even today in Kumaon, on reaching her husband’s home, the new bride first offers a ritual prayer at the village *Naula* or *Dhara*.
- These customs indicate that the ancestors of present-day Uttarakhandis recognized the importance of water and water-harvesting systems and included them in their rituals as if they were a member of their family.
- *Naulas* are common water harvesting structures in Kumaon, but less popular in Garhwal.
- The construction of public water facilities like *Dhara* and *Naula* was considered to be an act of piety in ancient times.
- *Naulas* in Kumaon made during the Katyuri and Chand Eras are still in use today.

Cultural Significance

- For instance, the 1,000-year-old *Naula* in Suryakot (Almora),
- 700-year-old *Naula* near Haat Kalika temple in Gangolihat (Pithoragarh), built by Raja Ramchandra Dev,
- Garhsher Naula in Bageshwar district built in the 7th century
- Baleshwar Naula, built by Raja Thorchand in 1272.
- The Ranidhara Naula (Almora), Pattiani Naula and Tularameshwar Naula of Shealgaon (Almora) and Pahadpani Naula (Nainital) are some other notable examples.
- Some *Naulas* were beautifully carved on stone. One such example is the Ek Hathiya Naula in Dhakana village of Champawat district.

Case of Springshed Development work at Lumkyntung Village (Umtyngar), Sikkim

Average Household size		**5.5**
Average Water Consumption per HH per day	167.23	litres
Average Water Consumption per capita per day	30.53	litres
Annual Total Water Availability	971	Lakh litres
Net Total Water requirement of (human + cattle + agriculture) Annually	1883	Lakh litres
Water Balance Annually (Total water availability - Total water requirement)	(-) 912	Lakh litres


Proposed Recharge Site
Spring 1
Spring 2

Water and the global climate crisis

- Extreme weather events and changes in water cycle patterns are making it more difficult to access safe drinking water, especially for the most vulnerable children.
- Around 74 per cent of natural disasters between 2001 and 2018 were water-related, including droughts and floods.
  The frequency and intensity of such events are only expected to increase with climate change.
- Around 450 million children live in areas of high or extremely high-water vulnerability. This means they do not have enough water to meet their everyday needs.
- When disasters hit, they can destroy or contaminate entire water supplies, increasing the risk of diseases like cholera and typhoid to which children are particularly vulnerable.
- Rising temperatures can lead to deadly pathogens in freshwater sources, making the water dangerous for people to drink.

Water and the global climate crisis

- Contaminated water poses a huge threat to children’s lives.
- Water and sanitation related diseases are one of the leading causes of death in children under 5 years old.
- Every day, over 700 children under 5 die from diarrhoea linked to inadequate water, sanitation and hygiene.
- Climate change exacerbates water stress – areas of extremely limited water resources – leading to increased competition for water, even conflict.
- By 2040, almost 1 in 4 children will live in areas of extremely high water stress.
- Rising sea levels are causing fresh water to become salty, compromising the water resources millions of people rely on.

- Thanks