Springshed Management: Importance, Methodology, Monitoring & Challenges

Dr. Debashish Sen, Mr. Rajesh Kumar & Dr. S.K. Bartarya

People's Science Institute

PSI – An Overview

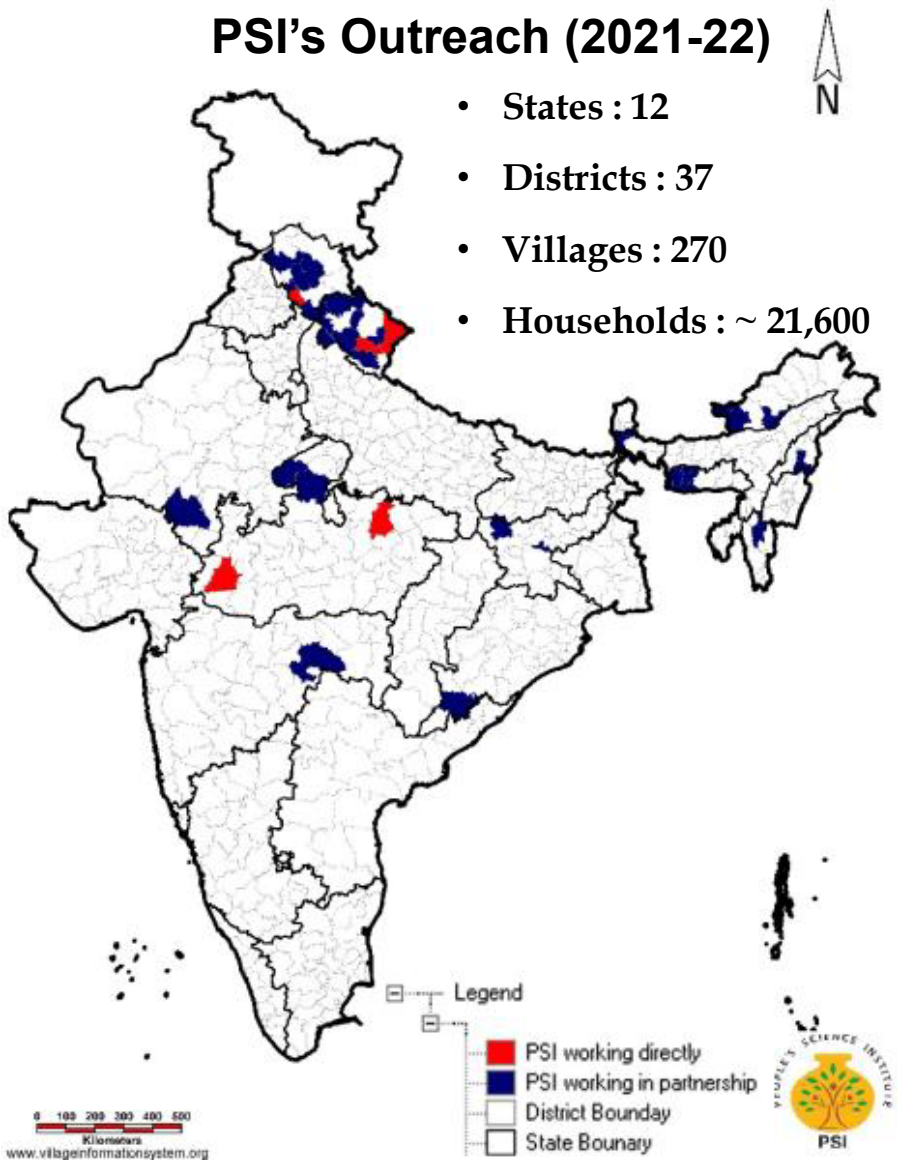
Established in 1988 with a vision of nation-building

Mission: Help eradicate poverty through empowerment of the rural poor and the productive, sustainable & equitable use of human and natural resources

Approach: Community Driven and Empowering

Geographical Spread: All over India, with focus on Himalayan and Bundelkhand regions

Partners: NGOs, Govt. Depts., Research Institutions & Universities



Thematic Areas Addressed by PSI

- Watershed Development
- Livelihoods Insecurity
- Malnutrition
- Water Scarcity
- Un-safe Water Sources
- Agro-ecology
- Air Pollution
- Disaster Mitigation and Response
- **Springshed Management**
- Fluorosis Mitigation
- Sustainable Urbanization
- River Restoration

Approach: Solutions to a community's problem come from the community itself. PSI supports people & empowers them to work for their better

"PSI is nationally recognized for pioneering many innovations in the field of Natural Resource Management, Sustainable Livelihoods, SRI, SWI, Participatory Groundwater Management, Springshed Development etc." *-Dr. Brij Gopal, Founder-Coordinator, Centre for Inland Waters in South Asia*

Earth Care Award in 2019 (A Times of India & JSW Initiative) for outstanding work on reviving springs in the Himalayan region under the Community Based Climate Mitigation and Adaptation category

Content

I. Concept & Importance of Springshed Management

What are Springs?

Springs are indicated by locations or points on the ground surface, where water from beneath the ground emerges onto the surface.

A spring may be considered as an 'overflowing aquifer'

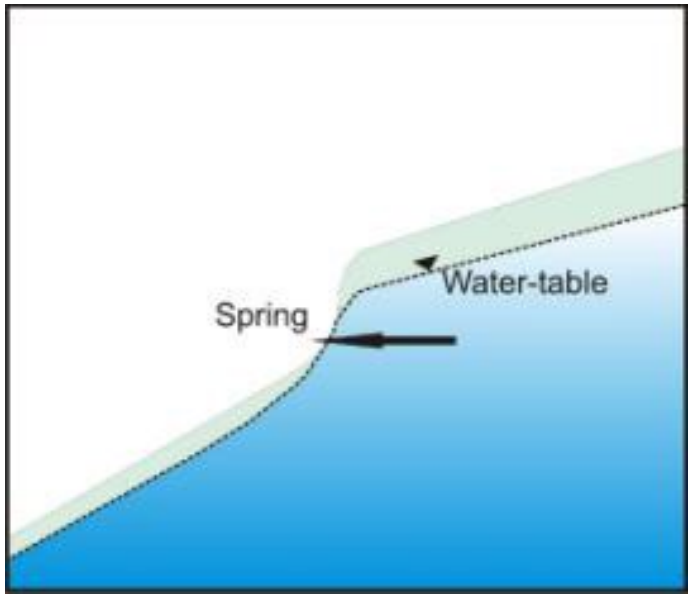
Springs represent 'natural ground water discharge that feeds streams and rivers, often making such streams and rivers perennial…

It is crucial to identify the type of spring in order to understand how they behave in space and time

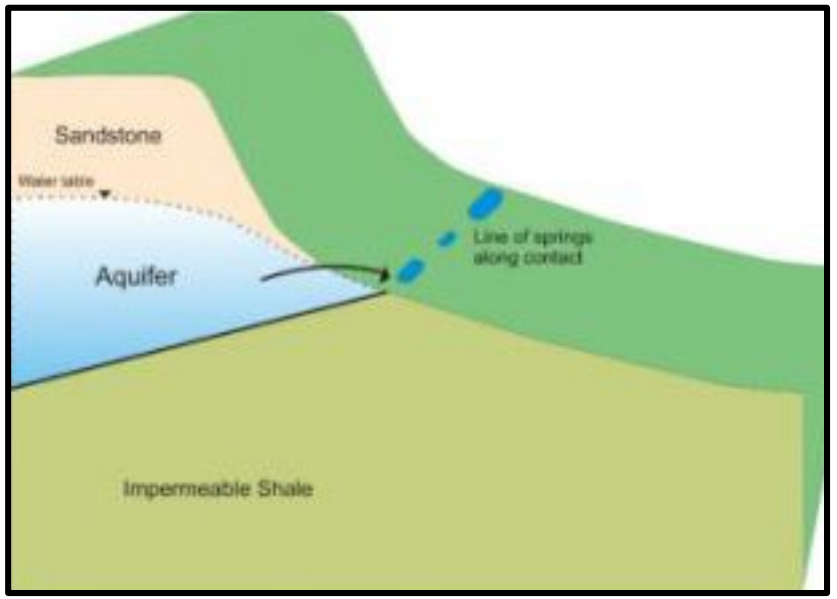
Points of groundwater discharge

Types of Springs

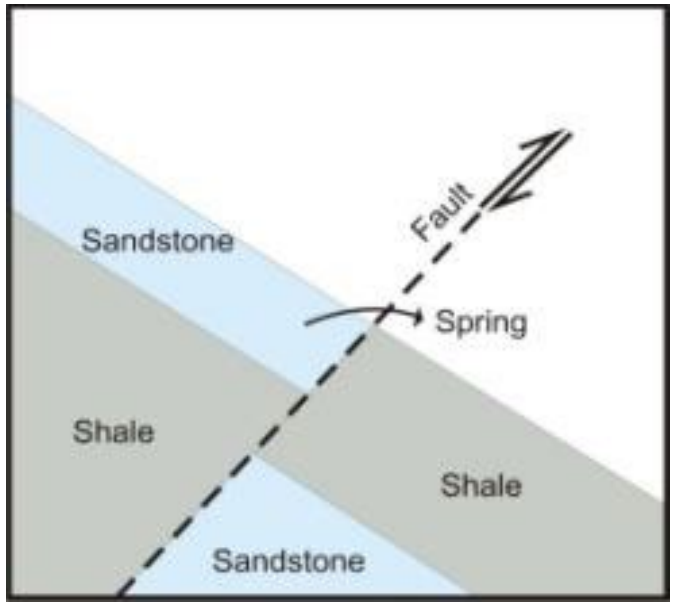
The broad typology represents diversity in aquifers, catchment conditions, size and distance of recharge zones etc.



(I) Depression Spring:
Formed when water table reaches the surface due to topographic undulations

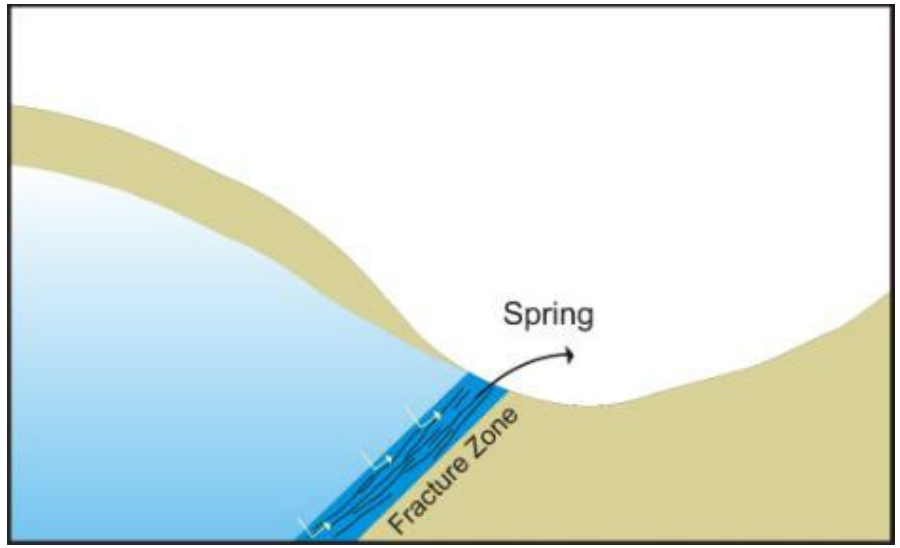


(II) Contact Spring :
Formed at places where relatively permeable rocks overlie rocks of low permeability



(III) Fault Spring :
An impermeable rock unit may be brought in contact with an unconfined aquifer due to faulting.

Types of Springs (Contd.)



(IV) Fracture Spring:

Occur due to existence of jointed or permeable fracture zones in low permeability rocks. Springs are formed where these fractures intersect the land surface

Movement of groundwater is mainly through fractures that may tap shallow as well as deep aquifers

(V) Karst Spring:

Springs in limestone terrains can be interconnected to topographic depressions caused by dissolving of limestones below

Water move through the cavities, channels, conduits and other openings developed in limestones

Why Springshed Management ?

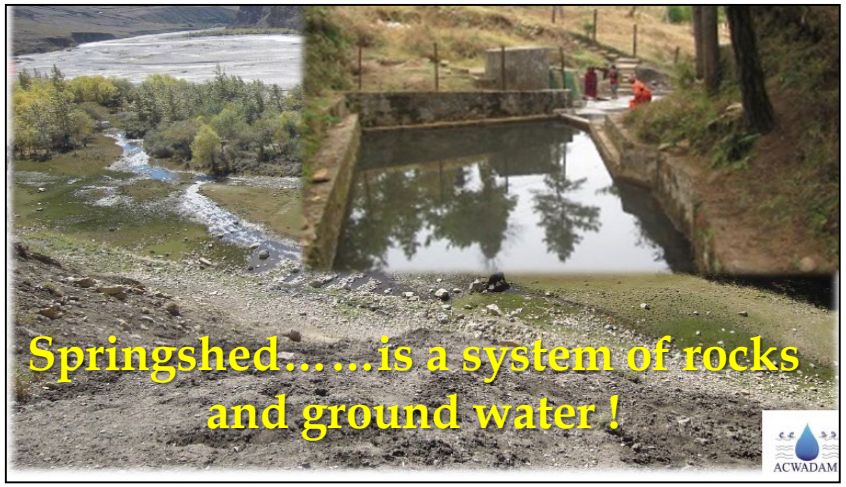
- Source of domestic and irrigation water in most mountain villages and towns - 200 million population
- They feed rivers and anchor ecosystems – 4-5 million springs (ACWADAM)
- Spring discharges are declining due to environmental degradation and changing land use and climate
- Urgent efforts are needed to revive, protect and manage springs to help ensure water security in a sustainable manner

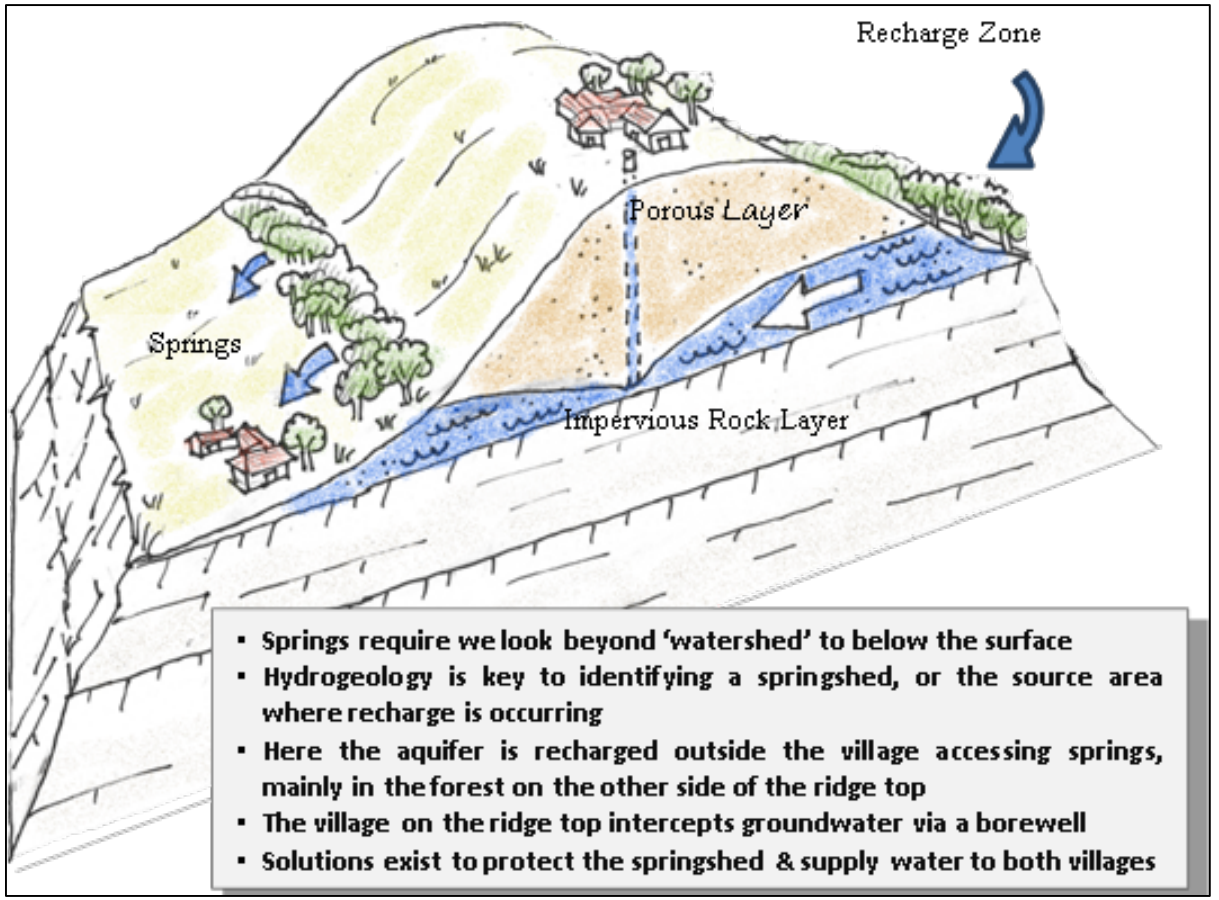
Therefore Springshed Management

Springshed vs Watershed Approach

Watershed Planning : Ridge to valley approach

In the case of folded/faulted mountains, the catchment area of the source is not necessarily confined to its topographic watershed. **Shift in focus needed- from sources….to a 'resource', i.e. aquifers**





Springshed Planning : Valley to valley approach

Springshed Management– Principles & Practices

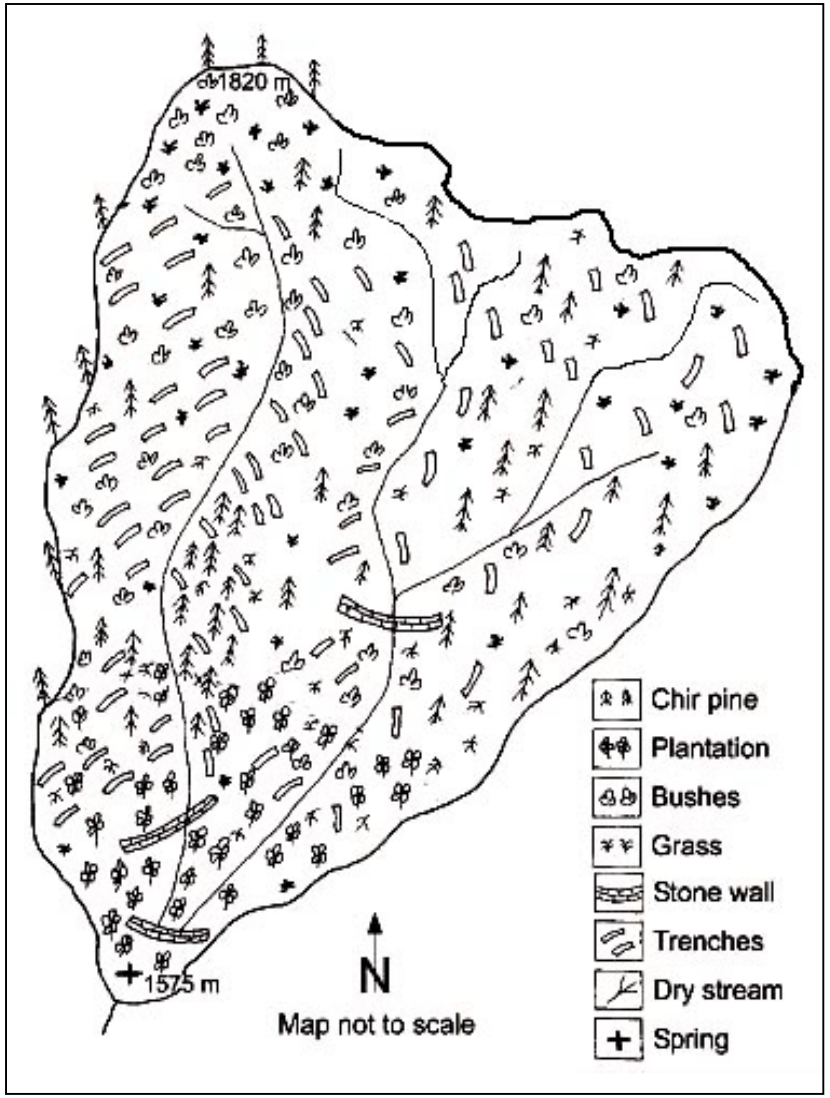
Regenerating underground seepage through engineering, vegetative and social measures in the spring recharge area

Principles:

- Increase Time of concentration
- Increase Infiltration
- Reduce Soil Erosion
- Improve Water Quality
- Promote Equitable Water Sharing

Practices:

- Trenching (SCT and CCT)
- Treatment of Drainage Channels
- Small Check Dams/Gully Plugs
- Vegetative Measures
- Social Fencing



Water Quality: Important Parameters and Standards

- **For Domestic Use**

Parameter	BIS:10500-2012	
	Acceptable Limit	Permissible Limit
pH	6.5-8.5	6.5-8.5
TDS (mg/l)	500	2000
Turbidity (NTU)	1	5
Total Hardness (mg/l)	200	600
Calcium (mg/l)	75	200
Magnesium (mg/l)	30	100
Total Alkalinity	200	600
Chloride	250	1000
Iron (mg/l)	0.3	No relaxation
Fluoride (mg/l)	1.0	1.5
Fecal Coliform (CFU/100ml)	Shall not be detectable in any 100 ml sample	

*mg/l- milligram/litre * Nephelometric Turbidity Unit *CFU-Colony Forming Unit

Causes of Spring Water Contamination

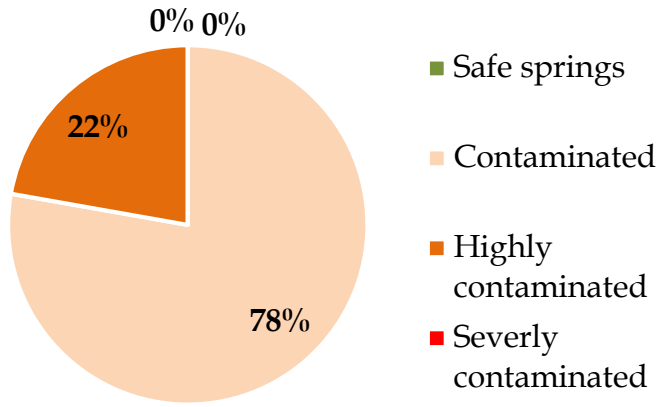
- Sewage disposal practices such as soak pits, direct discharge in drain, sewer line and open defecation
- Land use such as agriculture, especially using chemical fertilizers, pesticides, etc. also responsible for contamination
- Slope and direction of grey water & waste materials generally overlooked while designing the waste disposal systems.
- Geological contamination can lead to unacceptable levels of fluoride, arsenic, etc.

- Inherent structural weaknesses in rocks (fractures, cracks, and joints) allow untreated waste water to rapidly percolate and contaminate aquifers.

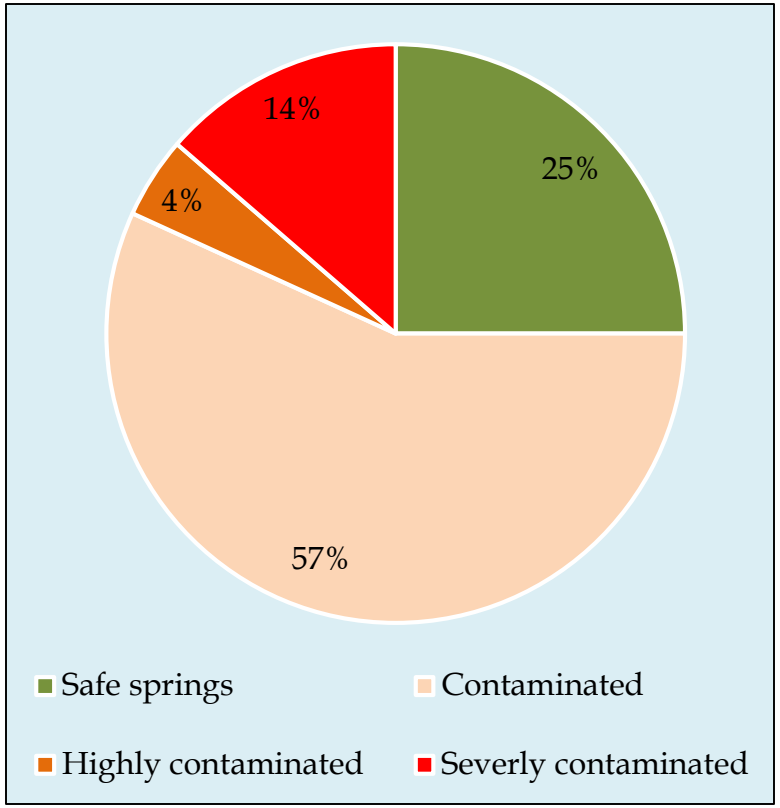
Important to determine pathways of contamination of springs

Bacteriological Contamination in Springs of Himachal Pradesh

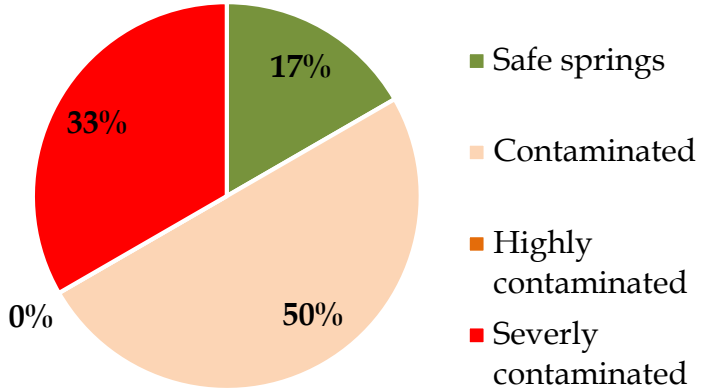
Fecal coliform (CFU/100ml) in Springs (9) of Nalagarh, Himachal Pradesh



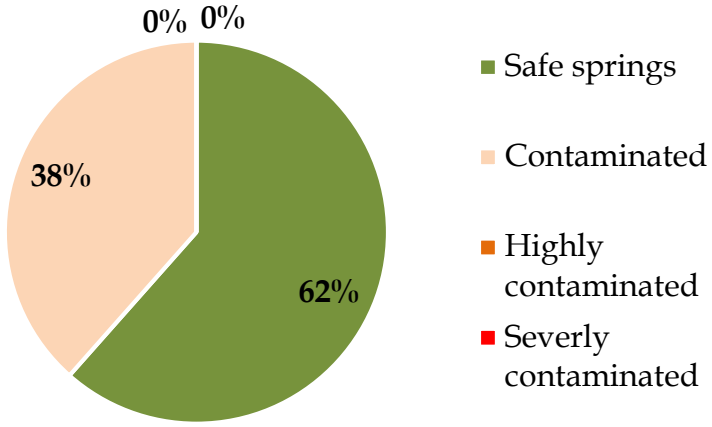
BIS Std. 10500:20127Y	Nil CFU/100ml
Safe springs (Uncontaminated)	0 CFU/100ml)
Contaminated	1-500 CFU/100ml
Highly contaminated	500-1000 CFU/100 ml
Severely contaminated	>1000 CFU100 ml



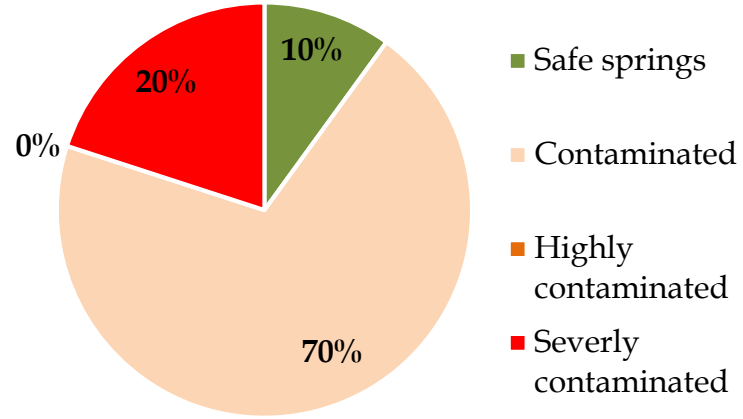
Fecal coliform (CFU/100ml) in Springs (12) of Bilaspur, Himachal Pradesh



Fecal coliform (CFU/100ml) in Springs (13) of Kangra, Himachal Pradesh



Fecal coliform (CFU/100ml) in Springs (10) of Mandi, Himachal Pradesh



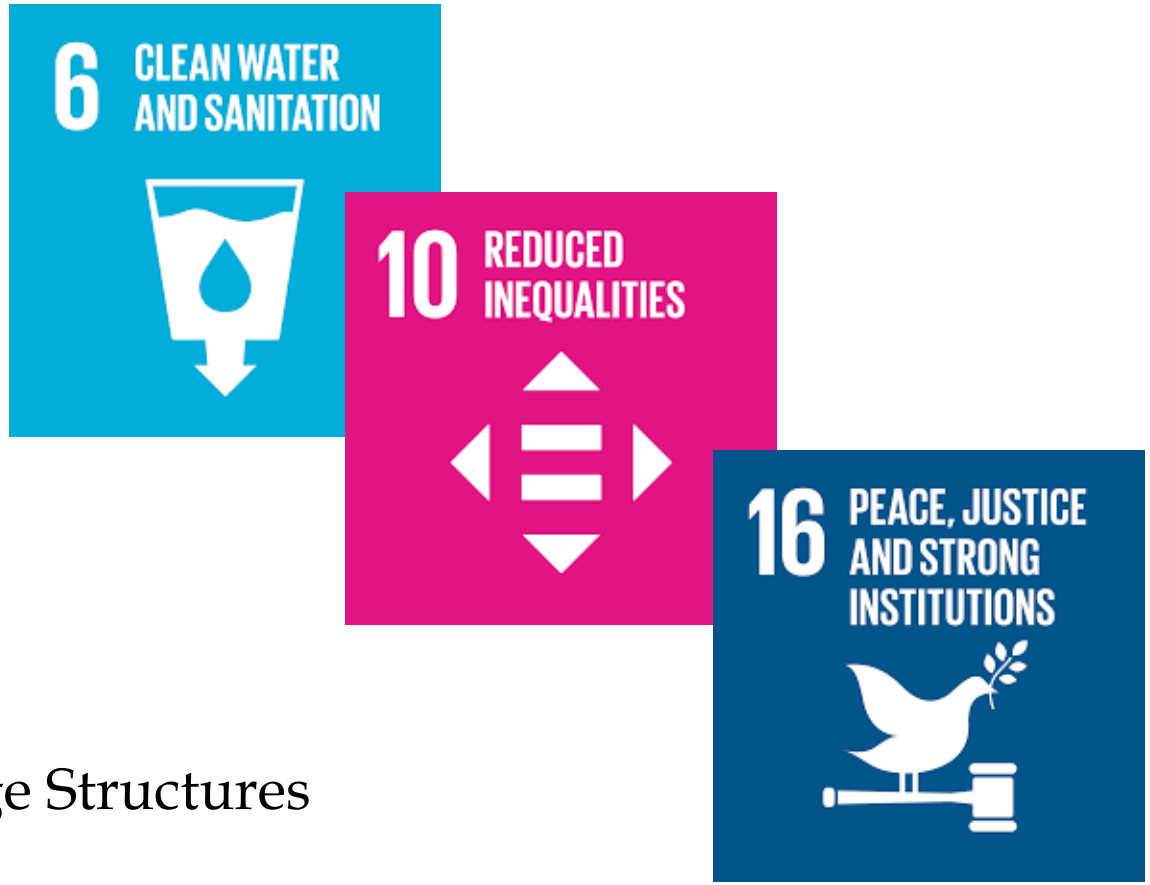
*CFU-Colony forming Unit

Monitoring Date Sep.-Oct., 2022

Benefits of Springshed Management

- Increased Base Flow
- Reduced Lean Flow Period
- Reduced Peak Flow
- Higher Plant Survival Rate
- Increased biomass production
- Increased Fodder Availability
- Household Water Security
- Improved Water Quality
- Increased Life of Downstream Storage Structures

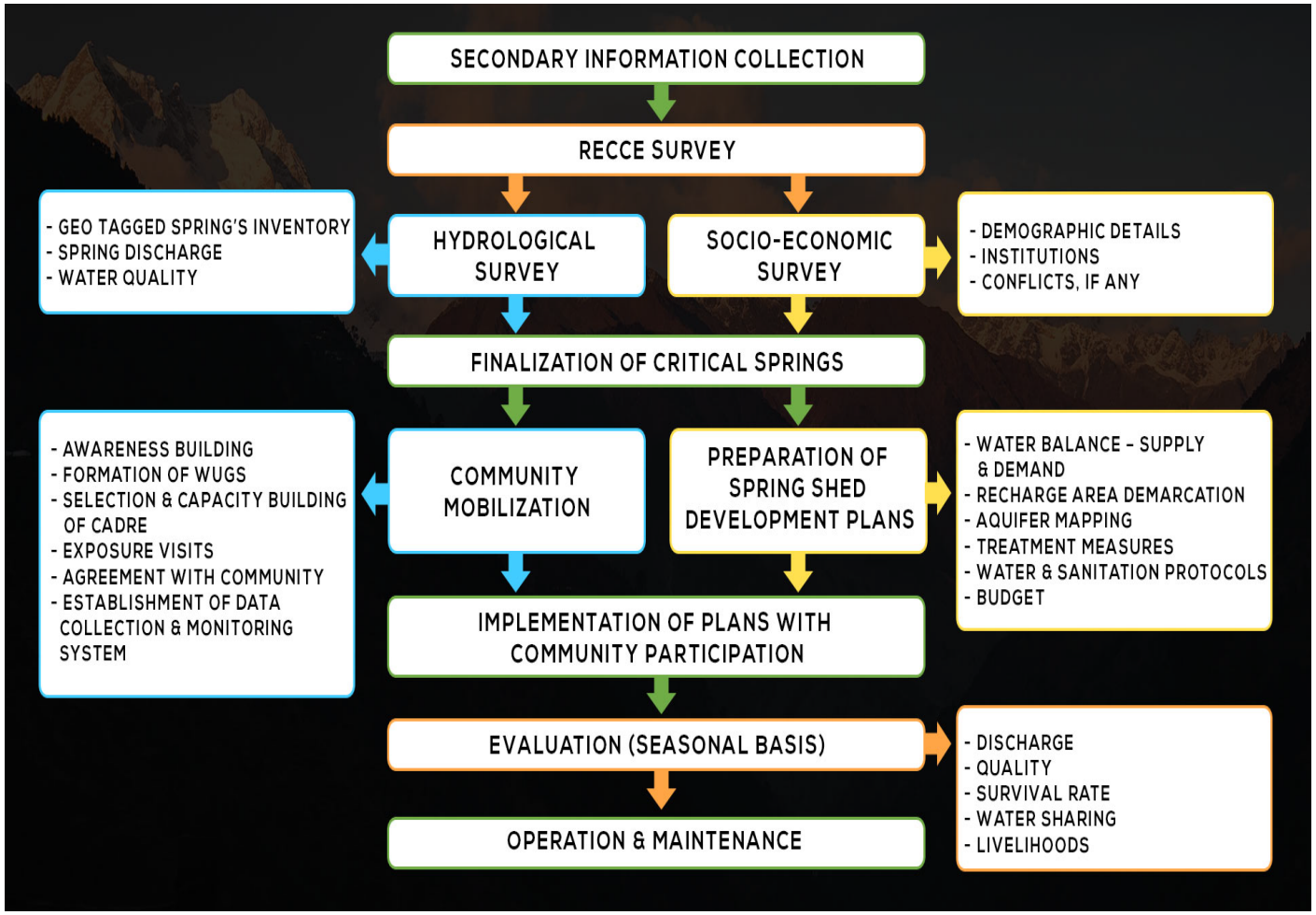
Community based springshed management fulfills the following SDG goals:



II. Methodology : The Case Study of ThanaKasoga GP

8-Step Methodology of Springshed Management

1. Comprehensive mapping
2. Data monitoring system
3. Social, gender and governance aspects
4. Hydrogeological mapping
5. Conceptual hydrogeological layout of springshed
6. Recharge area treatment plan
7. Springshed management protocol and implementation
8. Measuring impacts - hydrological and socio-economic



Case Study of Thanakasoga

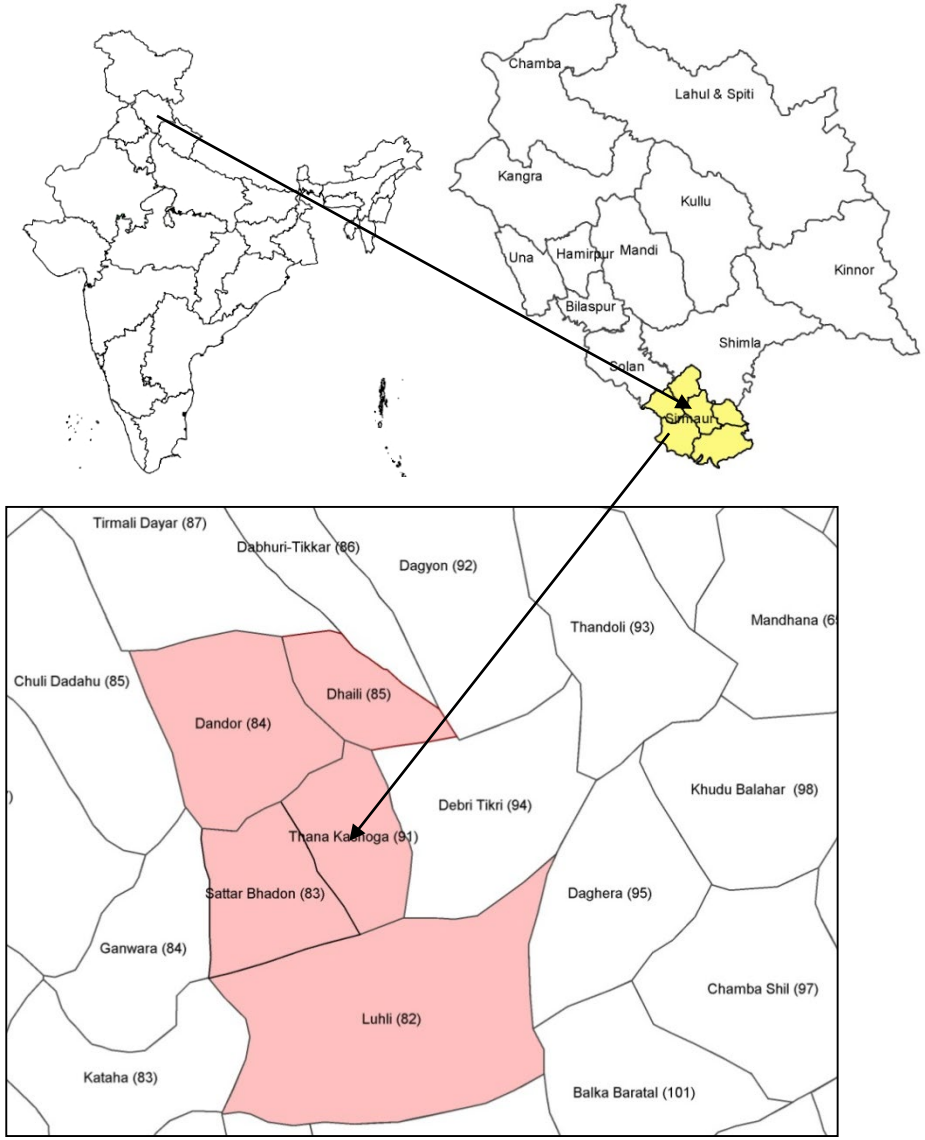
Location & Profile of Thanakasoga Gram Panchayat

Households – 217; Population - 1437

Avg. Annual Rainfall - 1206 mm

Critical Issues

- Fluctuations in rainfall
- Land Degradation
- High water scarcity
- Lack of irrigation
- Reduced crop yields
- Reduced fodder for livestock



Source: VIS, People's Science Institute

(I) Capacity Building & Participatory Planning for Comprehensive Mapping

Class Room Training

Transect Walk of the Village

Field Training

Planning with Communities

Comprehensive Mapping of Springs (Contd.)

In social map, residents depict

- Layout of individual households
- Community buildings

Household details to be recorded

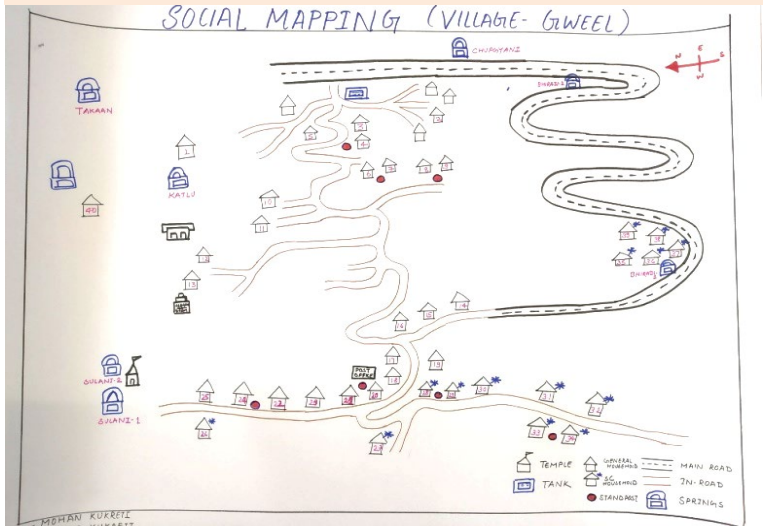
- Resident members
- Access to pipeline water supply
- Access to rain water harvesting tanks

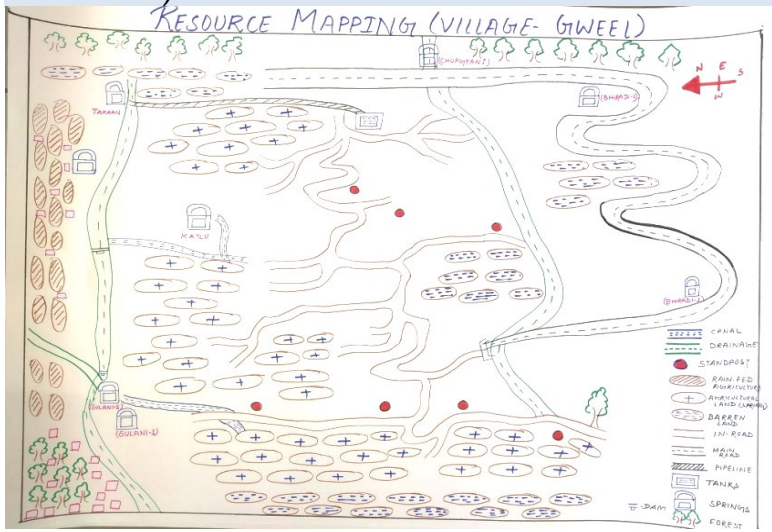
In resource map, residents indicate

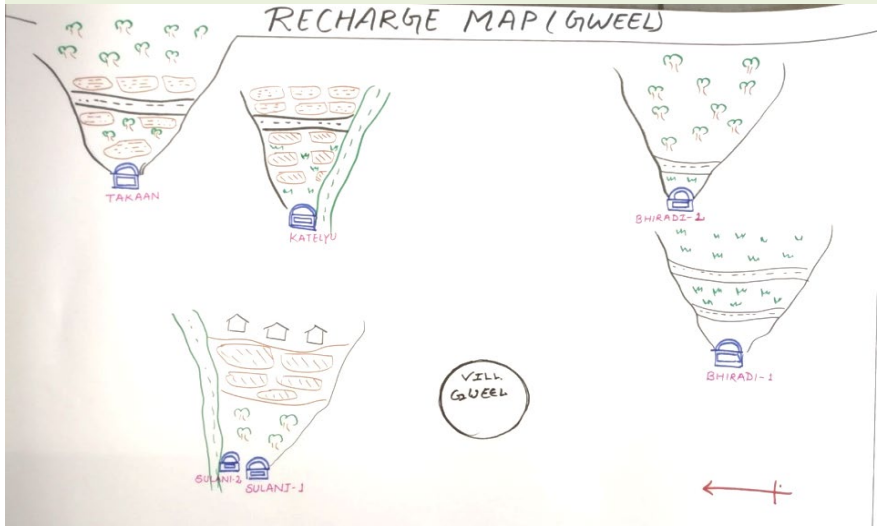
- Natural water sources (i.e. springs, ponds, streams, etc.)
- Constructed water sources (i.e. standposts, tanks, etc.)
- Catchment of water sources and developments in the catchment
- Different land usage (i.e. irrigated and non-irrigated lands, & forest land)

In source recharge area map, residents indicate

- Land use in catchment of springs (i.e. forests, barren lands, farmlands, habitation, etc.)
- Land ownership of catchment areas of springs (private, community, government, etc.)
- Infrastructural developments, if any, in the catchment areas of springs (i.e. roads, etc.)







Discussion on access of different sections to water resources/springs and water availability during different seasons

(II) Data Monitoring Systems

Daily Rainfall Measurement

Weekly Spring Discharge Measurement

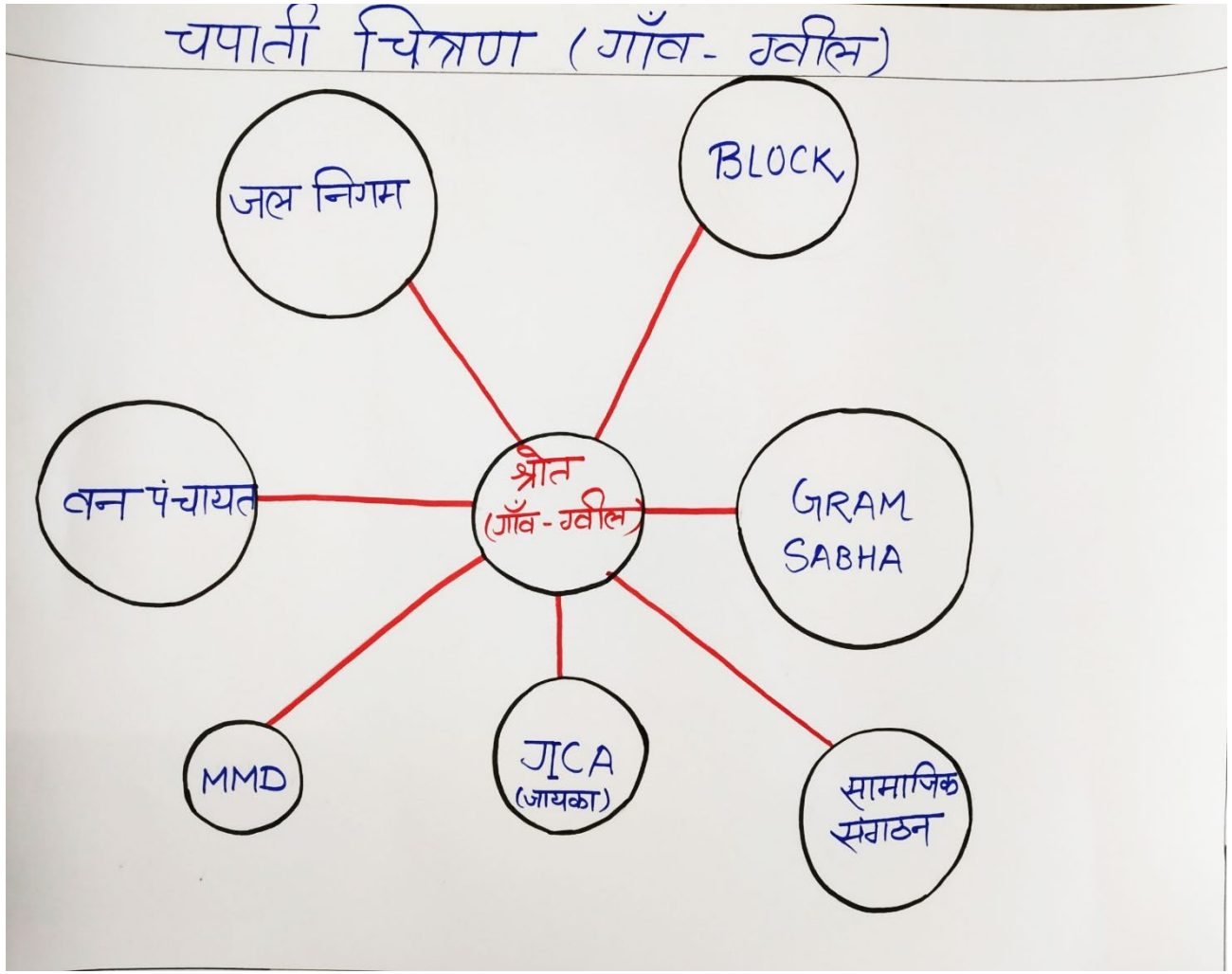
Sharing of Data with WUG

Seasonal Water Quality Measurement

(III) Institutional Mapping: Social, Gender and Governance Aspects

Focus group discussions on

- Role of each institution in springshed management (Pre and Post Project)
- Performance of institutions (regularity of meetings, democratic processes, transparency, etc.)
- Conflicts between institutions, if any
- Protocols related to springshed management – at source, recharge area, water usage, etc.



Formation & Capacity Building of Water User Group (WUG)

WUG: A general body of community members from all households directly dependent on the spring

Purpose

- Provides a democratic platform for water users to discuss issues as well as solutions for their problems.
- Empowers the water users to take ownership of their water source by protecting and conserving it.

Capacity Building of Spring WUG

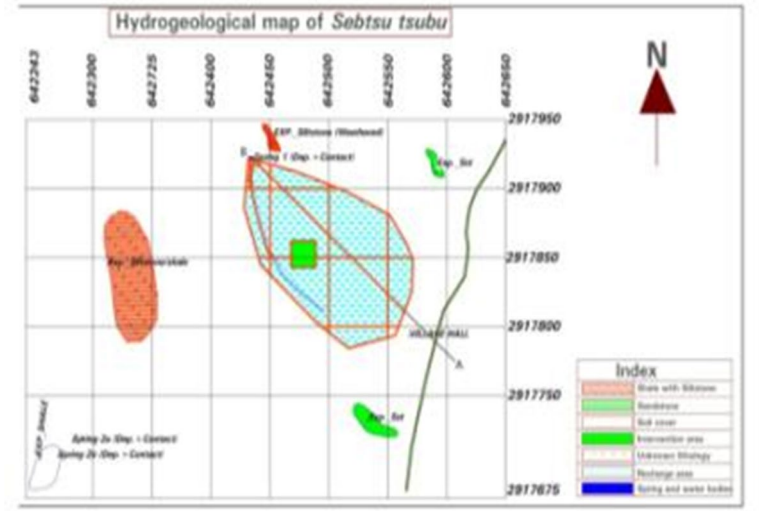
WUG's Roles and Responsibilities

Supervision	Sanitation Protocols	Contribution
Benefit Sharing norms	Monitoring	Financial Transparency

IV: Hydro-Geological Planning and Mapping


Creation of Spring Inventory

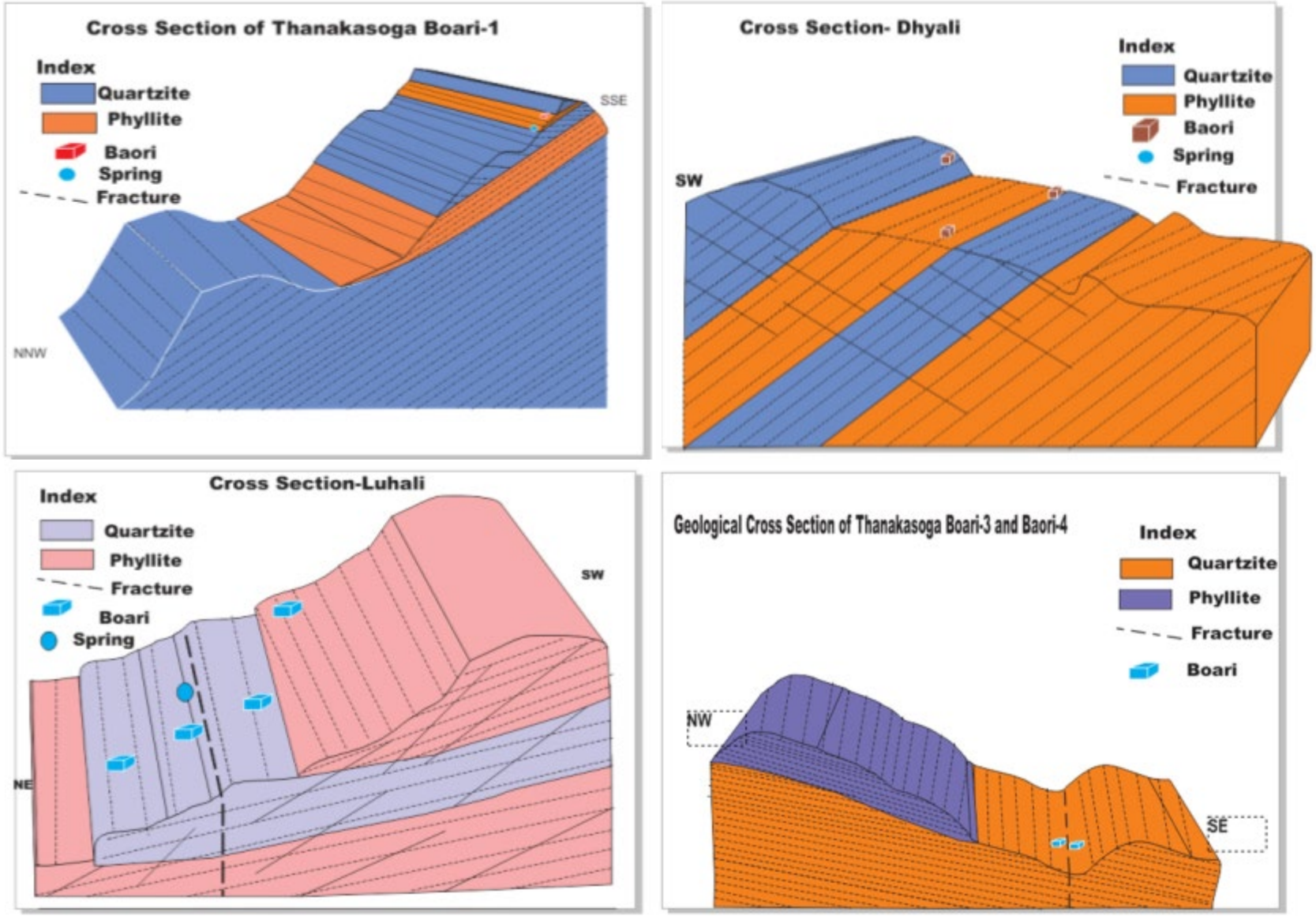

Geological Survey of Exposed Area



Hydrogeological Map of Spring

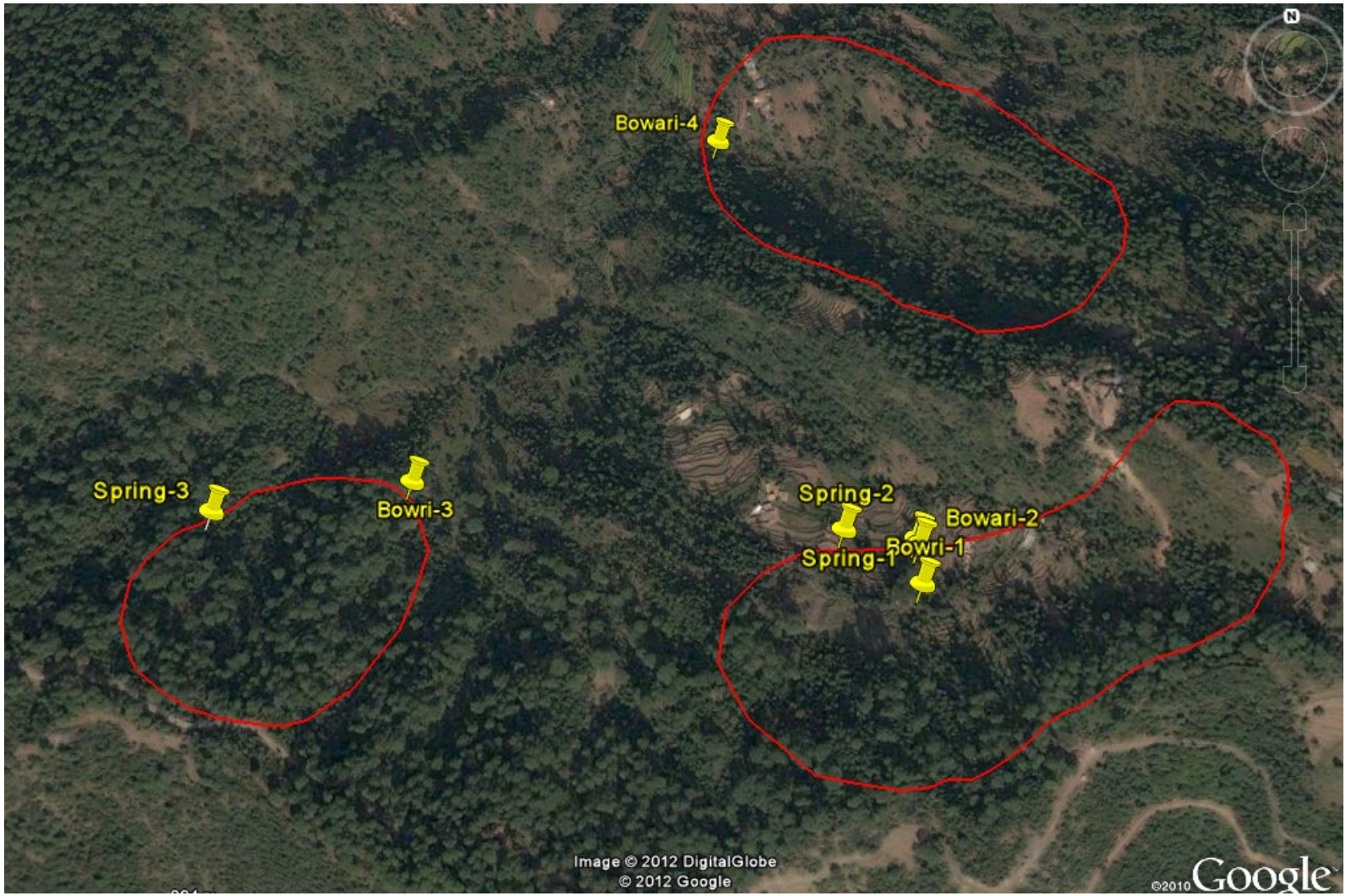

Measurement of Dip & Strike

(V) Conceptual Hyro-geological Layout of Springsheds



Cross-Sections of Springs of Thanakasoga GP, Sirmour District, Himachal Pradesh

Recharge Area Mapping



Springs and their Recharge Areas in Luhali village, Thanakasoga GP, HP

Profiling of Springs of Thanakasoga GP, Sirmour District, Himachal Pradesh

Springs	Thana-1	Thana-2	Dhyali-1	Dhyali-2	Luhali-3
Co-ordinates	N 30 35'12.1" E077 24'30.7"	N 30 35'00.8" E077 24'36.0"	N 30 35'06.3" E077 24'52.0"	N 30 35'04.3" E077 25'10.4"	N 30 35'30.9" E077 23'18.0"
Lithology (Rock Type)	Highly weathered Ferruginous Phyllite and Quartzite	Weathered ferruginous Phyllite weathered	Weathered Phyllite	Phyllite	Quartzite
Spring Typology	Fracture and Depression	Fracture and Depression	Depression	Fracture	Fracture
Seasonality	Seasonal	Seasonal	Perennial	Perennial	Perennial
Usage	Drinking and Domestic	Drinking and Domestic	Drinking and Domestic	Drinking and Domestic	Drinking and Domestic
Recharge area (Ha)	2.5 ha	2 ha	3 ha	2 ha	3 ha

(VI) Preparation of Springshed Management Plans

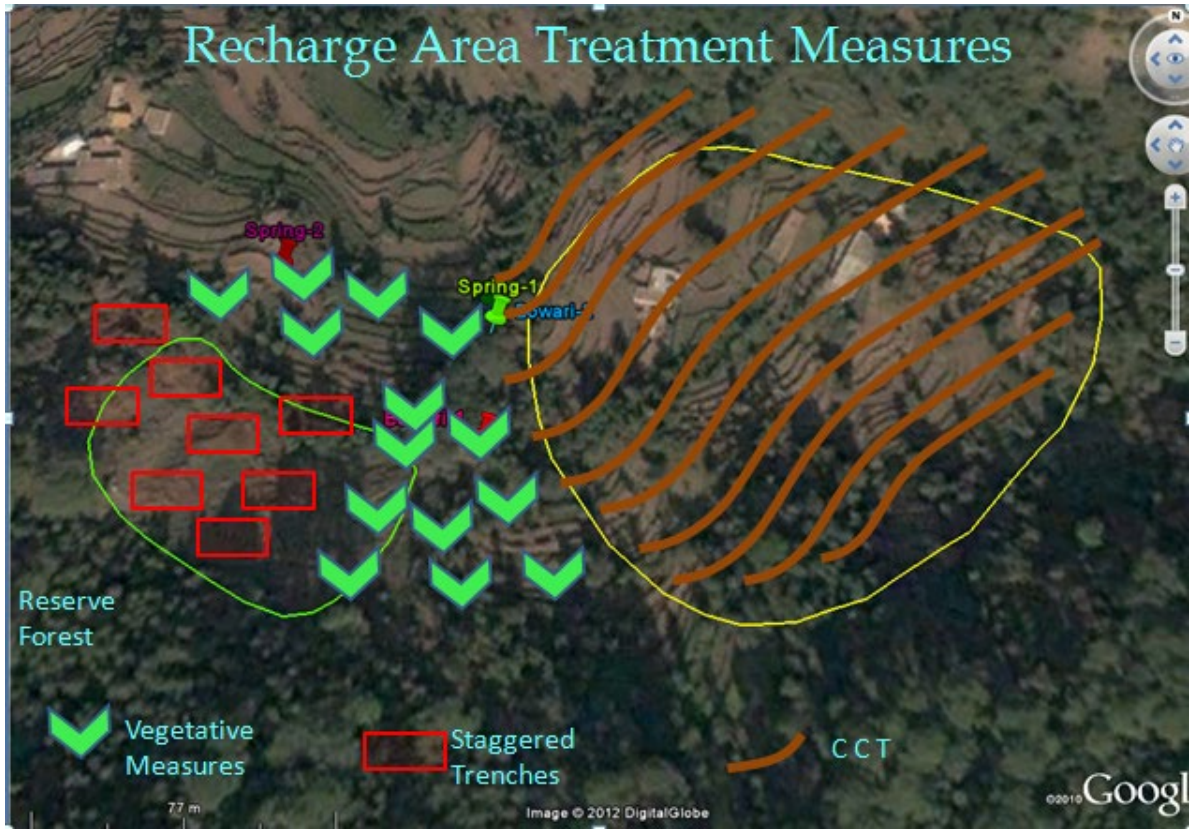
Springshed Management Plans consist of Engineering, Biological and Social Measures

S. No.	Site	Treated Area (ha)	Number of Staggered Contour Trenches	Number of Continuous Contour Trenches	Storage Capacity Created (volume in cubic meters)	No. of fruit plants	No. of fodder plants	No. of grass saplings
1	Thana-1	2.3	144	106	190	148	900	4000
2	Thana-2	2.5	129	45	151	105	800	4000
3	Dhayali-1	3	112	-	120	98	830	4000
4	Dhayali-2	2.7	75	-	86	80	560	4000
5	Luhali-3	2.5	105	207	197	135	700	4000
Total		**13**	**565**	**358**	**744**	**566**	**3790**	**20000**

Total cost of recharge area treatment activities: Rs.12,25,452 ~ 2.5 lakhs per spring

Springshed Treatment Measures

Selection of Treatment Measures should factor in (1) Slope, (2) Soil Depth, (3) Land Use, (4) Land Ownership, and (5) Community's Needs



Slope	Dimension (LX W X D) m	Volume (cu m/ ha)	Horizontal Interval* (m)	Approx. Number/ ha
< 10%	3.0 x 1.0 x 0.75	190	7 - 15	110-220
10-20%	2.5 x 0.75 x0.75	175	6 - 12	160-320
20-30%	2.5 x 0.75 x 0.6	160	5 - 10	200-400
30-40%	2.0 x 0.6 x 0.6	120	4 - 8	240-480
40-50%	2.0 x 0.6 x 0.45	100	3 - 6	275-550

*** Varies with soil**

(VII) Implementation of Springshed Management Plans

Measurement of Slope

Laying out of Trenches

Digging of Trenches

Fodder at edges of Trenches

Establishment of Nurseries

Plantation in Recharge Area

Engineering Measures

Staggered Contour Trenches

Continuous Contour Trench

Loose Boulder Check Dam

Percolation Tank

Small Ponds

Gabion Check Dam

Biological Measures

Vegetative Measures

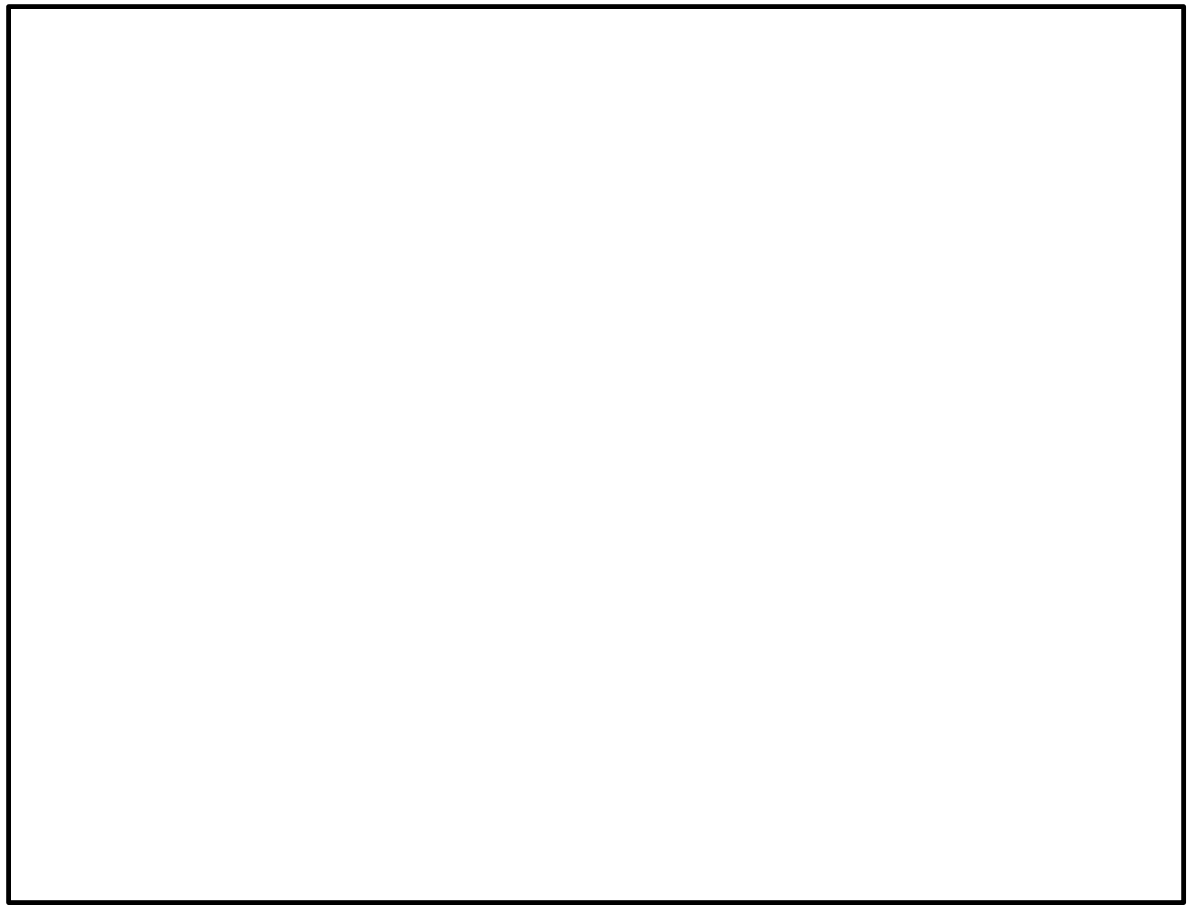
- Brushwood Dams
- Log Dams
- Vegetative Bunds
- Cribs
- Woven-wire Dams

Agricultural Measures

- Contour Farming
- Strip Cropping
- Mulching
- Composting
- Mixed Farming
- Agro-forestry

Pasture Development & Afforestation

- Fuel & Fodder Plantation
- Fruit Plantation
- Bio-diversity



Functions of Biological Measures

Demand Side Water Management: Concept and Tools

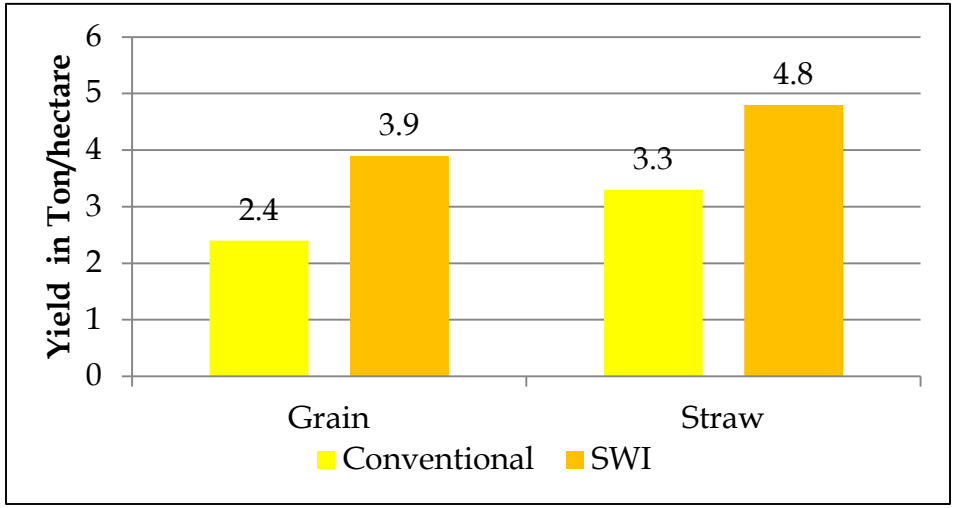
Demand side water management is defined as **reducing the amount of water being** used by the people for specific purposes, such as household, agriculture, municipal and industrial needs.

Technical	Social	Economical & Legal
• Reduction of water losses	• Behavioural changes	• Water pricing
• Leak detection & repair	• Public awareness	• Increasing block tariff
• Modern Irrigation techniques	• Educational curricula	• Fine/ Penalties/Fees
• Cropping Patterns	• Reduction of water losses	• Policies & Laws
• New water efficient practices		• Regulatory Framework

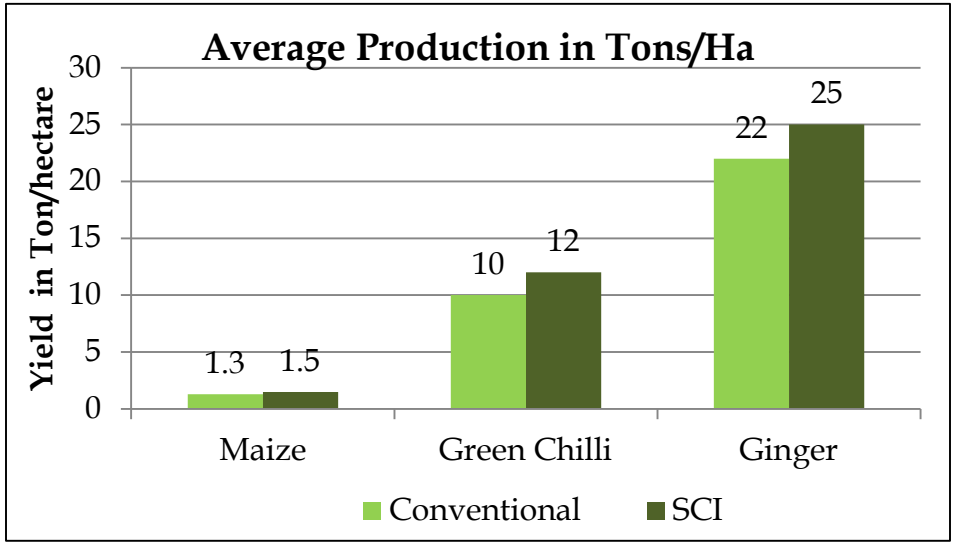
It is a long-term, integrated approach to water management that aims to conserve water by controlling use, influencing demand and promoting efficient use. The aim is to minimize loss and waste, to protect the water resources and to use water efficiently and effectively

Integrating Demand Management in ThanaKasoga GP

- With SWI technique, the average grain productivity of wheat went up from 2.4 tons/ ha to 3.9 tons/ ha grains



- The straw yield increased from 3.3 ton/ha to 4.8 ton/ha
- Introducing SCI for maize, vegetables and spices helped farmers (58 out of 152 households in 3 villages) earn additional income

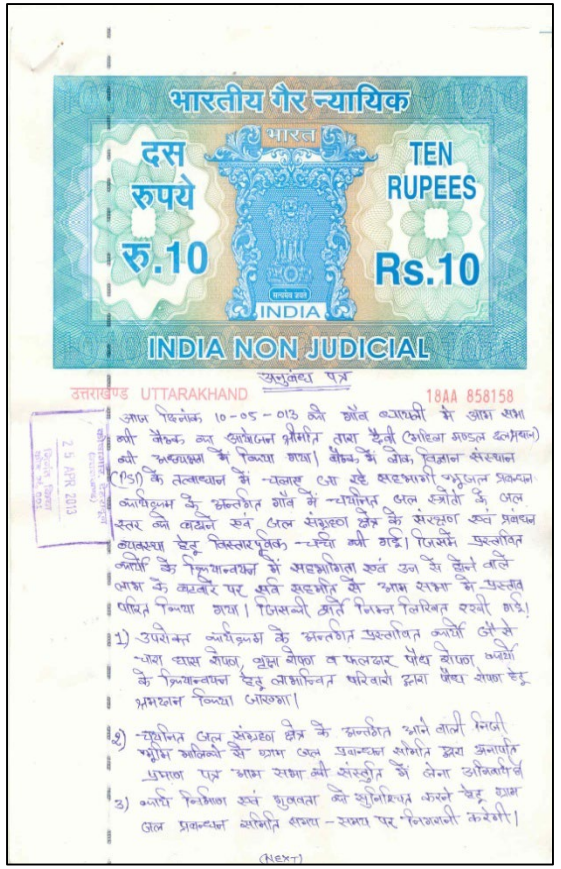


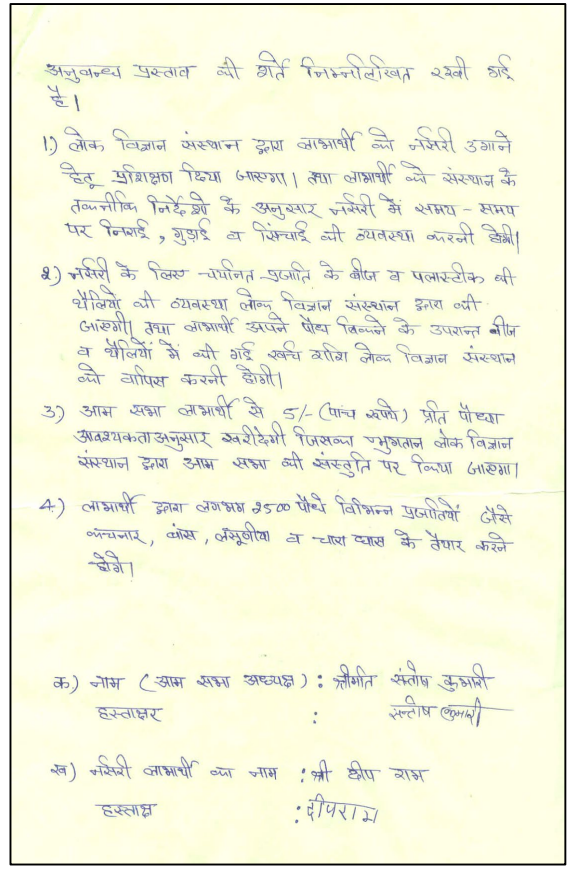
Springshed Management Protocols

Social Measures Adopted in Thanakasoga

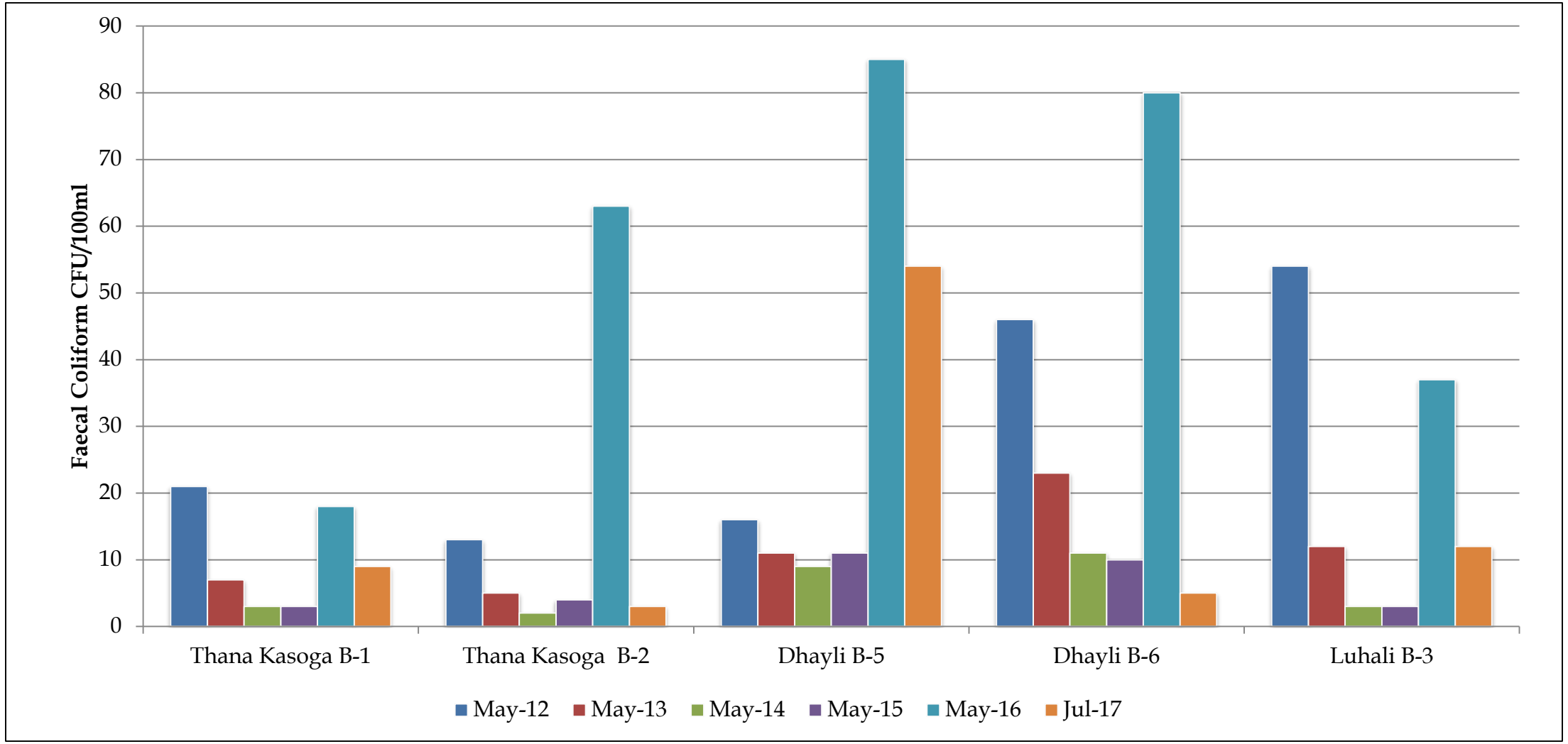
- Recharge area of springs mostly owned by absentee landlords
- Fruit trees (lemon) and grass planted along with trenches in the recharge area
- **Absentee landlords got fruits** whereas the **WUG members got additional fodder** apart from increased spring water supply
- Community imposed self-regulations – **Prohibiting (a) open defecation, (b) open grazing, and (c) green felling** in the recharge area
- Demand management was prioritized and community **adopted SCI** reducing agricultural water demand
- **Community based monitoring** helped in decision making

Springs' Protocols





(VIII) Measuring Impacts : Water Quality of Springs of Thanakasoga GP



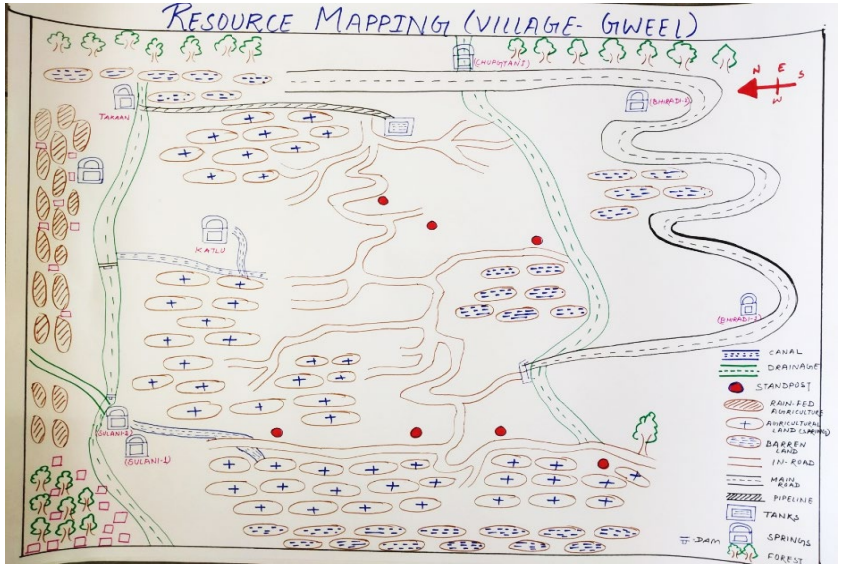
III. Results Framework and Monitoring Impacts

Impact and Results Framework

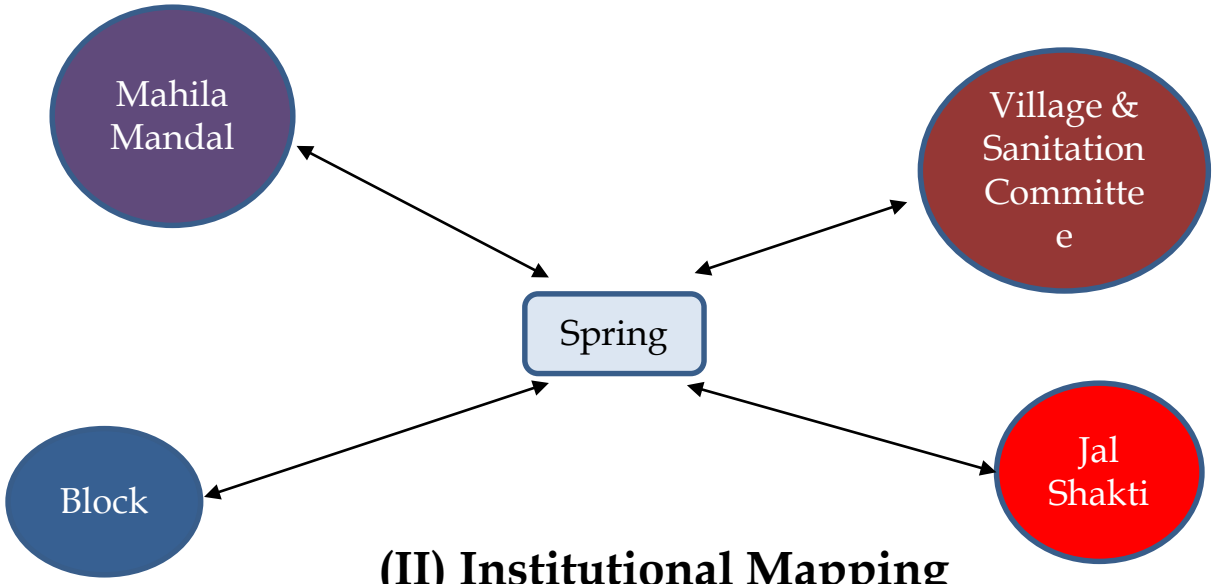
Major Impacts	Monitoring Indicators	Means of Verification
Natural Resource Productivity	Spring discharge	Springs flows – pre and post data (Register to be maintained)
	Water quality	Spring water quality - pre and post data (Register to be maintained)
	Soil moisture	Scientific data collected – pre and post
	Biomass productivity	Biomass Survey data collected – pre and post
	Soil erosion	Scientific data collected – pre and post
Economic Impact	Per capita increased availability of drinking water	Household water consumption survey – pre and post
	Fodder availability and increased production of livestock	Household surveys –Pre and Post
	Enhanced agriculture productivity	Household surveys and Crop Harvesting Data –Pre and Post
Social Impact	Better health indicator due to better water quality	PRAs, Household surveys and Health Records –Pre and Post
	Reduction in drudgery of women	PRA s and Household surveys –Pre and Post
	Per capita water accessibility (to measure the equitable distribution systems)	PRAs and Household surveys –Pre and Post
	Participation of weaker section of society and women in institutions	Attendance and profile of attendee in village meetings, Monthly meeting register
Sustainability of the Program	No. of cadre trained in Springshed development and their knowledge level	Impact assessment (impact of trainings to be assessed here)
	Strong village level institutions – social actions, participation	Case studies on social/collective action by communities
	Roadmap for future springshed development	Consultative meeting, Impact assessment studies

Components of Base Line Surveys & Participatory Impact Assessment

- Spring Discharge (Monthly)
- Spring Water Quality (Seasonal)
- Household Surveys- Water Consumption, Livestock Productivity, Health, and Women's drudgery
- Biomass Productivity: Grass Cutting
- Agricultural Productivity: Crop Productivity



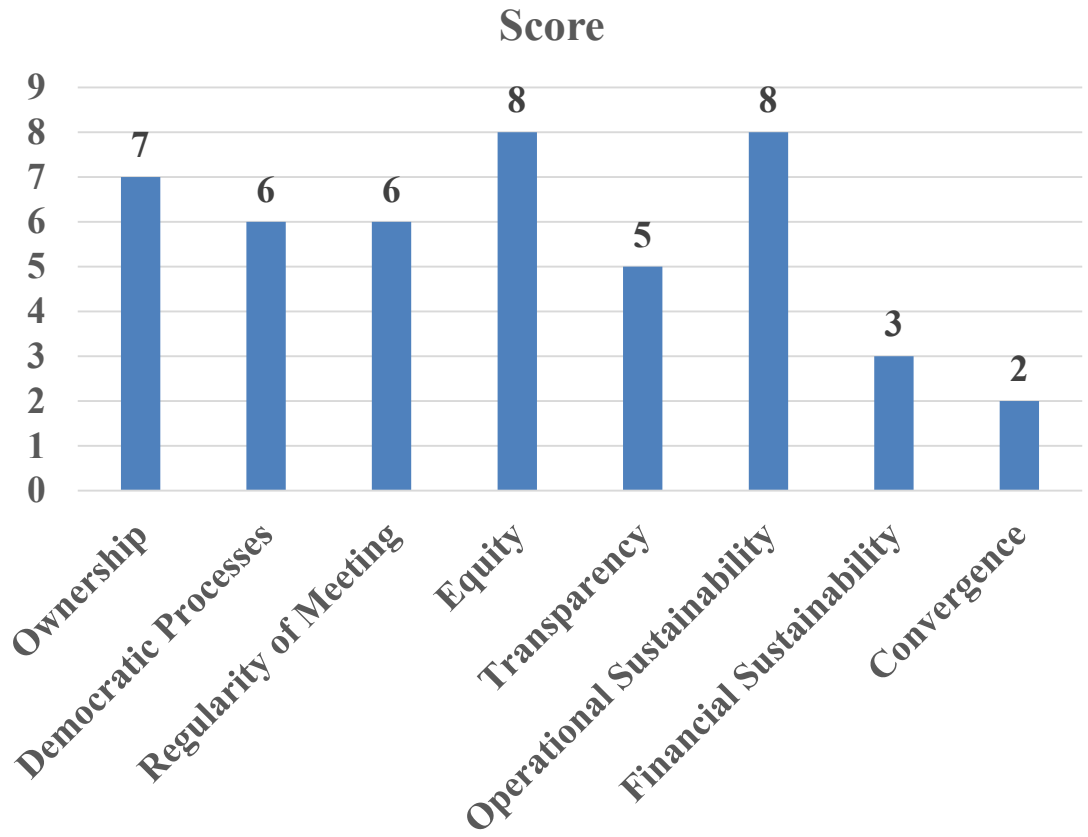
(I) Social and Resource Mapping



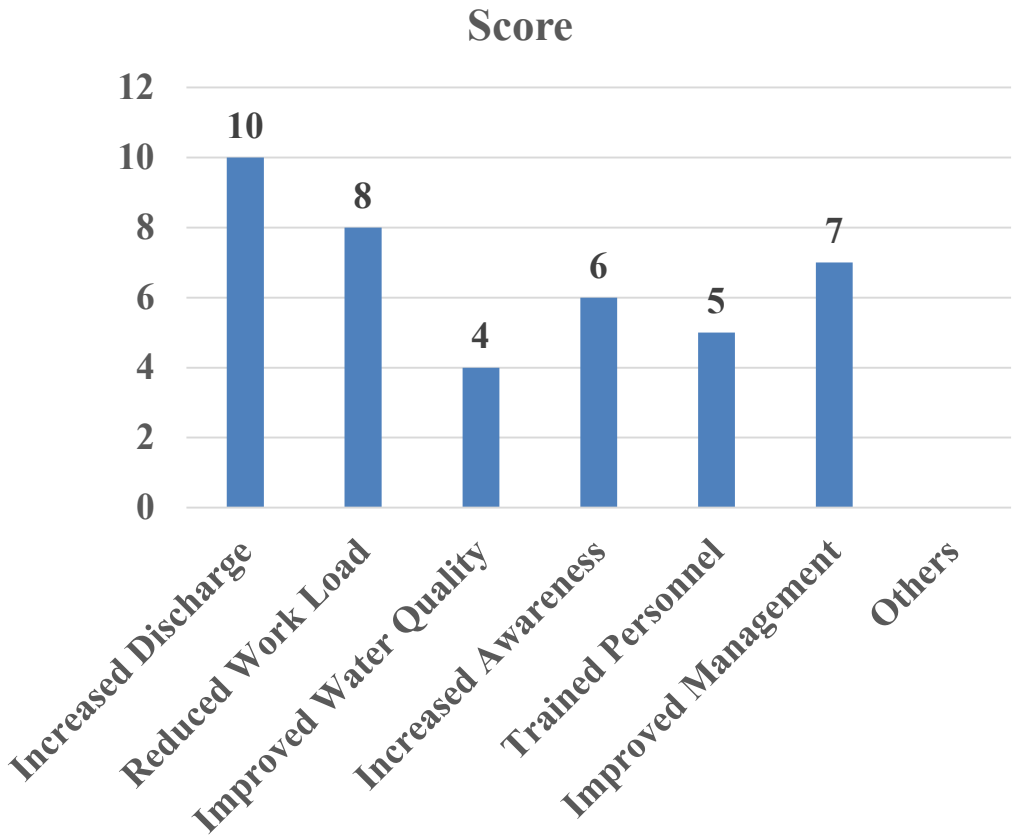
(II) Institutional Mapping

Participatory Exercises: Scoring and Ranking

(III) Performance of Institution responsible for Springshed Management of Treated Spring



(IV) Benefits of Springshed Management as per the community



High Resolution Hydrological Monitoring

a) Hilly terrain of Almora watershed

b) Mountainous terrain of Pauri watershed

c) Auto Weather Station

d) Spring location

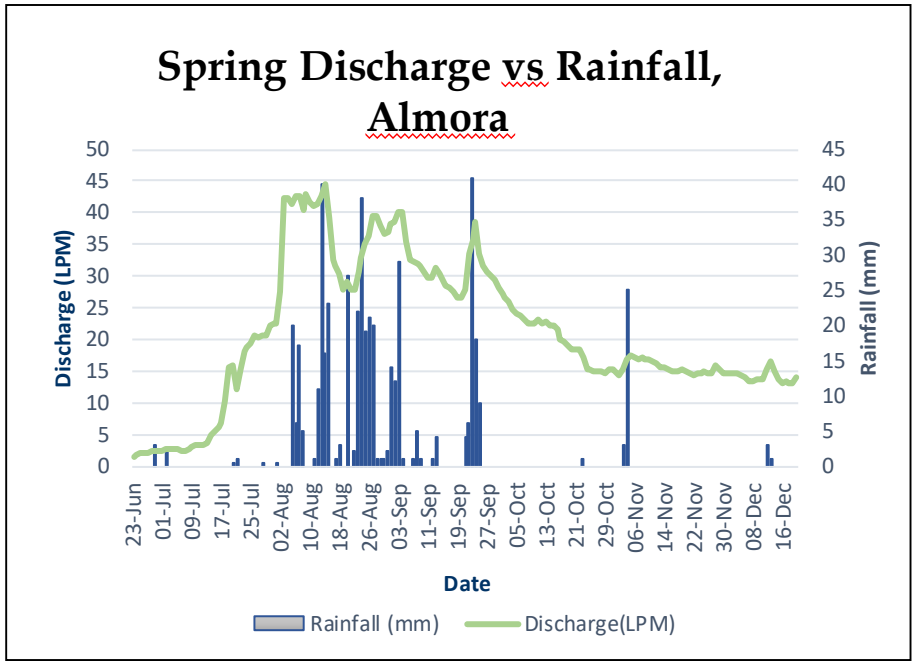
e) Parshall flume at stream

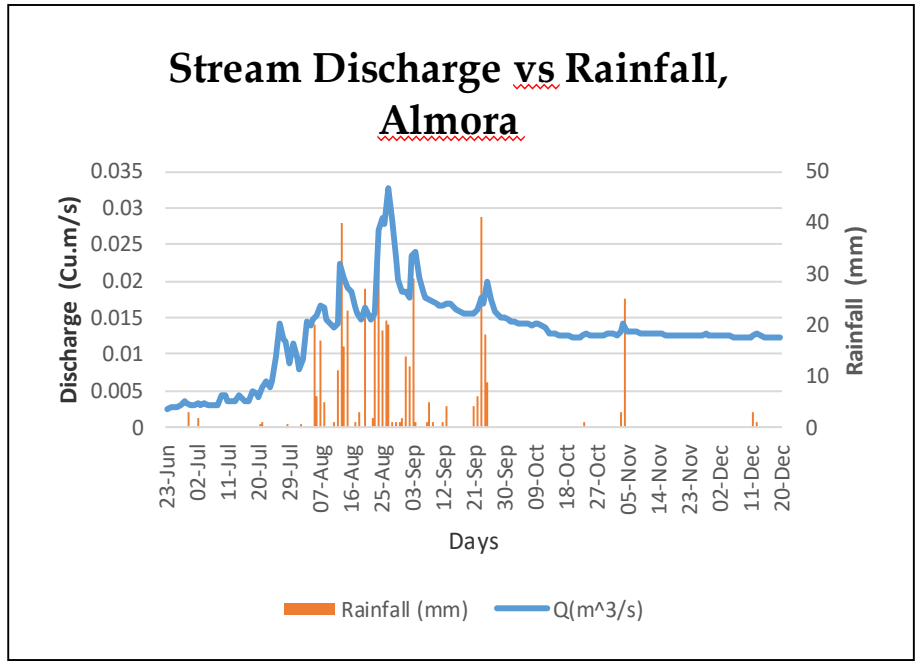
f) Lean flow in stream

g) Non-recording rain gauge

h) Installation of Pan Evaporimeter

Spring and Stream Discharge vs Rainfall- Shiv Gadera





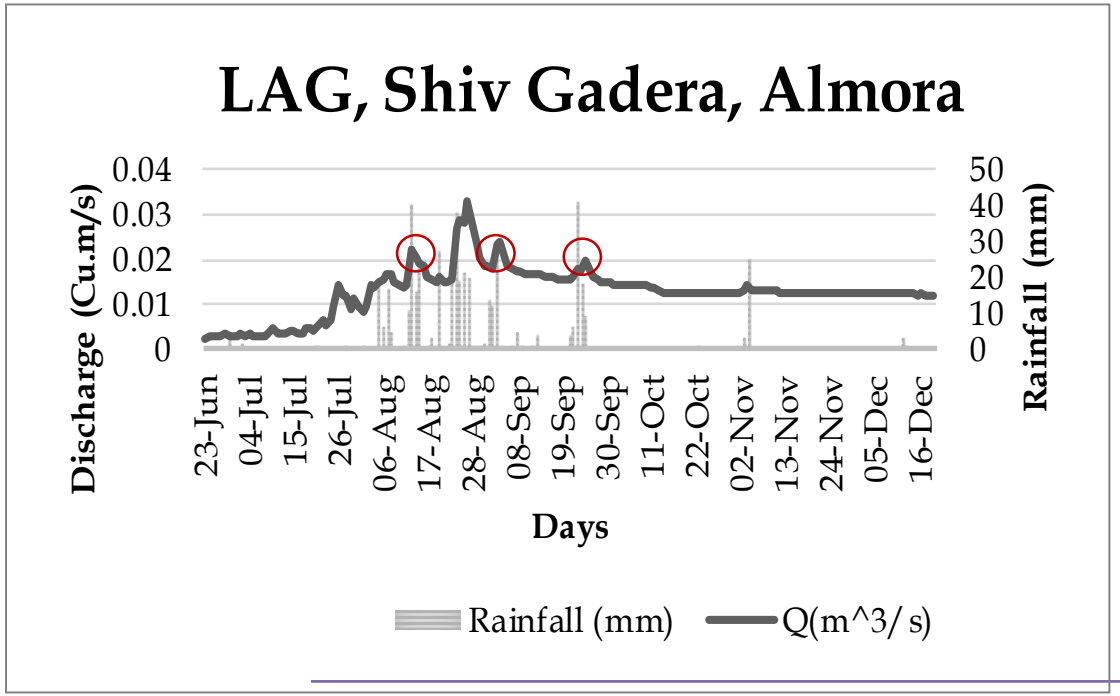
Average Spring Discharge	Maximum Flow	Minimum Flow
20.9 LPM	44.4 LPM	1.6 LPM

Average Stream Discharge	Maximum Flow	Minimum Flow
0.013 m^3s^{-1}	0.033 m^3s^{-1}	0.0026 m^3s^{-1}

Shiv Gadera Watershed, Almora

Area	Cum. Rainfall	Stream Runoff	Spring Discharge
176 Ha	483.5 mm	0.013 m^3s^{-1}	20.9 LPM

Lag Between Rainfall and Runoff



Date	Rainfall Magnitude	Rainfall Duration	Rainfall Intensity	Previous 5 Days' Rainfall
13/08/18	39 mm	7.5 hr	5.2 mm/hr	16 mm
03/09/18	25 mm	1.0 hr	25 mm/hr	27 mm
23/09/18	36 mm	8.0 hr	4.5 mm/hr	8 mm

Precipitation Peak	Lag (mins)	Stream Peak	Lag (mins)	Spring Discharge Peak
8:30 hrs (13 Aug)	**83**	9:53 hrs (13 Aug)	**400**	16:33 hrs (13 Aug)
15:00 hrs (3 Sept)	**8**	15:08 hrs (3 Sept)	**1120**	9:48 hrs (4 Sept)
14:30 hrs (23 Sept)	**80**	15:53 hrs (23 Sept)	**1495**	16:48 hrs (24 Sept)

- Increase in spring discharge after onset of monsoon on 29th July 2018
- High lag in spring response compared to stream.
- Potential for water storage and spring recharge intervention
- High resolution datasets helps monitoring and analysis of peaks.

IV. Challenges and Way Forward

Best Management Practices in SSM

Processes/Systems/Tools that can be replicated or scaled in IHR

- **Spring Inventory** Template
- Recording oral history of springs
- Dependency Mapping and **Water Budgeting – Village Level Water Security Plans**
- Hydro-geological mapping for characterization of springs & aquifers providing inputs to SSM
- **High resolution monitoring tools** for spring hydrology modeling
- Spring water quality assessment
- Identify the cause of deterioration of springs discharge and its water quality
- **Integration of septage management with springshed management**
- Develop need and **context specific protocols** for spring revival
- **Connecting recharge interventions with livelihoods**
- **Capacity building** of frontline workers and concerned stakeholders
- Enhanced community participation, especially women and **building springs water user groups**
- **Convergence** with MGNREGS and other schemes for implementation
- Implementation of Jal Abhyaranya Programme across Himalayas for spring revival
- Collaborations and Partnerships

Challenges and Gaps in Scaling Up SSM

In terms of knowledge, skills, practises

- **Active community involvement** is a challenge especially in the context of migration & tapped water supply
- Lack of awareness & capacity building both at GP level and at decision making levels
- Absence of training materials in local languages
- Absence of systematic data and information
- Aquifer characteristics overlooked while planning interventions
- Lack of understanding water and sanitation linkages
- Spring recharge activities like trenches can trigger landslides in steep slopes
- Community conflicts pertaining to common recharge area, sharing of water, etc.
- Reconciling natural and administrative boundaries where interventions or treatments are to be done
- Dedicated human resources and incentives for springshed management
- Lack of policy support for concept like spring sanctuaries for protecting the springs and it's recharge areas
- Lack of interdepartmental or inter-stakeholder convergence
- Decision support system required
- Cost benefit analysis of interventions is lacking to learn lessons
- SSM is not aligned with RD programs like MNREGS

Recommendations for Scaling Up SSM

- Springsheds to be recognized and treated as ecosystems
- Higher investment and resource allocation to **data collection, research and documentation**
- Aquifer mapping for spring regions and a unified open data repository - **Spring census** to be developed
- Tools and processes for **better monitoring** of springs work
- Investment in technological resources and **dedicated human resources**
- Common platform for **cross learning** between UKD and HP Departments
- Appropriate knowledge dissemination to **demystify science to the community** and their skill building
- **Incentives for community level persons** through convergence of relevant schemes
- Source and **septage management** to avoid contamination
- Urban springs and springshed management should also become a specific focus area
- **Convergence and collaboration**
- Well-defined role and **mandate of GP**, Block, District level departments, to be scaled at state level - open channel policy discourse
- **A national-level springshed programme** and guidelines on protection of springs and roadmap for revival

Dedicated policy to enable springshed work and convergence of resources

Way Forward

"Springs should be treated as critical ecosystems, to be managed primarily by local communities for promoting safe and secured water primarily for drinking water in an equitable and sustainable manner"

Major Recommendations:

1	Inventorization of Springs	Systematic information gathering protocols, Creation of geo-tagged based regional/national level inventory, Web Portal by research/technical institutions, Identification of priority areas based on database
2	Research, knowledge and documentation	Spring as ecosystem, Aquifer mapping, Documentation of heritage, traditions, & culture, platforms for exchange of knowledge and experiences
3	Springshed Management	Adoption of 8-Step Methodology, Trans-disciplinary work, Integration of traditional knowledge, location specific best practices, Promote demand management and water efficient technologies, Institutional Framework including PRIs, Address water quality, Convergence
4	Capacity Building	Para-hydrogeologists (especially women) along with incentive mechanisms, Community to Government level capacity building, Development of IEC materials

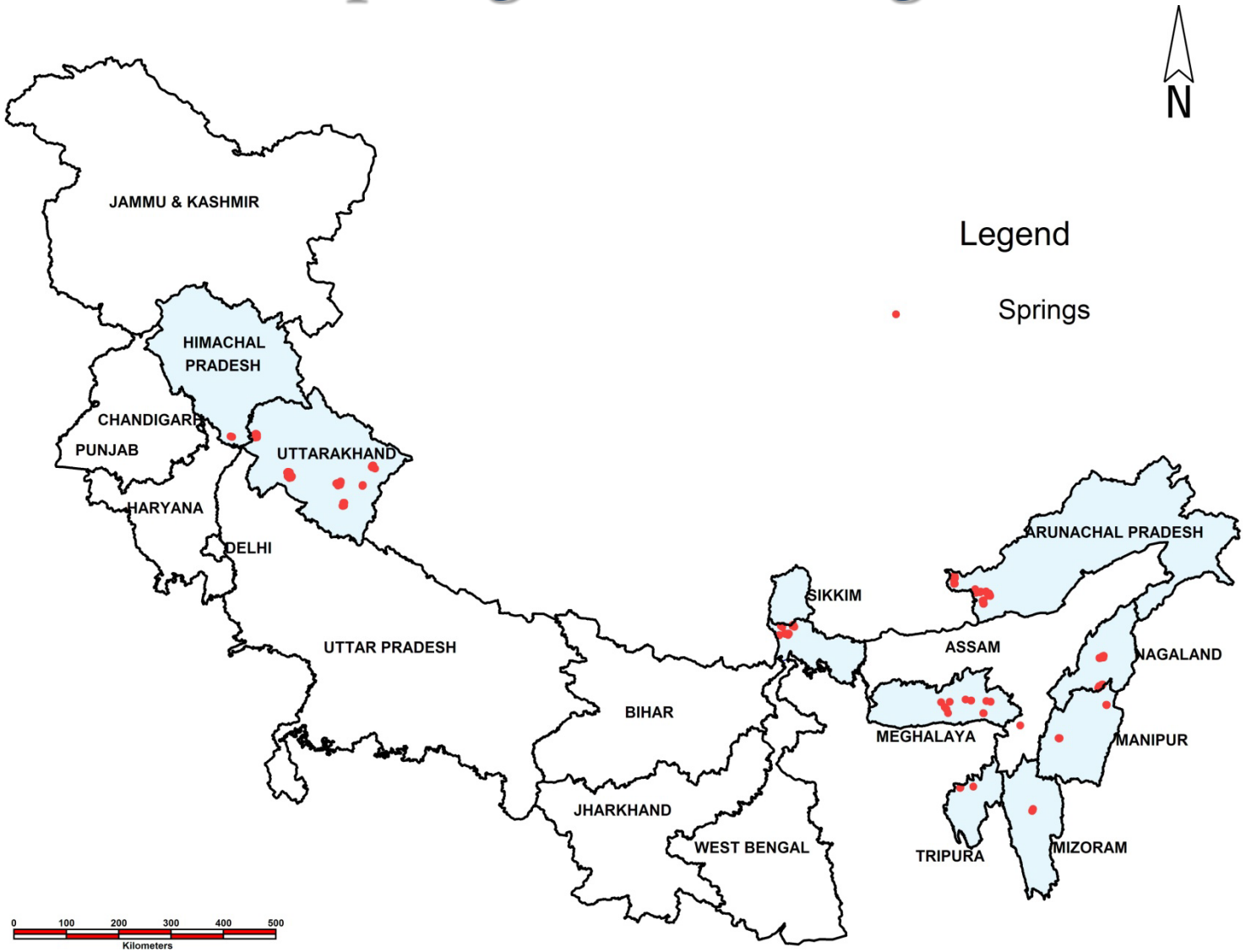
V. Our Outreach and Achievements in SSM

Our Outreach in Springshed Managemnet

STATES
10

VILLAGES
500+

INVESTMENT
~6 CRORES

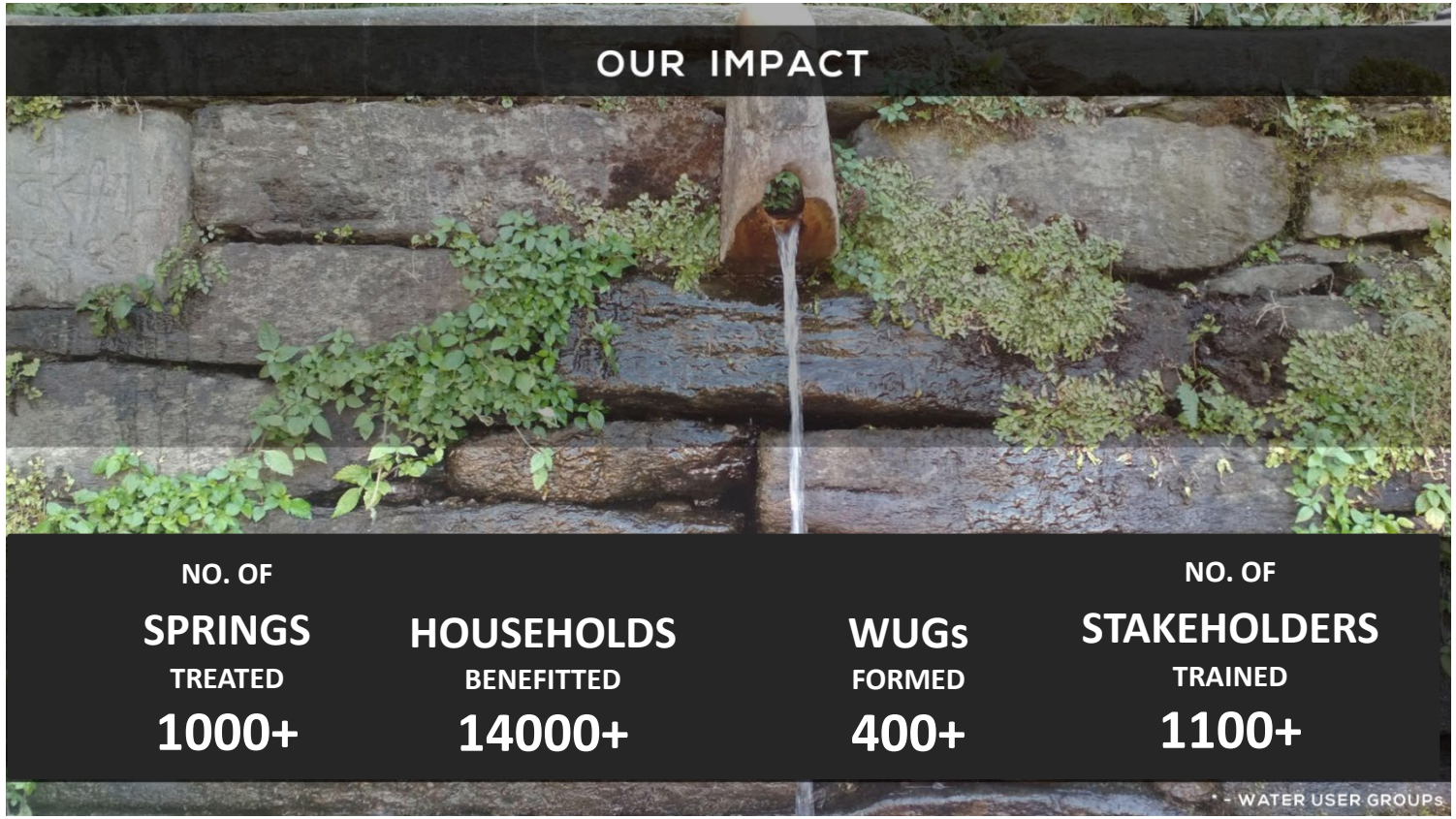


Springs' Rejuvenation Programs in H.P.

Year	Spring Rejuvenation Work	Partners	Financial Support
2002-2006	Under Watershed Development Programs (98 springs)	7 VOs of Himachal Pradesh	CAPART, MoRD, New Delhi & Tata Trusts, Mumbai
2012-2016	Participatory Ground Water Management (PGWM) Program in Sirmour, Himachal Pradesh (5 springs)	-	Arghyam, Bengaluru
2020-2024	Water Security Through Integrated Water Management Based on Scientific Data & Evidence-Based Decision Support System in Solan, Mandi, Kangra & Bilaspur districts of Himachal Pradesh (45 springs)	3 VOs of Himachal Pradesh, ACWADAM & IIT-Roorkee	Wheel Global Foundation, India & USA
2021-2023	Development and Implementation of Science-based Springshed Management in Chamba & Kangra districts of Himachal Pradesh (7 springs)	1 VO of Himachal Pradesh & Forest Department, Chamba	ICIMOD, Kathmandu

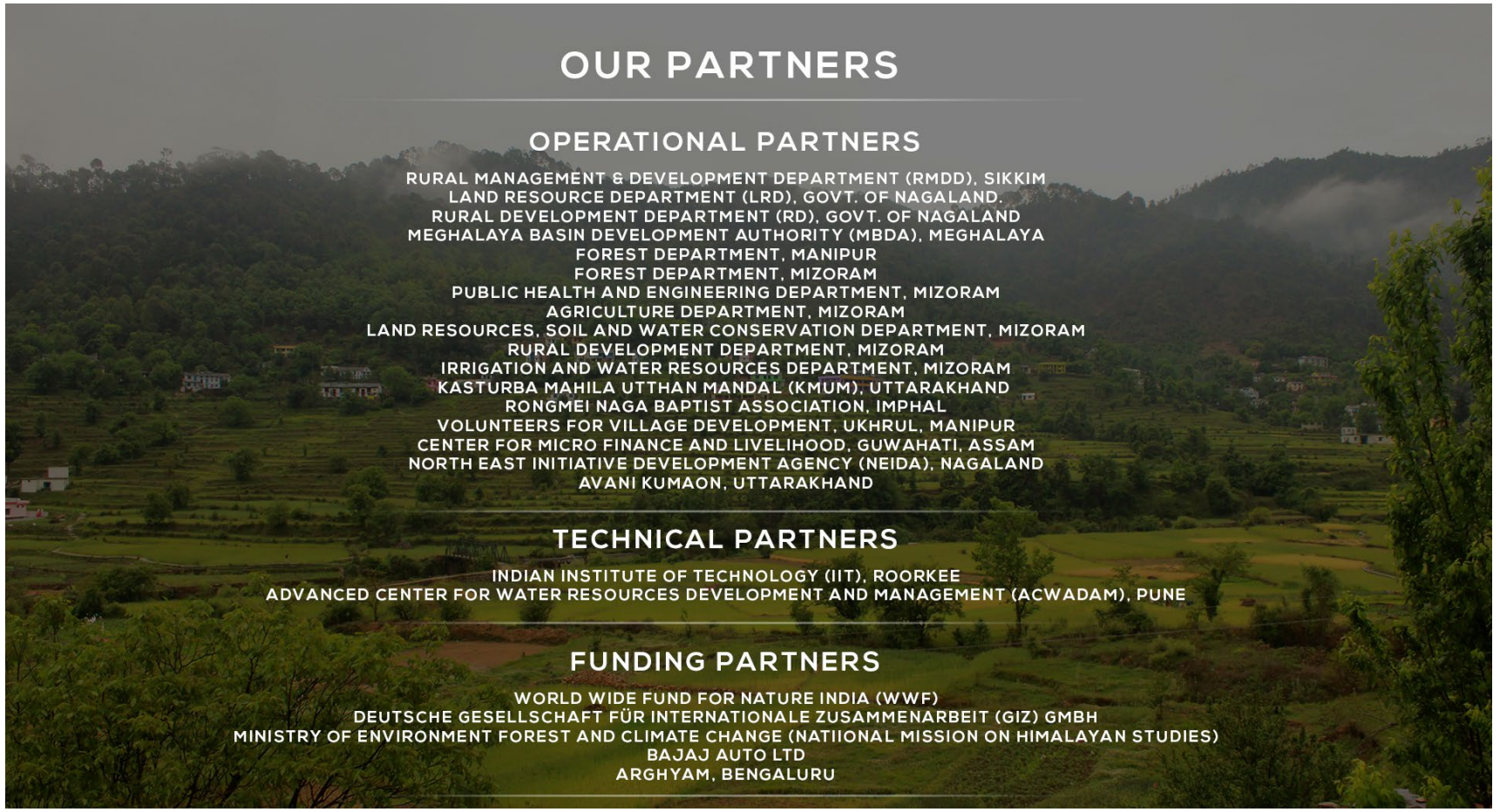
Our Achievements in SSM

- Inventory of more than 4000 springs in the Indian Himalayan Region
- Increased spring discharge (up to 3-5 times) leading to enhanced per capita water availability
- Access extended to drier months (extension of 2 to 4 months in a year)
- Reduction in bacterial contamination in treated springs and beyond
- Reduced drudgery of women and enhanced local governance



- Creation of local cadre of more than 100 para hydrogeologists
- Enhanced livelihoods security from increased water and biomass production
- Development of Springs MIS

Thank You



Web : **www.peoplesscienceinstitute.org**
Mail : **psiddoon@gmail.com**
Phone : **+91 135 3500308/09**

ITBP Road, P.O. Kanwali
Dehra Doon - 248 001
Uttarakhand, INDIA

Training Modules

Training Module – I

Theory

- Groundwater and its significance
- Introduction to springs
- Introduction to geology and hydrogeological properties of the rocks
- Introduction to Springshed Management
- Spring discharge measurement
- Groundwater quality: An introduction
- In-situ water quality testing
- Springshed planning: Water demand, supply and gap estimates
- Introduction to use of instruments like GPS, Brunton
- Community mobilization (Sandesh Yatra)
- Social and resource mapping
- Field Work: Transect walk, Identification of springs and rocks, geological mapping

Pedagogy: classroom lectures, group discussions, practicals & field exposure

Training Module – II

Theory

- Revision of the first training
- Identification of recharge area
- Springs regeneration methods
- Engineering survey: contour mapping: use of A-Frame, slope measurement
- Engineering and Vegetative measures

Field Work: Slope measurement, Contour mapping, Layout of SCTs

Training Module – III

Theory

- Revision of the second training
- Formation of Spring Water User Group
- Protocols for WUGs including social fencing, sharing of water, contributions..
- Monitoring Systems: Rainfall, Discharge & Quality

Field Work: Formation of WUG, Installation of rain gauges

Relation between Sewage Disposal Practices and Faecal Contamination - Almora

- Dependency on an estimated 69 naulas especially during summers
- Massive unplanned construction of houses and hotels
- Quality of ground water is suffering because of lack of sewage disposal systems, insufficient septic tanks, soak pits and unlined open drains