Impact Assessment Report

“Recharging Spring for Water Security” Nainital District, Uttarakhand

Contents

Acknowledgement

We are grateful to Dharampal Satyapal Group for entrusting us with this study in Uttarakhand State.

We would like to thank the entire team of CHIRAG (Central Himalayan Rural Action Group) for their constant support and guidance during the field study. We also acknowledge the support of field staff in all the study villages for their active participation during the field processes.

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Centre for Integrated Development
& DSC Foundation

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Abbreviations

APL	Above Poverty Line
BPL	Below Poverty Line
CHIRAG	Central Himalayan Rural Action Group
CAPI	Computerized Assisted Personal Interview
DS	Dharampal Satyapal
FGD	Focus Group Discussion
FHTC	Functional Household Tap Connection
HH	Household
KII	Key Informant Interview
LPM	Litres per Minute
MBGL	Meters below Ground Level
OBC	Other Backward Class
SC	Scheduled Caste
SHG	Self Help Group
SMC	Soil Moisture Conservation

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Executive Summary

BACKGROUND

Uttarakhand, a mountainous state, relies heavily on springs as a natural water source, especially in the Kumaon and Garhwal regions. The primarily agrarian community in the project villages of Dhari block in Nainital district of Uttarakhand relies on springs as a primary and crucial source of drinking, domestic & irrigation purposes. In the past 2 decades, spring water availability and quality have been increasingly affected by various natural and human-induced factors like deforestation, changing land use, sanitation practices, population growth, and climate change. This has affected the spring discharge & led to drying up of springs, leading to water scarcity and impacting the livelihoods of the agrarian community.

In order to address this challenge, CHIRAG (Central Himalayan Rural Action Group) has implemented the project 'Recharging Springs for Water security" in Dhari block of Nainital District of Uttarakhand with the support of Dharampal Satyapal Group. The project has been implemented from November 2020 to March 2023. The project had been designed to enhance the discharge of water from sources by recharging of spring through spring-shed management based on the hydrogeology of the area. A total of 40 springs have been rejuvenated, benefitting nearly 5200 inhabitants of the 19 villages in Dhari Block.

IMPACT STUDY BRIEF

The objectives of the Impact study are to assess the impact of interventions on increased spring discharge, increased water availability & adequacy, strengthened village-level institutions for managing springs & empowered community through knowledge transfer and data, taking into account the traditional practices. The impact study mainly looks into:

- Quality of technical works undertaken
- Document and assess project-related plans and achievements as per target
- Identify learnings, challenges, and best practices as well as success stories.
- Evaluate the project with reference to OECD parameters in terms of relevance, efficiency, effectiveness, impact, and sustainability.

A mixed-method approach is adopted for determining the impact, using both qualitative and quantitative aspects. Of the total 40 springs covered in the project, 13 springs are sampled for study. Quantitative study included a CAPI-based checklist and beneficiary interviews with 132 HHs and 18 HHs for roof top water harvesting systems. Qualitative aspects are studied through FGDs, KIIs and Case Study.

KEY FINDINGS

Project Region Brief

- Major sources of drinking, domestic, and irrigation water in hills are small rivers, streams and rivulets locally called "gadhera". Traditionally, "Naulas" were designed to collect water from subterranean seepages or springs for domestic water needs, but are not much in use now. Groundwater manifests as springs in the Himalayan Region. The springs are highly dependent on rainfall.

- Summers (March-June) are pleasant with temperatures between 10°C and 20°C, Monsoon (July-September) bring heavy rainfall. Winters (November-February) are cold, with temperatures potentially dropping to 0°C or lower, and occasional snowfall.
- Annual rainfall is good, ranging from 1500-1890 mm annually.[1]
- The community normally lives in clusters/clans with an average family size of 6 members.
- The community in the region primarily depends on agriculture as a primary occupation. Livestock rearing is also high to augment income, with more than 60% of HHs from the sample survey owning mainly milch cattle or small ruminants.

Type of Physical Interventions

- Varied water conservation & management interventions have been undertaken in the project.
- The most frequently implemented interventions are contour trenches, mainly to control water runoff and improve groundwater recharge. Percolation pits have been constructed in conjunction with trenches to enhance water infiltration.
- Spring collection pits (new and repairs) have been constructed on all springs for the collection of water and ease in fetching for the community.
- Spring sources have been rejuvenated through structural interventions like deep recharge pits and check dams.
- Plantation activities were also part of the project's ecological approach and promote natural recharge.
- Limited roof top water harvesting system at the household level have been taken up for capturing rain and ensuing storage at the source.

Status of Physical Structures

- Various community ownership structures have been verified on 13 springs. The location of various structures seems appropriate. While the majority are in good condition, it has been observed that a few infrastructures now require repairs. The loose boulder check dam on Bhumiya Than Dhara in Babiyar village is scattered and needs repairs. Trenches need maintenance to continue functioning effectively. Contour trenches and percolation pit need cleaning and deepening /digging, and removal of vegetative cover inside. Of the total 13 spring water collection pit, 8 are in good condition. 5 pits require minor plaster repair.
- Individual assets in the form of RRWHS are in good condition and well-maintained. While there is no structural damage, chipping of plaster might need repairs in the long run, though seepage is not seen in any of the structures.
- Cleaning of spring catchment & desilting is carried out in all villages by WUC or community or Panchayats.

Project Implementation Strategy

- Project implementation strategy involved achieving the project objective by creating ownership of the community towards natural resources.
- The project activities included a feasibility survey of the springs for need-based spring selection, including hydrogeological surveys, an orientation meeting and establishing a

[1] . (source: CRIS-IMD, District Wise Rainfall Pattern (2017-2024), Indian Meteorological Department).

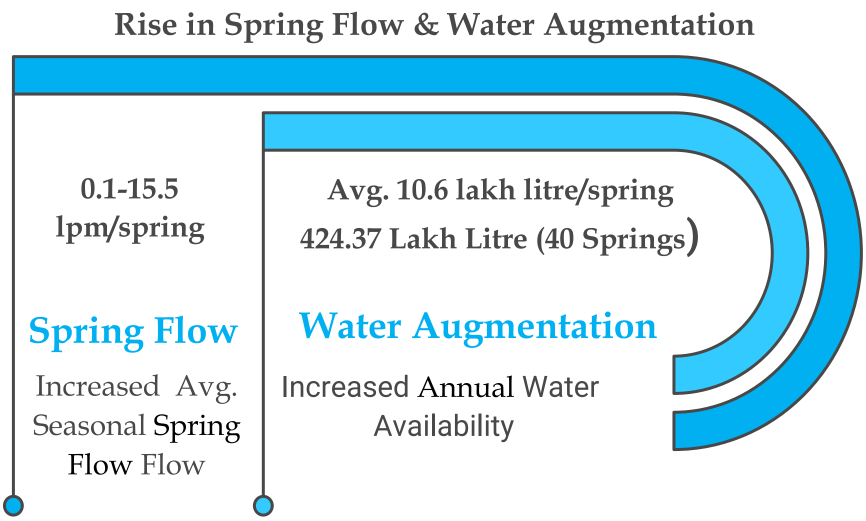
baseline, community mobilization for the formation of Water User Committee (WUC) & identification of Key Resource Persons (KRPs), capacity building of WUC and KRP.

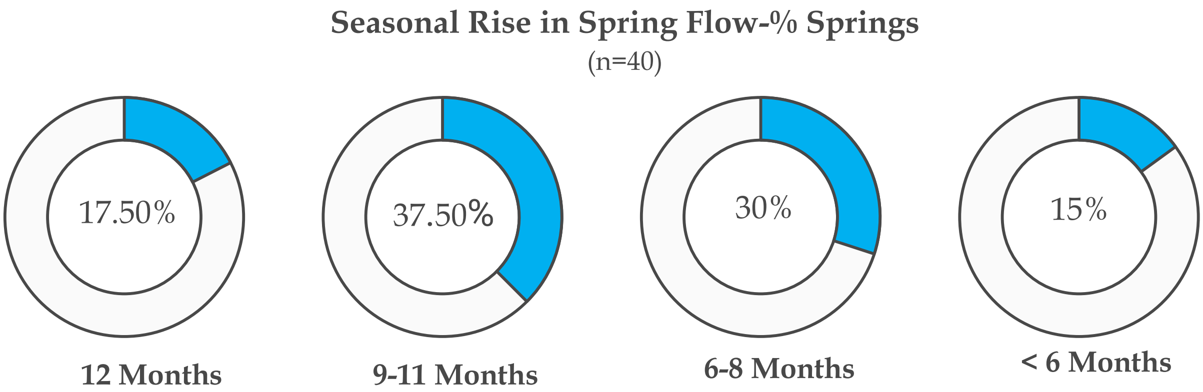
- The implementation works have been carried out in coordination with the Water User Committees (WUCs), continuously monitored by CHIRAG.
- To ensure sustainability, all the spring recharge-related interventions involve small amounts of monetary contribution from the beneficiaries, deposited as a maintenance fund, which will ensure the sustainability of the spring recharge structures.
- WUCs formed are responsible for the cleanliness and maintenance of these water structures.
- As part of an exit strategy, CHIRAG has gradually handed over the work done to the WUCs for independent management.

Impact of Spring Rejuvenation on Spring Flow

Longitudinal data have been maintained by CHIRAG and KRP. The following are major findings from the spring flow comparison of data pre (Nov 2020-Sept 2021) as well as post-interventions (April 2022-March 2023) for 40 springs. The following are key findings:

- The data indicates the average seasonal rise of 0.1-15.5 lpm/spring, resulting in annual water augmentation of 424.37 lakh litres from total of 40 springs.
- Nearly 17.5% of springs indicate a rise in spring flow year round.



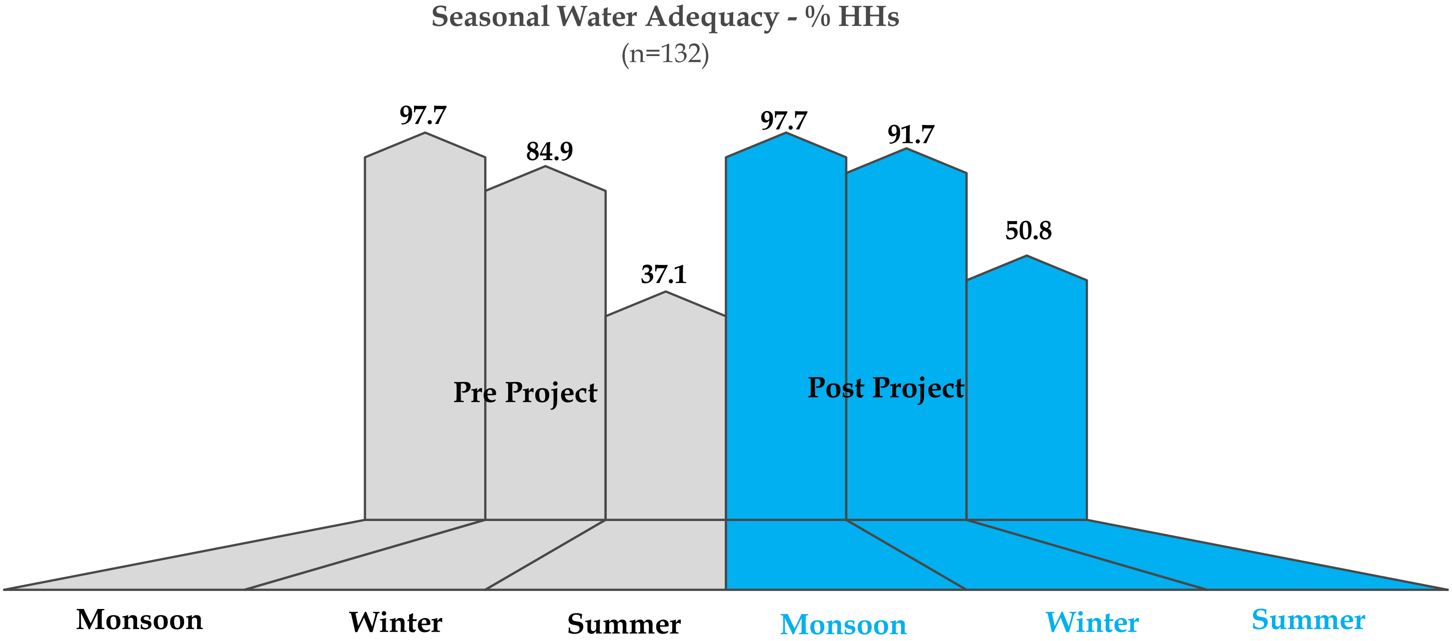


Spring water flow was measured in 11 springs during the field visit in April 2025 and compared with the baseline data in April 2021, which indicates a rise in spring flow in 64% of springs despite lower rainfall in April 2025. A rise of 0.09 lpm to a maximum 4.8 lpm (Balkandiya Dhara) has been noted in April.

(detailed data in core report)

Impact of Spring Rejuvenation on Water Availability, Adequacy & Quality

- Water Source: Due to spring rejuvenation and increased water availability, there is a rising dependence post-project on springs (direct fetching) and reduced dependence on lake/pond, and well.
- Water Adequacy: There is a major impact on water adequacy in lean months, summer, with more than 50% HHs reporting water adequacy post-project as compared to merely 37.1% HHs before the project, indicating a rise of 13.7% HHs with water adequacy. While there is increased discharge in springs, the water consumption pattern remains quite similar in the region.



- Water Quality & Water Treatment: Data of 29 springs indicates bacterial contamination /presence of faecal coliform in 93% of springs, which needs attention. Water tests also indicate that higher fluoride concentrations in most springs. 1.6% of HHs reported water borne disease, mainly Jaundice during baseline, while none of the HHs reported the disease last year. Water quality has improved in terms of reduced dirt/mud due to the new/repair of spring collection tanks.

Social Impact

- Project has been instrumental in the reduction of drudgery for fetching water, which has been a boon, especially for females and young girls who normally bear the brunt.
- RRWHS has been highly effective in eliminating the need for fetching water for 2-3 months a year. The major impact of RRWHT is a sense of security due to the storage system at home and a reduction in frequency and time spent on fetching water. Further atleast for the monsoon months, people reported improved water quality.
- For HHs not having tap connection at home nor roof top tank, utensil filling time has reduced significantly due to increased spring flow. However, trip time from home to spring still remains a challenge due to a lack of conveyance or storage nearby. Over all 68% HHs reported having time saved in filling buckets from spring in winter, while the impact is low in monsoon and summer.

- It should however, be noted that due to spring recharge and water availability in near spring, dependence on far away springs is reduced, which has led to saving of trip time. The average time saved for fetching water (filling bucket plus trip time) in a day ranges from 10 min-25 min seasonally. Nearly 28.7% HHs reported to have reduction of more than 1 hour time for fetching water in summer.

Seasonal Impact on Drudgery for Fetching water
(n=132)

% HHs with Reduction in Drudgery	Monsoon	Winter	Summer
Reduced Time in Filling Buckets	34.1%	68.2%	23.5%
Reduced Time in Fetching Water (Filling bucket + Trip Time)	36.8%	80.3%	40.1%
Reduction of more than 1 hour/day for fetching water (Filling bucket + Trip Time)	12.8%	15.9%	28.7%

Water Governance, Community Capacity Building & Structure Maintenance

Water Governance & Spring Sharing Practices

- While more than 50% spring fall on private land, it was reported that spring sources were considered common property and were open to all, with no restrictions on spring sharing or access. Water tax/tariff is not yet collected in any of the project villages.

Water User Committee/Group (Jal Upboghata Samiti)

- WUC is a democratic body with responsibility of management of local spring sheds. These groups have played a key role in the maintenance of structures, coordinating usage, and, in some cases, managing financial contributions. Women, particularly those in leadership roles such as president and treasurer of the WUGs, have played a key role in supervising the implementation of activities.
- However, these user groups have become largely non-functional after the project period. Although they have financial resources available, none of the groups have utilized the collected user charges for repairing or maintaining the infrastructure.

Community Training & Capacity Building

- Capacity-building efforts were central to the project's implementation strategy. Community has been trained on various aspects like maintenance of structures, cleanliness around springs & judicious use of water.
- Community members reported increased knowledge, confidence, and a greater willingness to participate in developmental initiatives.

KRP (Key Resource Person)

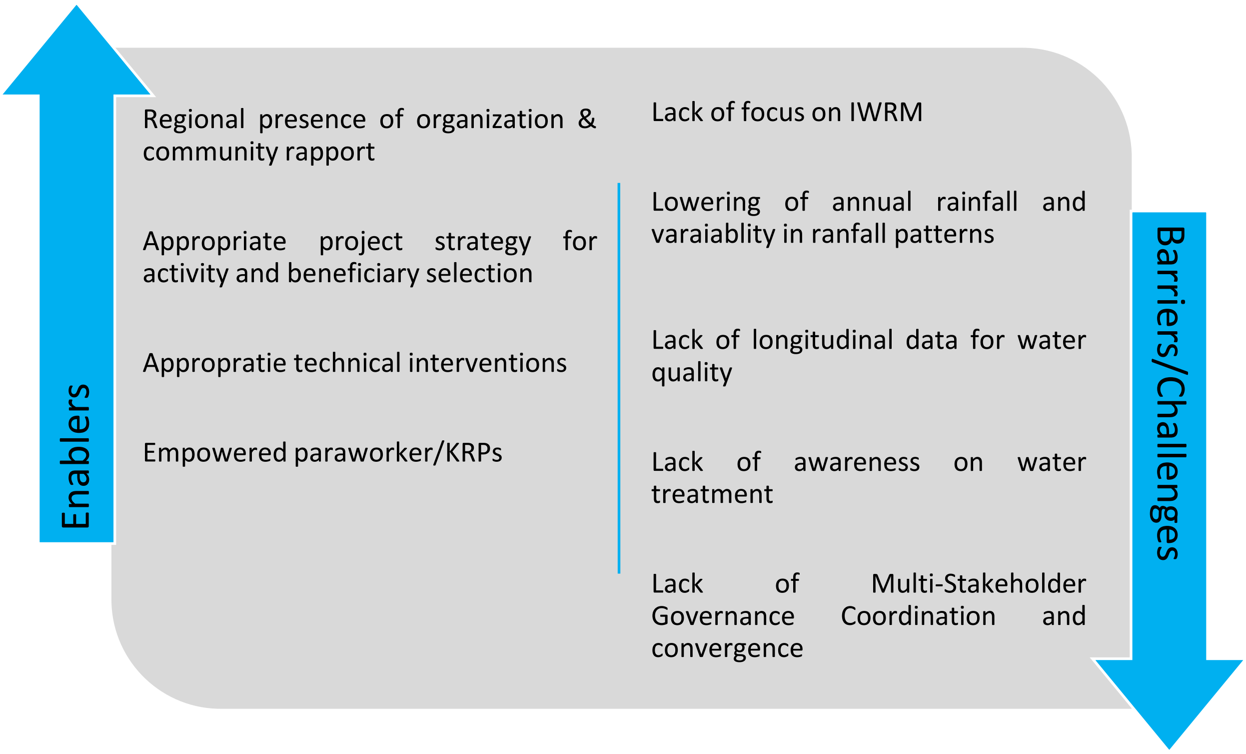
- The project's success can be largely attributed to the capacity building of KRPs as they have played a major role in decentralizing water governance.
- Across all the surveyed villages, the primary role of KRPs has been centred around the measurement of water flow from their respective springs. This includes basic hydrological tasks such as identifying water sources, assessing the volume of water flow, and monitoring changes over time.
- However, despite their consistent technical engagement, KRPs from all locations reported that they are not currently involved in any formal mechanism related to water governance or planning or even water flow management.

Role of PRIs

- Though a positive working environment has been maintained with PRIs during the project phase, their involvement in project activities has been limited during implementation and monitoring.

Summary & Way Forward

To summarize, the project has been highly successful in achieving its primary objective of increasing water flow in springs, which has increased water adequacy to a considerable level. By restoring and managing springs, this project contributes to overall water security, reducing the vulnerability of communities to water shortages, especially during lean seasons. Overall, the village communities are convinced about the concept of spring shed management and felt that the project has brought in all the listed benefits. The project activities were well implemented with the help of communities and concerned implementing agencies, resulting in satisfactory performance.



Project Relevance	Addresses water scarcity, a major challenge in mountainous regions
Project Efficiency	Highly efficient, focusing on targeted interventions that maximize impact with minimal resource expenditure (e.g trenches, infiltration tanks etc)
Project Effectiveness	Positive impact on spring discharge and water availability Spring discharge increased by 5-31% Enhanced water access for irrigation in few villages. Monitoring spring discharge throughout the project phase
Project Impact	Increased Water Adequacy (rise of HHs with water adequacy by 6.8% in winter and 13.7% in summer) Time saving on filling buckets from springs (68% HHs reported to have time saved in filling buckets from spring in winter) Overall time saving on fetching water- 10 min-25 min seasonally. 37 HHs harvesting upto 30000 litres annually through RRWHT
Project Sustainability	Effective Community organizing through formation of WUC Extensive capacity building and awareness on water conservation and judicious use of water Adaptation to climatic variations

Some of the recommendations are:

- **Adoption of Integrated Approach:** While source strengthening has been rightly focused, it is highly recommended that conveyance to the cluster level and ultimately to achieve FHTC (Functional Household Tap Connection) be planned. There is still scope for improvement in terms of the reduction in workload for collecting spring water. RRWHT has been highly successful and can be scaled up in the region for serving not only water harvesting at source, but also increased storage at home. Further, as irrigation needs and livestock needs are also met from these springs, an integrated approach through water budgeting and demand-side interventions should be done in the villages, ensuring equitable use of water in the future.
- **Convergence & Partnerships for Scaling Up:** There is a need for leveraging support and finance with government programs like Jal Jeevan Mission(JJM), Uttarakhand Peyjal Nigam (UJN), Uttarakhand Jal Sansthan (UJS), MGNREGA and the forest department for spring rejuvenation work and conveyance infrastructure for achieving FHTC, which has not been explored considering the bureaucratic hurdles and delays. But it can be planned if the project plans to take up work in Phase II.
- **Addressing Conflicts & Focusing on Sustainability:** For future sustainability, spring ownership and conflicts need to be looked at seriously because a lot of land is privately owned. Some governance mechanism, like social fencing or community tribunals needs to be devised for the water sharing mechanism.
- **Monitoring and Evaluation:** Long-term monitoring of spring discharge and water quality is crucial to assess the effectiveness of these projects and make necessary adjustments. Some arrangements should be made for longitudinal data collection by roping in KRP and Government line departments.
- **Post-project sustainability:** There is a need for long-term handholding to ensure the sustainability of community structures through regular monitoring and maintenance. Trained KRPs or existing youth groups can be hired on a project basis for an additional 2-3 years after project completion to ensure regular upkeep of the structures. Partnerships with government schemes or line departments (watershed and water supply departments) can also be sought upon for this purpose.

Project Indicators

Indicator	Target	Achievement	Source
Enhanced Spring discharge	Min. 1 lpm	0.95-15.5 lpm 0.09 lpm - 4.8 lpm (varied spring and seasons)	Data monitoring by Chirag (all months) Data measurement by CFID (month of April)
	5.26 lakh litres per source annually	Avg. 10.6 lakh litre per spring	Data monitoring by Chirag
Increased availability of water	341.64 Lakh liters per annum	424.37 Lakh Litres per annum	Data monitoring by Chirag
Water harvesting through Roof Top Water Harvesting System	10.5 Lakh Litres/year	11.1 Lakh Litres/year	Sample HH survey
Reduction in time	Avg. 2 hours per day/HH	Upto 20-25 min/day/HH	Sample HH survey
Reduction in water borne diseases	10%	1.6% HHs (reduction in water borne diseases)	Sample HH survey

Project Brief

Spring is the major source of drinking. domestic and irrigation purposes in the Himalayan regions. Due to various natural as well as human-induced reasons, these regions are experiencing a decline in spring discharge & drying up of springs due to climate change, land use changes, deforestation, and rising water demand. This leads to water scarcity, impacts livelihoods, and exacerbates existing social and environmental challenges.

In order to address this challenge, CHIRAG (Central Himalayan Rural Action Group) has implemented project 'Recharging Springs for Water Security" in Dhari block of Nainital District of Uttarakhand with the support of Dharampal Satyapal Group. The project has been implemented from Nov 2020-March 2023.

The project had been designed to enhance the discharge of water from sources by recharging of spring through spring-shed management based on the hydrogeology of the area. A total of 40 springs have been rejuvenated, benefiting nearly 5200 inhabitants of the 19 villages in Dhari Block.

The major objective of the project encompassed:

- Identification of the springs where discharge is reduced through secondary data as well as with community consultation.
- Conducting feasibility and base line study of the spring based on hydrogeology by using GIS tools with the community involvement.
- Formation of a community-based local institute i.e 'Jal Upbhokta Samiti' for each spring for planning, execution, monitoring, and future sustainability.
- Recharge and rejuvenate the spring by spring-shed management as per hydrogeology results.
- Construct a rooftop rainwater harvesting system to store the rainwater.

The project indicators are:

- The project will directly improve the water security of local communities dependent on 65 springs in the Himalayas.
- The solution would lead to the enhanced discharge of a minimum of 1 liter per minute (LPM) per spring, which contributes to 5,25,600 liters of water from each source, annually.
- This would lead to an increased availability of water to 3,41,64,000 liters per annum through the proposed work of Spring Recharge.
- The project will manage the demand side by constructing 35 Rain Water Harvesting Tanks, which will add to the availability of almost 10,50,000 litres of water per year (assuming each tank fills thrice a year).
- It is envisaged that each household would save 2 hours of time and the associated energy they currently spend in fetching water, especially aiding in reducing the drudgery of women folk.

- Training & Awareness of communities on Water Quality will result in cleaner springs shed reducing contamination of the Spring Water; leading to 10% decrease in the incidences of waterborne diseases.

Project implementation strategy involved achieving the project objective by creating ownership of the community toward natural resources. The project activities included:

- Feasibility survey of the Springs for need-based spring selection.
- Orientation meeting and establish a baseline on water availability, quality and use.
- Community mobilization for the formation of Water user committees & identification of Key Resource Persons (KRPs).
- Capacity Building Training of water user committees (WUCs) and Key Resource Persons (KRP).
- Establishing a water User Committee (WUC) based on voluntarily contributed operations & maintenance (O&M) funds for future management of the infrastructure.
- Springs and water-use awareness campaigns with local educational institutions and civil society.
- Hydrogeological mapping for identification of spring recharge zones, water quality, and discharge monitoring.
- The implementation work is carried out in coordination with the Water User Committees (WUCs) continuously monitored by CHIRAG.
- To ensure sustainability, all the spring recharge-related interventions involve small amounts of monetary contribution from the beneficiaries that are deposited as a maintenance fund which will ensure the sustainability of the Spring recharge structures. Water User Committees (WUCs) are formed and they will be responsible for the cleanliness and maintenance of these water structures. Furthermore, these committee members are trained in the operation & maintenance (O&M) of the structures as part of the project.
- As part of exit strategy, CHIRAG has gradually handed over the work done to the WUCs for independent management.

Brief on Impact Study

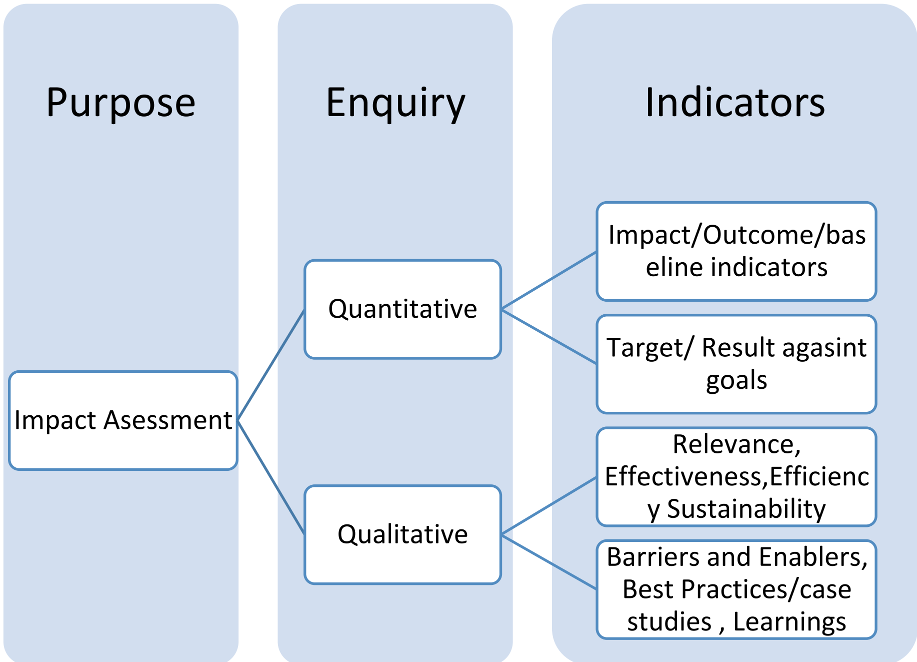
Study Objectives

The objectives of the Impact study are to assess the impact of interventions on the following parameters:

- Increased discharge rates in springs
- Increased Water Availability
- Strengthened village-level institutions for managing springs in a sustainable and equitable manner.
- Empowered communities through knowledge transfer and data taking into account the traditional practices
- Quality of technical works undertaken
- Document and assess project-related plans and achievements as per target
- Assess the satisfaction level of project beneficiaries
- Identify learnings, challenges, and best practices as well as success stories.
- Evaluate the project with reference to OECD parameters in terms of relevance, efficiency, effectiveness, impact, and sustainability.

Study Framework

A mix method approach is adopted for determining the impact, using both qualitative and quantitative aspects. Qualitative aspects are studied through FGDs, KIIs and Case Study, while quantitative aspects will be covered through CAPI based checklist and beneficiary interviews with households



Sampling Strategy

Of total 40 springs covered in project, 13 springs are sampled for study as suggested in TOR. Sampling of springs is done based on varied geographic locations.
Household coverage- From each identified spring, 10 HHs are taken as sample for study. HH are sampled based on location from spring (upto 200m, 200-500 m and > 500m)
Further, of total 37 roof top water harvesting system, 18 households are taken as sample.

As per the information given on the location and type of interventions, the following samples has been finalized:

Details		Universe	Sample
Spring		40	13
Villages		19	13 (nearly 70%)
HHs	Total	5200	132 (10 per spring)
	RRWH	37	18 (nearly 50%)
Key Resource Person		40	5

Study Tools

A household-level study including a rooftop water harvesting system is done through CAPI - Kobo tools through a structured questionnaire.
Village-level consultation including PRI and Water user group & Water user committee, is done through FGD through semi-structured questionnaire.
Further, KII (Key Informant Interview) with 5 Key Resource Persons was done through PAPI using a semi-structured questionnaire.

List of villages and springs sampled for study as well as the list of qualitative study is listed in annexures.

Brief on Project Region

The project villages fall under the Dhari block of Nainital district in Uttarakhand, predominantly a hilly region. Nainital district forms part of the Kumaon Division of Uttarakhand State. Dhari tehsil is situated in the eastern part of Nainital district.

Dhari Tehsil is located in the foothills of the Himalayas, which significantly influences the climate. Project region experiences temperature to cool climate due to its location in the foothills of the Himalayas, with topography characterized by rolling hills and valleys. The temperature in a year ranges from 30°C in summers and 5°C in winter, sometimes going below 0°C.

Major sources of drinking, domestic, and irrigation water in the hills are small rivers, streams, and rivulets locally called "gadhera". Traditionally, "Naulas" were designed to collect water from subterranean seepages or springs for domestic water needs, but are not much in use now. Groundwater manifests as springs in the Himalayan Region. The springs are highly dependent on rainfall.

Summers (March-June) are pleasant with temperatures between 10°C and 20°C, Monsoon (July-September) brings heavy rainfall. Winters (November-February) are cold, with temperatures potentially dropping to 0°C or lower, and occasional snowfall. Annual rainfall is good, ranging from 1500-1890 mm annually. In last 3 years, the region also received rainfall in May and October. (source:[1] CRIS-IMD, District Wise Rainfall Pattern (2017-2022), Indian Meteorological Department)

However, according to baseline information, the project villages have been facing a water crisis due to the gradual reduction of water in natural springs because of changing rainfall patterns, increasing deforestation and lack of recharging of rainwater, and high run off due to hilly terrain. As infiltration plays a key role in the formation of groundwater, any change in rainfall pattern is bound to affect the discharge of springs. The reduction has had a cascading effect on the streams that are fed by springs. They show a decline during the summer months, further affecting the community as well as the ecology downstream.

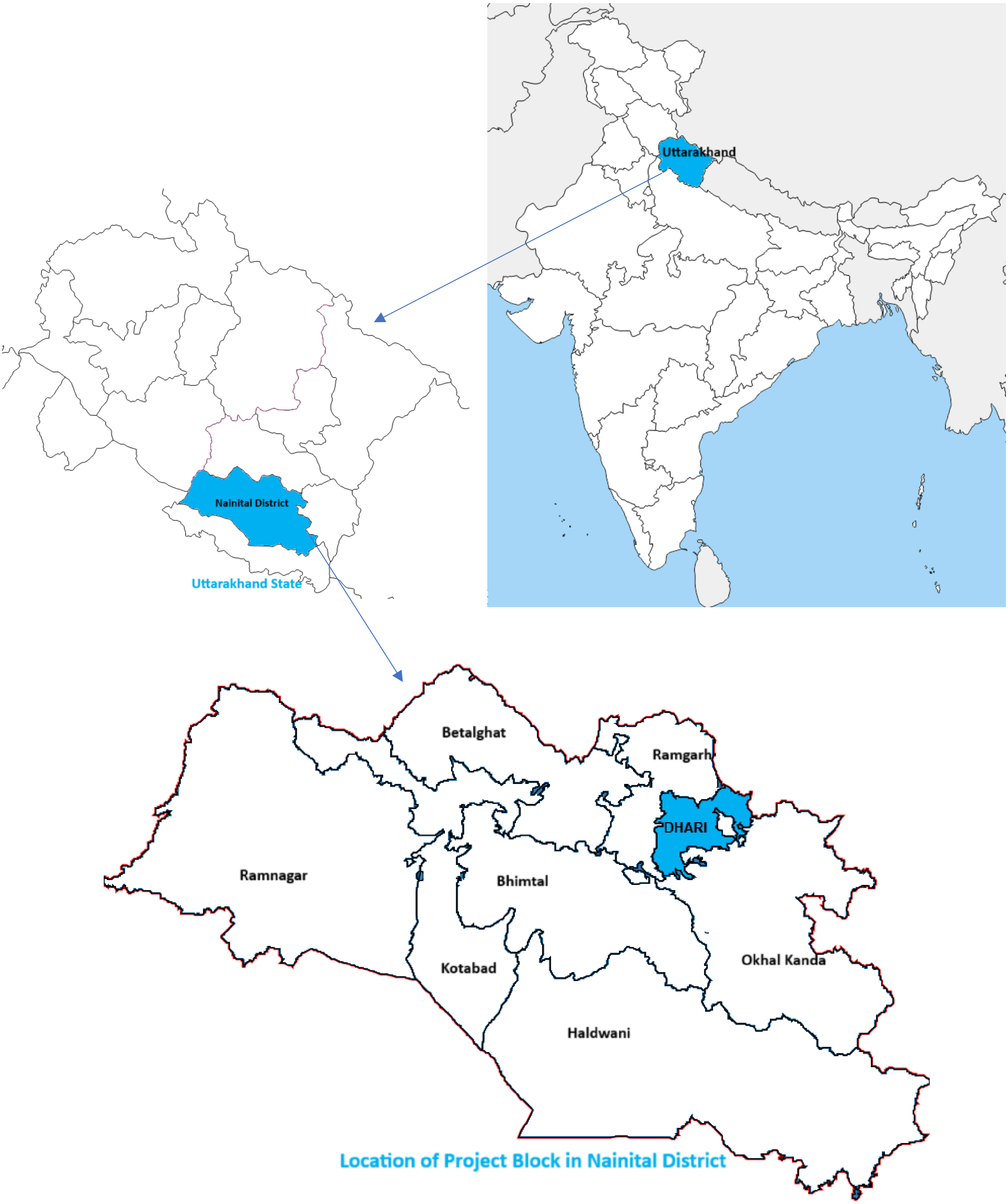


Figure 1 Project Location

Socio-Economic Profile of Study Respondents

Table 1 Respondent Profile

Respondents Profile- % HHs			
Men	63.6%	**Women**	36.4%

Parameter	Category	Project Villages- % HH (n=132)
Age Group	18-25 years	6.8
	26-35 years	18.2
	36-50 years	42.4
	>50years	32.6
Caste Category	OBC	0.0
	General	70.5
	SC	29.5
	ST	0.0
Economic Status	BPL	81.8
	APL	9.1
	Antyodaya	9.1
Occupational Pattern 	Agriculture	100.0
	Livestock Rearing	60.6
	Private Job	9.9
	General Labour	5.3
	Micro Enterprise/business	3.8
	Agriculture Labour	2.3
	Semi-skilled Works (electrician, plumbing etc)	0.8

Gender: 36.4% of respondents are female respondents and the remaining are male.

Age: More than 70% of respondents are in the age group of 63-50 years and above

Caste: 70.5% of HHs fall under the general category, while 29.5% of HHs fall under SC (Scheduled Caste) category.

Economic Status: More than 81% of HHs fall under BPL (Below Poverty Line), 9.1% of HHs fall under Antyodaya, while merely 9.1% of HHs fall under APL (Above Poverty Line), indicating poor economic status in the region.

Occupational Pattern: The community in the region primarily depends on agriculture as a primary occupation, with all HHs surveyed involved with agriculture. Livestock rearing is also high to augment income, with more than 60% of HHs owning mainly milch cattle or small ruminants. Family members in 9.9% of HHs are employed in private organizations. About 7% of HHs indicate members in family taking up farm or general labour. Merely 3.8% HHs have small business or micro enterprises, while 0.8% HHs are involved with semi-skilled work like plumbing, masonry etc.

Key Findings

A. Spring Rejuvenation Interventions

Across all surveyed locations, a wide range of water conservation and management interventions were introduced under the project. The most frequently implemented interventions were contour trenches, with some villages having as many as 250 trenches. These trenches played a vital role in slowing down water runoff and improving groundwater recharge. Spring collection pits (new and repairs) have been undertaken on all springs for the collection of spring water and ease in fetching for the community. Percolation pits were another widely used method, often used in conjunction with trenches to enhance water infiltration. Rainwater harvesting tanks were constructed in some areas, and several spring sources were repaired or rejuvenated through structural interventions like deep recharge pits and check dams. In certain locations, traditional springs such as Naulas and Dharas were specifically targeted for revival and repair, ensuring their sustainability for future use.

Spring tanks and plantation activities were also part of the project's ecological approach. Various plant species, including Dalchini (Cinnamon), Tej Patta (Bay Leaf), and Baanch were planted strategically to enhance soil stability and promote natural recharge. These green interventions not only improved the micro-ecosystem but also contributed to climate adaptation efforts in the region.

B. Structure Quality & Maintenance

Various structures have been verified on 13 springs. The location of various structures seems appropriate. While the majority are in good condition, it has been observed that few infrastructures now require repairs:

- Loose boulder checkdam on Bhumiya Than Dhara in Babiyar village need major repairs.
- Trenches in particular have degraded over time and need maintenance to continue functioning effectively. Contour Trenches need cleaning and deepening /digging on Ratidhara in Sarna as well as Banj ki Dhara in Pokhari.
- Percolation pit on Naula Dhara in Nagoniya needs removal of vegetative cover inside.
- Of the total 14 spring water collection pit, 9 are in good condition. 5 pits require minor plaster repair at Bhumiya Than Dhara in Babiyar, Golda Dhara in Putgaon, Ratidhar in Sarna, Golda Dhara in Bhelwanagari, Paar Ka Pani in Agariya. Moreover, lot of waste including plastic wrappers were found in few pits, which requires cleaning.
- A technical gap was also noted in location of check dams on sharp steep slopes, which reduces their efficiency and stability. (Bhumiyadhan Dhara).
- Cleaning of Spring Catchment & Desilting in carried out in all villages studied by WUG or community or Panchayats.

Figure 2 Contour Trench, Balkaniya Dhara, Churigarh

Figure 3 Loose boulder check dam, Bhumiyadhan dhara, Babiyar

Status of Physical Structures Verified		
Type of Physical Structure	**Total No. verified**	**Status**
Stone Cement Checkdam	1	Appropriate location and good quality
Loose Boulder Checkdam	1	Needs Repair
Contour Trenches	7 springs	Need repair on 2 springs (digging and cleaning), others are maintained
Percolation Pit	1	Need removal of vegetative cover
Recharge Pit	1	Appropriate location and need no maintenance
Spring Water Collection Pit (new and repair)	13	Repairs required in 5 pits
Vegetative cover	2	Good condition

Table 2 Status of Physical Structures Verified

Figure 4 Collection Pit at Golda Dhara

C. Impact of Physical Interventions in Spring Discharge Rate

- Physical work for spring rejuvenation is done mainly from March 2021-April 2022 across various villages. Spring flow monitoring data for 40 springs has been captured month-wise by CHIRAG. The following are findings from the spring flow comparison of data pre (Nov 2020-Sept 2021) as well as post-interventions (April 2022-March 2023) for 40 springs (refer Table 3):
  - ✓ It should be noted that annual rainfall is 1570 mm in 2023 and 1984 mm in 2021 (Nainital District- as per IMD), indicating a reduction in annual rainfall by nearly 20%. The monthly pattern of rainfall indicates lower rainfall in all months, while a rise in rainfall in September & October.
  - ✓ Despite a lowering of rainfall, there is rise in spring water flow in 37-55% springs in June-Sept, 62.5-85% springs in Oct-Mar and 42-60% springs in Apr-May
  - ✓ Springs like Talla Pani Dhara (village- Silada), Jamna Dhara (Village- Churigarh), Jhagrubaan Dhara & Ratour Dhara (village- Duduli) show rise in water flow in most months, ranging from 0.95 lpm in January to max 15.5 lpm in October.

Avg Rise in Annual Spring Flow

Avg. 10.6 lakh litre/spring

Total 424.37 Lakh litres (40 spring)

Spring Flow Changes (Pre and Post Project)				
Month	**Month Wise Rainfall (pre project)- mm**	**Month Wise Rainfall (post project)- mm**	**Month wise rainfall fluctuation (pre and post)- mm**	**% Springs with rise in water flow**
Jan	133.9	105.6	-28.3	87.5
Feb	70.7	58.4	-12.3	85
Mar	131.8	0.2	-131.6	82.5
Apr	37.6	0.1	-37.5	60
May	108.3	63.7	-44.6	42.5
June	144.7	119.3	-25.4	37.5
Jul	372.6	271	-101.6	42.5
Aug	349.9	330.7	-19.2	42.5
Sep	85	298.9	213.9	55
Oct	0	253.2	253.2	62.5
Nov	0	0	0	87.5
Dec	4.3	0.1	-4.2	85
Based on spring flow data provided by Chirag				

Table 3 Spring Flow Changes (Pre and Post Project)

Figure 5 Spring Outlet, Bhumka Dhara Duduli

17.5% Springs

Increased discharge for all 12 months

(Talla Pani Dhara, Jamna Dhara, Jhagruabaan Dhara, Ratour Dhara, Mansi Dhara, Jhanjheer Dhara, Laida Dhara)

37.5% Springs

Increased discharge for 9-11 months

Kasani Dhara, Ratidhar Dhara, Shela Dhara Cheena Dhara, Panera Dhara, Talla Golda Dhara, Mona Dhara, German Dhara, Pattlikote Dhara, Talla SunPatla Dhara, Diwari 1 Dhara, Diwari 2 Daoura Naula, Bhujrailgadd Dhara,Kat Kat Naula, Serwakanala Dhara)

30% Springs

Increased discharge for 6-8 months

(Mugroo Dhara, Duduligaa Dhara, Siniya Kataul, Nagoniya Naula, Bhumka Dhara, Ghauna Dhara, Banj Ka Dhara, Daneja Dhara, Malla Golda/Belwal Dhara, Alchonikhan Naula, Dhari Gadd Dhara, Timra Ni Dhara)

15% Springs

Increased discharge for <6 months

(Paar Ka Pani, Masvad Dhara, Pani Gadhera, Bhumiya Than Dhara, Talla Bheeta Dhara, Balkandiya Dhara)

Table 4 Seasonal Impact on Spring Flow

Figure 6 Spring Collection Point, Balkandiya Dhara, Churigarh

- Spring water flow was measured in 11 springs during field visit in April 2025 and compared with the baseline data in April 2021, which indicates a rise in spring flow in 64% springs despite lower rainfall in April in 2025. Rise of 0.09 lpm to a maximum 4.81 lpm (Balkandiya Dhara) has been noted in April. (Refer Table 6)
- Reduction in spring flow in 3 springs Paar Ka Pani, Bhumiya Than and Banj Ka Dhara is noted in the month of April. This can be attributed to damage to the physical structure (stone boulder check dam in Bhumiya than Dhara, damage to water collection pit at Paar Ka Pani). It should also be noted that rainfall has also reduced post assessment in the month of April, and it is normally a lean month. The longitudinal data taken by CHIRAG also indicated a lowering of water flow in most months in these 3 springs.

Spring Flow Changes in the Month of April (Pre and Post Project)					
Village	**Spring Name**	**Spring Water Flow (lpm)**		**Rise in Spring Water Flow (lpm)**	**% Rise in Spring Flow**
Month/Year		**April 2021 (measured by Chirag)**	**April 2025 (measure by CFID)**		
Monthly rainfall as per IMD		**Rainfall- 35 mm**	**Rainfall- 25.4 mm**		
Churigarh	Balkandiya Dhara	15.19	20	4.81	31.7
Sarna	Ratidhar Dhara	0.61	0.7	0.09	14.8
Palara	Shela Dhara	5.58	6.67	1.09	19.5
Nagoniya	Nagoniya Naula	1.50	1.5	0.00	0.0
Agheriya	Paar ka Pani	4	1	-3.00	-75.0
Putgaon	Panera Dhara	6.5	6.67	0.17	2.6
Kulori	Masvad Dhara	5.12	5.3	0.18	3.5
Tanda	Bhumiya Than	9	3.75	-5.25	-58.3
Pokhri	Banj ka dhara	2.439	0.1	-2.34	-95.9
Belwalnagri	Malla Golda/ Belwal Dhara	7.25	7.5	0.25	3.4
Baduwagaon	German Dhara	1.8	5.45	3.65	202.8

Table 5 Spring Flow Changes in Month of April

D. Impact on Water Adequacy & Quality

Drinking & Domestic Water Source: Before the interventions, most villages depended on a limited number of spring sources for their daily water needs, with water availability often dropping to just a few Naulas & Dharas during the summer. Due to population pressure and climate-induced stress, these sources were barely sufficient. However, the implementation of recharge structures and piped water systems brought about a positive change. Many villagers now have piped connections bringing spring water directly to their households. This has not only improved ease of access but also ensured better hygiene and water storage options. In some places, the community has constructed simple pipelines using plastic pipes from the spring source to their homes, reducing the manual effort of water collection and freeing up time, particularly for women.

Due to spring rejuvenation and increased coverage of rooftop water harvesting tanks in the project villages, there is a rising dependence post-project on springs (direct fetching) as well as RRWHT and reduced dependence on lake/pond, public taps, and well. It should also be noted that during the project span, there is also increased HH tap connection in these villages under the government program.

Seasonal Change in Drinking & Domestic Water Source (Pre and Post Project)- % HHs (n=132)

Source	Drinking			Domestic		
	Monsoon	Winter	Summer	Monsoon	Winter	Summer
Spring (direct fetching)	0.8	7.6	3.0	4.6	8.3	6.1
HH tap	15.2	12.9	15.2	15.9	16.7	14.4
Cluster/village storage tank	-2.3	0.8	-0.8	0.8	2.3	0.8
lake/pond	-1.5	-1.5	0.0	-0.8	-2.3	-1.5
Roof Top Water Harvesting Tank	0.8	2.3	3.0	4.6	3.0	2.3
Public Tap	0.0	0.0	0.8	0.0	-0.8	0.0
Well	0.0	-0.8	0.8	0.0	0.0	0.0

Table 6 Seasonal Change in Drinking & Domestic Water Source

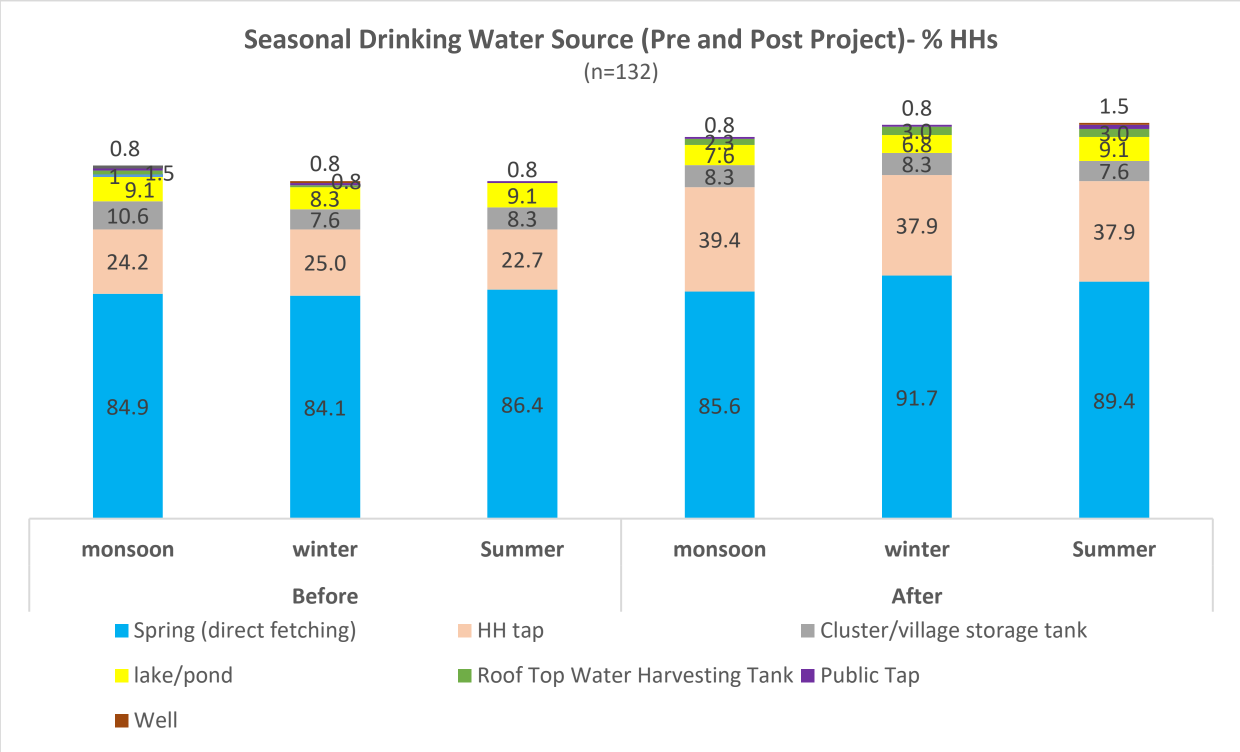


Figure 7 Seasonal Drinking Water Source (Pre and Post Project)

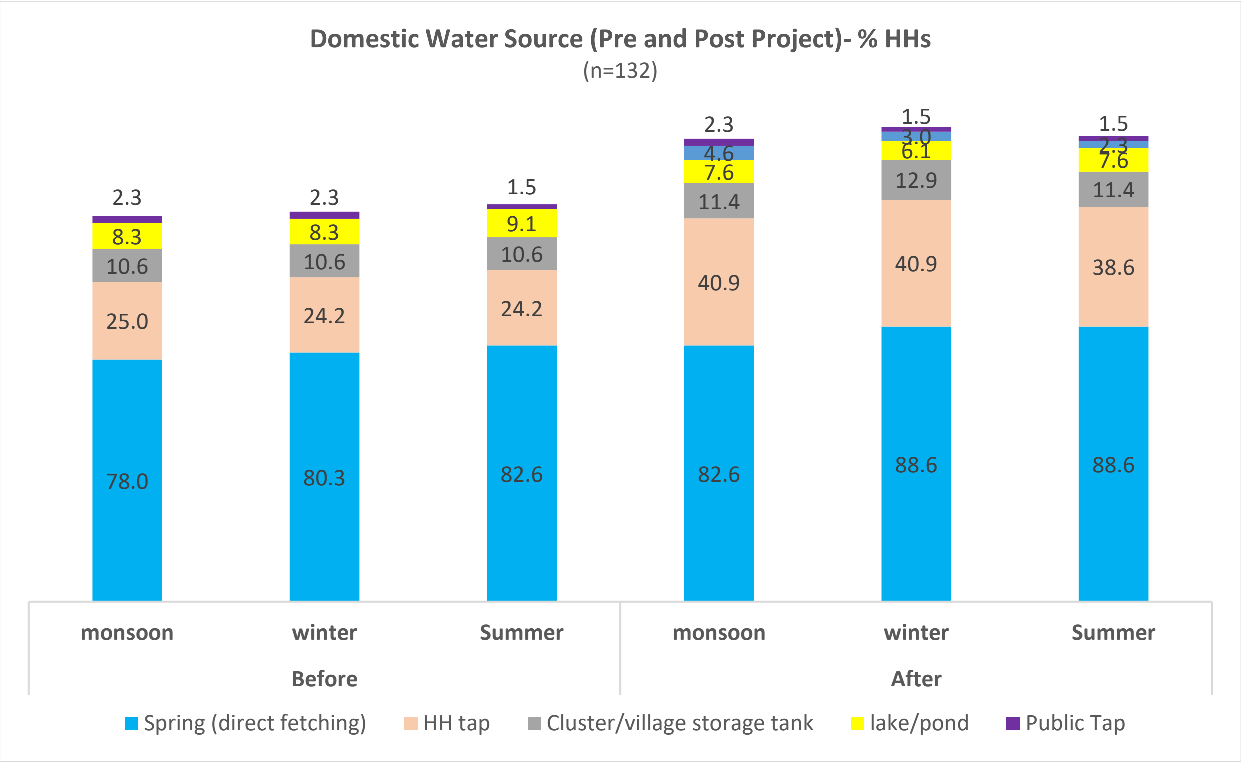


Figure 8 Domestic Water Source (Pre and Post Project)-

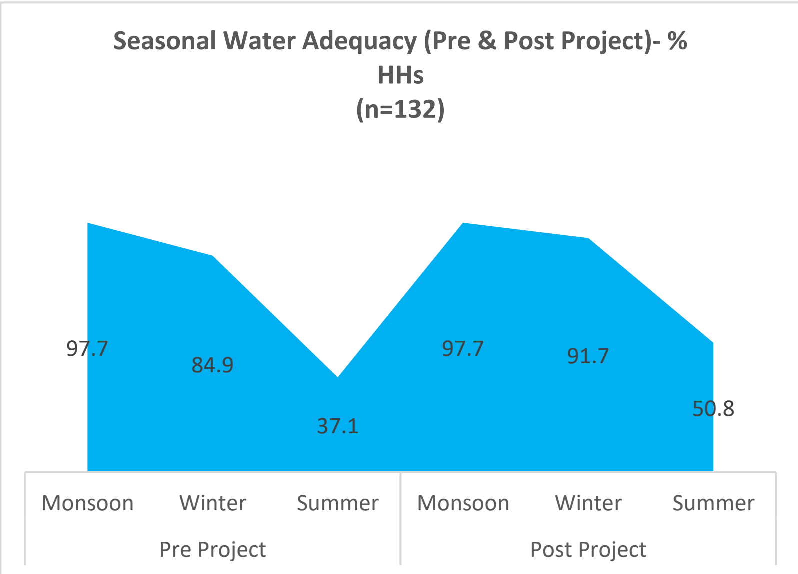


Figure 9 Seasonal Water Adequacy (Pre & Post Project)

Water Adequacy: Due to increased discharge in springs, increased rooftop harvesting systems and increased HH tap connections, there is rise in HHs reporting water adequacy, mainly in winter by about 6.8%. there is a major impact in lean months, summer, with more than 50% HHs reporting water adequacy post project as compared to merely 37.1% HHs before project, indicating a rise of 13.7% HHs with water adequacy. While there is increased discharge in springs, the water consumption pattern remains quite similar in the region with an average 65 LPCD in monsoon, 48 LPCD in winter and 70 LPCD in summer. The community seems aware of the sustainability of water due to project interventions with minimal water wastage. FGD with community and PRIs indicate that in all study villages, direct pumping from spring or spring outlets by HHs is prohibited to avoid water wastage.

Water Quality & Water Treatment: Water quality data pre-project (2021 and towards project end (Feb 2022) indicate that there is no dramatic change in water quality in springs due to project interventions. Data of 29 springs indicates bacterial contamination / presence of faecal coliform in 93% of springs, which is alarming and may be due to the increased sewer water discharge in open in the region. Water tests also indicate that higher fluoride concentrations in most springs may be due to rock morphology in the region.

No water treatment is done at the source, while at the household level, only filtering with cloth is primarily done. Disinfection like boiling/treatment with chlorine is done by merely 2.3% HHs. With increasing bacterial contamination in springs due to human interference, it is advisable to have at least boiling of drinking & cooking water.

1.6% HHs reported water borne disease, mainly Jaundice during baseline, while none of the HHs reported the disease last year.

E. Social Impact- Reduction in Drudgery

- Nearly 60% of HHs reported the location of the spring in a range of 200-500 m, while 80% of HHs stated the location of the cluster storage tank within a 500 m range from their house. Location of lake /ponds from homes seems far, with nearly 35% HHs stating location beyond 1 Km. So those fetching water from lake/ponds often had to travel far.
- With increased spring flow, rise in rooftop harvesting tanks, and HH tap connection, drudgery and time for fetching water have reduced moderately.
- For those having a RRWHS, drudgery for fetching water has been reduced for 2 months a year. For HHs not having tap connection at home or rooftop tank, utensil filling time has reduced significantly due to increased spring flow. Reduction in bucket filling time is reported by as high a 68.2% HHs in winter, 34.1% HHs in monsoon and 23.5% HHs in summer.
- However, trip time from home to spring still remains a challenge due to lack of conveyance or storage nearby. The average time saved for fetching water in a day (including bucket filling and travel time) ranges from 10 min-25 minutes seasonally. It should however, be noted that due to spring recharge and water availability in near spring, dependence on far away springs is reduced, which has led to substantial savings in fetching water. Nearly 28.7% HHs reported to have reduction of more than 1 hour time for fetching water in summer.
- In all HHs, women are responsible for fetching water, though accompanied by children or men in some instances. Hence, women/young girls are benefitted the most from the project due to the reduction in drudgery for fetching water.

Drudgery Reduction due to Project Interventions			
	Monsoon	Winter	Summer
% HHs with reduction in time in filling bucket/utensil at spring	34.1%	68.2%	23.5%
% HHs with reduction in over all time in fetching water in day (filling bucket plus travel)	36.8%	80.3%	40.1%
Average Reduction in Time for fetching water per day	upto 10 min	10-15 min	20-25 min
% HHs with reduction of more than 1 hour time in fetching water in day (filling bucket plus travel)	12.8%	15.9%	28.7%

Table 7 Drudgery Reduction due to Project Interventions

Increased Water Security & Reduction in Drudgery

In the small Himalayan village of Kulori, Mamta Thunag and her family have found a new sense of relief and stability since they began accessing water from the Masvad Dhara spring in 2021. Prior to the project interventions, water availability for drinking and household purposes was inconsistent and often required long walks to distant sources. The family of six, which includes Mamta, her husband, two sons, and her parents, now benefits from a reliable, clean, and sufficient source of drinking water just near their home.

"Having access to clean drinking water near my house has changed our lives. We are healthier, I have more time for my family, and we feel more secure."

The spring fills a 500-litre tank in approximately 30 minutes to an hour, providing an ample supply for the family's daily drinking, cooking, and hygiene needs. The quality of the water is excellent, as reported by the family. This has significantly reduced the health risks, particularly for the children and the elderly in the household.

The intervention by Chirag played a crucial role in securing this water source. Previously, a leaking wall near the spring led to frequent water loss and compromised availability and water contamination. With project support, a protective wall was constructed, and the leakages were addressed, ensuring that the spring water remained clean and intact. Now, the water flows into a collection tank, from where it is used exclusively for drinking and domestic needs.

Mamta emphasized how this transformation has saved her several hours each week, as she no longer has to fetch water from distant sources. The physical burden and time constraints that once plagued her daily life have been significantly eased, allowing her more time to care for her children and engage in household activities.

Mamta believes that while the current setup is a vast improvement, the installation of a larger storage tank and a roof rainwater harvesting system would further increase their water security—especially during the dry months when spring flow might reduce.

Increased drinking and irrigation water security due to spring rejuvenation and coordinated community efforts

In the remote village of Palera, Nitish Dani and his mother have come to rely heavily on the Shella Dhara spring for their daily drinking water needs. Prior to project interventions in 2021, their access to potable water was extremely limited, and they often had to walk long distances to collect water from seasonal sources that were neither reliable nor clean.

"Before we had this spring, clean water was a daily struggle. Now, we have safe drinking water, and that means everything to me and my mother."

Since the new spring collection tank has been constructed near Shella Dhara spring in 2021, their life has undergone a significant transformation. Due to increased spring flow and availability of storage near the spring, households near by are able to easily fetch drinking and domestic water, reducing their time in filling collection utensils at spring.

Moreover, due to the storage tank, farmers are now able to get water every 28 days on a rotational system designed to ensure fair and sustained access. This has helped in providing critical irrigation in both cultivation seasons and improved crop productivity in these rainfed areas.

Although the quantity is limited due to shared access among village families, the consistency and quality of the spring water has had a profound impact. For the first time, Nitish's family has a dependable and safe source of drinking water, which has drastically reduced their risk of waterborne diseases and the physical strain of fetching water from far-off and unreliable locations.

The use of a basic pit and tank system ensures minimal contamination and allows Nitish to store the allocated drinking water safely.

Nitish is president of WUG for this spring and believes that these co-ordinated efforts of the community has benefited his family for domestic and irrigation water needs.

Nitish recognizes that while the current system has improved their water security, the allocation is not always sufficient, especially during hotter months. He strongly believes that building a larger community storage tank and initiating roof water harvesting can increase the availability and ensure a continuous supply of drinking water for all villagers.

F. Impact of Roof Top Water Harvesting System

A total of 18 HHs across 9 villages have been studied.

Structure Details

- Roof top water harvesting system comprises of ferro cement storage tank with RCC roof and plastic conveyance pipes and a metal gutter from rooftop to tank.
- Total cost of system, including material & labour is Rs. 95000, of which Rs. 19000 have been contributed by beneficiaries.
- Capacity of the tank is 15000 litres, with annual storage capacity of 26000-30000 litres, depending on annual rainfall pattern, indicating filling of tank 1-2 times in a year. During the lean season, HHs use the tank for refilling from streams through small flexible pipes.
- Most HHs withdraw water manually with buckets from roof or with tap. 27% HHs have installed a pump for water withdrawal.

HH Level Roof Top Water Harvesting System

- Storage Tank : 1.7 m radius and 1.6 m clear height (10000 litres effective storage capacity)
- Average rooftop/catchment: 30 sq.m
- Avg annual rainfall: 1500 mm
- Annual rainfall harvested: 26000-30000 litres per HH

Impact of interventions

- Water harvested in the tank is used for all purposes, including drinking & cooking, domestic as well as livestock drinking. Hence, effective usage of harvested water is only for 1-2 months in year. Later, the storage tank is refilled by most HHs from the stream and tank serves as a sense of security due to HH level storage system.
- The major impact of the system has been a reduction in the frequency of fetching water and a reduction in drudgery. There is a dramatic reduction in the fetching of water especially in monsoon months. In other months, 22% HHs now refill tanks from springs. Of them, there is need to fetch only when the spring flow and pressure reduces. Other HHs, however, still have to fetch water in lean seasons.

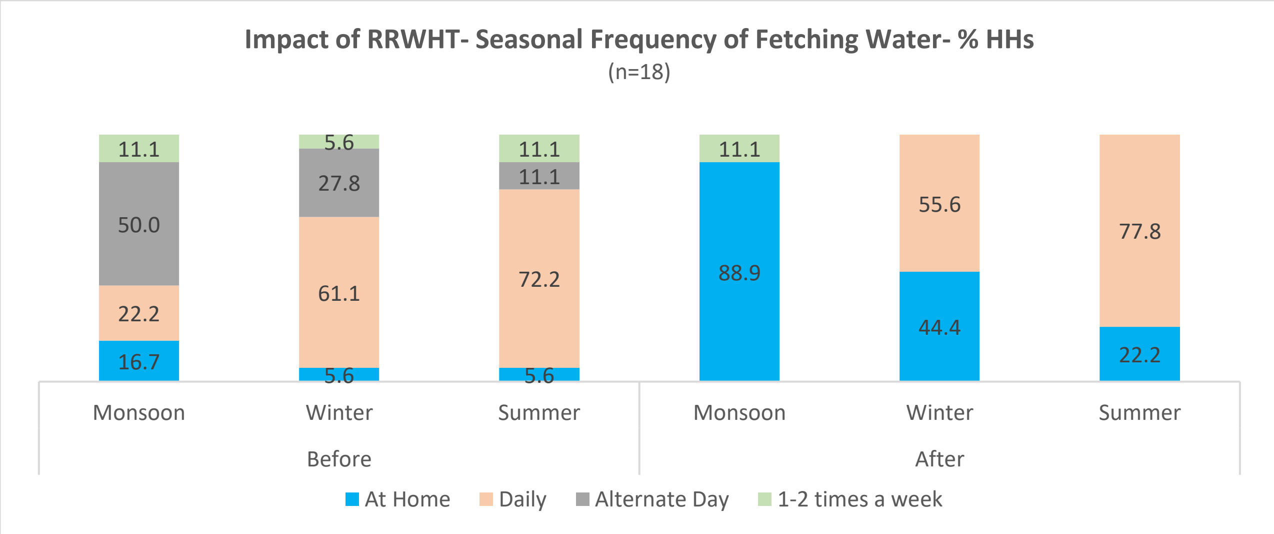


Figure 10 Impact of RRWHT- Seasonal Frequency of Fetching Water

- Based on the perception of households, the major impact of RRWHT is sense of security due to storage system at home and a reduction in frequency and time spent on fetching water. This has reduced drudgery to a considerable level. Further at least for the monsoon months, people reported improved water quality.

Structure Quality & Maintenance

- Of the total 18 HHs surveyed, structures in 38.9% of HHs need minor repairs (mainly in the storage tank). There is chipping of plaster and a minor crack, which requires repairs, though seepage is not seen in any of the structures.
- Removal of debris and dust from gutter and conveyance pipes as well as cleaning of tank at least once year, is done by all HHs.

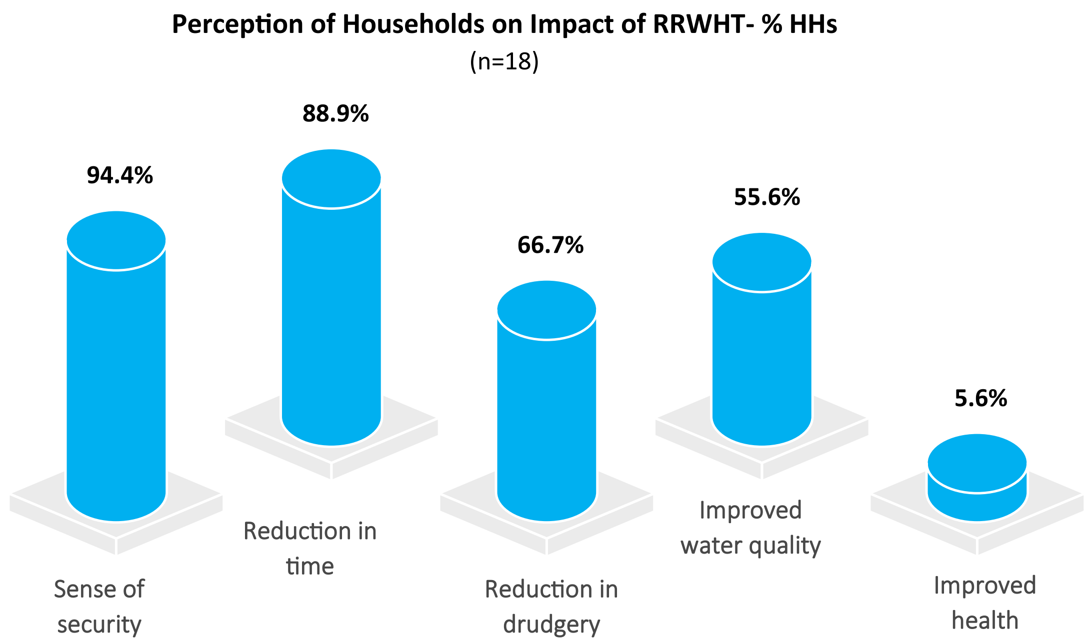


Figure 11 Perception of Households on Impact of RRWHT

G. Water Governance, Capacity Building & Structure Maintenance

Water Governance & Spring Sharing Practices

The principle of equitable access was universally emphasized. Based on discussions with the community and PRIs, of total 23 springs in 11 study villages, more than 50% springs fall in private land, about 30% in Panchayat/Van Panchayat land, and the remaining on common land. However, in nearly all discussions, it was reported that spring sources were considered common property and were open to all, with no restrictions on access. This inclusive model promotes social cohesion and minimizes conflict, ensuring that all households, regardless of their socio-economic status, can benefit from the water resources. Although it had been observed the maximum use of the spring is being done by the same family staying at a hamlet. Family here notify same caste and Clan.

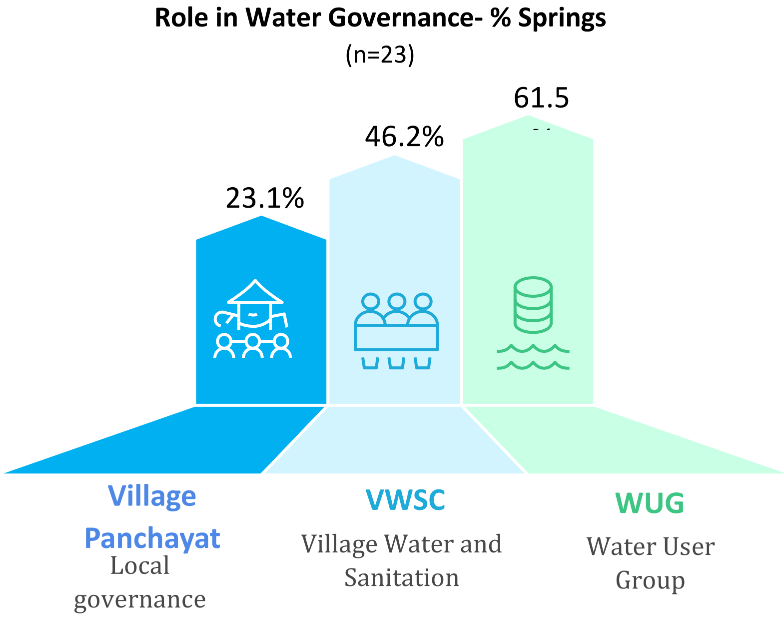


Figure 12 Role in Spring Governance

It should be noted that currently, no water tax/tariff is collected in any of the project villages.

Water User Groups

Water user groups were formed across all surveyed areas, and funds were collected from community members to support maintenance. Water user groups were formed in all the participating communities. These groups played a key role in overseeing the maintenance of structures, coordinating usage, and, in some cases, managing financial contributions. While some groups were reported to be more active than others, most had funds ranging from ₹1,200 to ₹17,000. These funds were collected and maintained collectively, although the operational activity of the groups varied. In villages where the groups were more active, members also took responsibility for cleaning the surroundings of water sources and ensuring fair usage. However, a critical concern has emerged: these user groups have become largely non-functional after the project period. Although they have financial resources available, none of the groups have utilized the collected user charges for repairing or maintaining the infrastructure. This reflects a gap in post-project engagement.

One of the underlying reasons appears to be the lack of regular meetings, capacity reinforcement, and handholding. The project focused heavily on physical structures during implementation, but less attention was given to building institutional sustainability. As a result, the committees have not developed the confidence or clarity needed to independently manage ongoing repairs or enhancements, particularly for upstream recharge structures. Continued handholding, follow-up training, and guidance are essential to reactivate these groups and instill a sense of ownership and accountability within the community.

Community Training & Capacity Building

Capacity-building efforts were central to the project's implementation strategy. Training sessions focused on user group functions, source management, and recharge techniques were conducted across villages. HH survey indicates that the community has been trained on various aspects like maintenance of structures, cleanliness around springs & judicious use of water.

These sessions were generally viewed as highly beneficial. Community members reported increased knowledge, confidence, and a greater willingness to participate in developmental initiatives. Many mentioned that they felt more empowered to take decisions and engage in the upkeep of water infrastructure as a result of the training.

KRP (Key Resource Person)

A series of Focus Group Discussions (FGDs) were conducted with KRPs from five villages—Babiyar, Churigard, Duduli, Nagoniya, and Putgaon—to assess their involvement, training, and the benefits derived from a community-led water resource management project. These discussions aimed to understand the role KRPs play in decentralizing water governance and the challenges they face in contributing to the sustainability of local water sources.

Roles and Responsibilities of KRPs

Across all the surveyed villages, the primary role of KRPs has been centered around the measurement of water flow from their respective Dhara. This includes basic hydrological tasks such as identifying water sources, assessing the volume of water flow, and monitoring changes over time. Despite their consistent technical engagement, KRPs from all locations reported that they are not currently involved in any formal mechanism related to water governance or planning, or even water flow management.

Training and Exposure Visits

There is a notable training and exposure KRPs have received. KRPs attended training focused on water flow measurement and gained exposure through field visits which emphasized identifying the source and tracking the water's journey. They also participated in comprehensive sessions that covered water source management, understanding slopes, identifying types of rocks, and understanding their influence on water retention and movement.

Figure 13 Kamladevi KRP, Nagoniya

KRPs universally acknowledged that the training and exposure visits they attended were beneficial. They reported increased knowledge, improved confidence, and better participation in local development efforts. These sessions not only enhanced their technical abilities but also increased their awareness about the significance of water management at the village level.

Perceived Usefulness of the Project

The project has been perceived as highly beneficial by the KRPs, especially in enhancing their understanding of local water systems. They noted a better grasp of how water sources function, the value of monitoring flow patterns, and the broader linkages between water availability and community development. However, while knowledge and awareness have improved, there is still limited application of this learning in structured village development activities due to the absence of a formalized governance role for KRPs.

Figure 14 Mamta & Geeta, KRP, Duduli

Key Observations and Gaps

The FGDs brought to light several critical observations. While the role of KRPs in measuring water flow is consistent across villages, KRPs are not yet integrated into decision-making processes concerning water governance, which limits the practical application of their on-ground insights. This disconnect undermines the potential impact of the project, as valuable field data often does not inform village-level planning or resource management.

Climate Change Impacts and Community Preparedness

All the communities reported observable changes in climate patterns, including erratic and unseasonal rainfall, frequent hailstorms, rising temperatures, and decreasing groundwater levels. Many villages also faced forest fires, which led to soil erosion and negatively affected local water catchments. These climatic shifts have raised concerns about long-term water security.

To cope with these challenges, communities have begun to adopt mitigation measures such as plantation drives, construction of contour trenches, and the rejuvenation of springs. However, they highlighted the need for further support in the form of storage tanks, additional training, and financial assistance to enhance their resilience against future climate shocks. The demand for technical guidance and sustained external support emerged as a recurring theme across the discussions.

In Agaria Village, PRI members laid stress on the training of youth in the region for water conservation works as there are many active youth groups. They further stated the need to leverage sources & funds from the forest department and MGNREGA for spring rejuvenation works.

Recommendations

To summarize, The **Spring Rejuvenation Project** has been instrumental in improving spring discharge and water availability, increasing water security, and reducing drudgery as well as climate resilience. The project rightly involves adopting spring shed management principles integrated with a community-centric approach and scientific assessment.

Some of the recommendations are:
Integrated Water Resource Management: Springs for major source of water not only for drinking and domestic purpose, but also for irrigation and livestock drinking. Hence an integrated planning and water budgeting should can be taken up also considering demand side interventions with water-efficient irrigation and cropping techniques.

Improved Water Conveyance: While project has been highly successful in source strengthening and increased water availability, conveyance of water to the cluster level and ultimately household level can be planned in future project phase in line with the government's target of "Har Ghar Jal (Functional HH Tap Connection- FHTC)" to ensure reduction/elimination in drudgery for fetching water. Considering the topography in the region and the gradient, cluster level storage tank and tap can be provided. Solar pumping can also be installed where the gradient does not permit gravity flow. Water conveyance being cost-intensive, convergence with various government programs and line departments can be considered.

Longitudinal Spring Discharge Monitoring: In order to understand the exact spring flow in a year, daily monitoring or installation of water meter can be looked upon to understanding the long-term impact and help communities on water budgeting.

Addressing Conflicts & Establishing Water Rights: While many springs or its outlets fall in private land, there is a need to establish clear guidelines for water usage, allocation, and conservation. Leveraging existing social norms and traditions to reinforce water conservation practices can be thought upon. Formal systems for resolving disputes, like community tribunals can be developed.

Social Fencing to reduce catchment contamination[2]: Social fencing can be though upon to limit or prevent activities that can contaminate or deplete the groundwater that feeds the spring, including activities like grazing, deforestation, or improper waste disposal within the recharge area

Long-term handholding support for post project sustainability: While individual structures like RRWHS are maintained regularly, there is a need for long-term handholding to ensure the sustainability of community structures through regular monitoring and maintenance. Trained KRPs or even existing youth groups can be hired on a project basis for an additional 2-3 years after project completion to ensure regular upkeep of the structures. Partnerships with government schemes or line departments (watershed and water supply departments) can also be sought upon for this purpose.

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[2] Social fencing involves informal, non-physical boundaries created through community consensus and cooperation, where local people agree to restrict or regulate certain activities (like grazing, tree cutting, farming, waste disposal) in ecologically sensitive areas — without installing physical barriers like walls or fences.

Annexures

List of Sample Villages

Name of Village	Name of Spring	No. of HHs studied for spring use	No. of HHs studied for RRWHS
Churigard	Balkandiya Dhara	10	2
Pokhari	Banj ka dhara	11	
Babiyar	Bhumiya Than Dhara	11	5
Dudhali	Bhumka Dhara	8	4
Barwa gaon	German Naula	10	1
Belwalnagri	Malla Golda/ Belwal Dhara	21	
Akshora(bhametha)	Katnaula	8	
Kulori	Masvad Dhara	11	
Nagoniya	Naula dhara	6	2
Putgaon	Paneera Dhara	9	2
Aghariya	Par ka pani	9	
Sarna	Ratidhar Dhara	7	
Palara	Shella Dhara	11	2
13 villages	**13 springs**	**132 HHs**	**18 HHs**

List of Qualitative Study

List of Village level FGD

Sr. No.	Name of Village	Name of Spring	Number of Participants
1	Agaria	Par Ka Pani	6
2	Babiyar	Bhumiya Than	7
3	Badwagoan	German Naula	4
4	Belwanagri	Malla Gonda	4
5	Churigarh	Balgandiya Dhara	6
6	Kulori	Masvad Dhara	6
7	Nagoniya	Nagoniya Naula	7
8	Palra	Shela Dhara	5
9	Pokhari	Banch ka Dhara	7
10	Putgoan	Panera Dhara	6
11	Sarna	Ratidhar Dhara	7

List of KRP Consulted

S. No.	Name of Respondent	Contact No.	Village	Associated Dhara	Year of Association	Role in Project
1	Geeta	9759814745	Babiyar	Buimiyathan Dhara	2022	Measuring water flow
2	Jaya Sah	9410754261	Churigard	Balkandiya Dhara	2021	Measuring water flow
3	Geeta Arya	9411527280	Duduli	Bhumika Dhara	2023	Measuring water flow
	Mamta Sharma	9410961716				
4	Kamla Devi	Not mentioned	Nagoniya	Naula Dhara	2021	Measuring water flow
5	Neeta Kuloura	9389130366	Putgaon	Paneera Dhara	2021	Measuring water flow