स्वामी राम हिमालयन विश्वविद्यालय
Swami Rama Himalayan University

6 CLEAN WATER AND SANITATION

SDG 6

Clean Water and Sanitation

Sustainable Development Goal 6 (SDG 6) calls for universal access to sustainable water and sanitation management by 2030. Access to clean water and adequate sanitation is essential for human health, environmental sustainability, and economic progress. Nevertheless, billions of people worldwide lack access to facilities for safe drinking water, proper sanitation, and hygiene. SDG 6 emphasises the significance of integrated water resources management, improved water quality, and water-use efficiency in order to address the global water problem and ensure sustainability.

Swami Rama Himalayan University (SRHU) is dedicated to promoting sustainable development by community outreach, research, and teaching. SDG 6 is strongly aligned with the university's emphasis on societal welfare, environmental sustainability, and holistic growth. By incorporating research on waste treatment systems, hydroponics, and water purification technologies into its academic and research programs, SRHU supports sustainable water management practices. Its emphasis on training and community development enables rural communities to embrace sustainable sanitation and water use practices. In addition, SRHU's infrastructure development projects guarantee environmentally friendly water management systems on campus, establishing a standard for sustainability. In order to achieve SDG 6 and build a sustainable future, SRHU actively promotes innovation, education, and awareness.

CHALLENGES IN ACHIEVING SDG 6

- **Water Scarcity:** Growing population, climate change, and over-extraction are exacerbating water shortages.
- **Pollution and Contamination:** Industrial effluents, agricultural runoff, and lack of wastewater treatment facilities pose risks to water quality.
- **Infrastructure Deficiency:** Many rural areas lack basic infrastructure for water supply and sanitation.
- **Funding and Governance Issues:** Inadequate investments and weak regulatory frameworks hinder progress.

STRATEGIES AND SOLUTIONS

- **Innovative Technologies:** Development of water purification systems, wastewater recycling, and desalination technologies.
- **Capacity Building and Education:** Promoting awareness and training programs for sustainable water management practices.
- **Public-Private Partnerships:** Encouraging collaboration between governments, NGOs, and private sectors to finance and implement water projects.
- **Policy Reforms:** Strengthening regulations, monitoring systems, and enforcement to ensure compliance with water safety standards.

ALIGNMENT WITH SRHU UNIVERSITY GOALS

Swami Rama Himalayan University (SRHU) aligns with SDG 6 through the following initiatives:

1. **Research Programs:** Conducting research on water purification technologies, hydroponics, and wastewater treatment systems.
2. **Sustainable Infrastructure:** Implementing eco-friendly water management systems within the campus.
3. **Community Training Programs:** Empowering rural populations to adopt sustainable water usage and sanitation practices.
4. **Educational Integration:** Incorporating sustainable water management practices into academic curricula.
5. **Innovation and Development:** Promoting innovative solutions for water conservation and recycling.
6. **Outreach Activities:** Engaging in community outreach to raise awareness and provide training on sustainable water management.

Rainwater harvesting @SRHU

SRHU actively promotes sustainable water management practices through rainwater harvesting systems implemented across the campus. Key features include:

1. **Collection Systems:** Rooftop rainwater collection structures installed in multiple buildings to capture and store rainwater.
2. **Storage Tanks:** Large underground and overhead storage tanks to preserve harvested water for non-potable uses such as irrigation and cleaning.
3. **Groundwater Recharge:** Recharge pits and trenches to replenish groundwater levels and enhance aquifer sustainability.
4. **Water Conservation Awareness:** Regular workshops and awareness campaigns to educate students and staff about the importance of rainwater harvesting.
5. **Sustainability Monitoring:** Periodic evaluations and audits to assess system performance and optimize water usage efficiency.

Waste water recycling systems

SRHU has implemented wastewater recycling systems to promote efficient water use and minimize wastage. Key aspects include:

1. **Wastewater Treatment Plants:** Advanced systems are used to treat wastewater generated within the campus, ensuring it is safe for reuse.
2. **Reuse for Irrigation:** Treated water is utilized for irrigating gardens and green spaces, reducing the demand for fresh water.

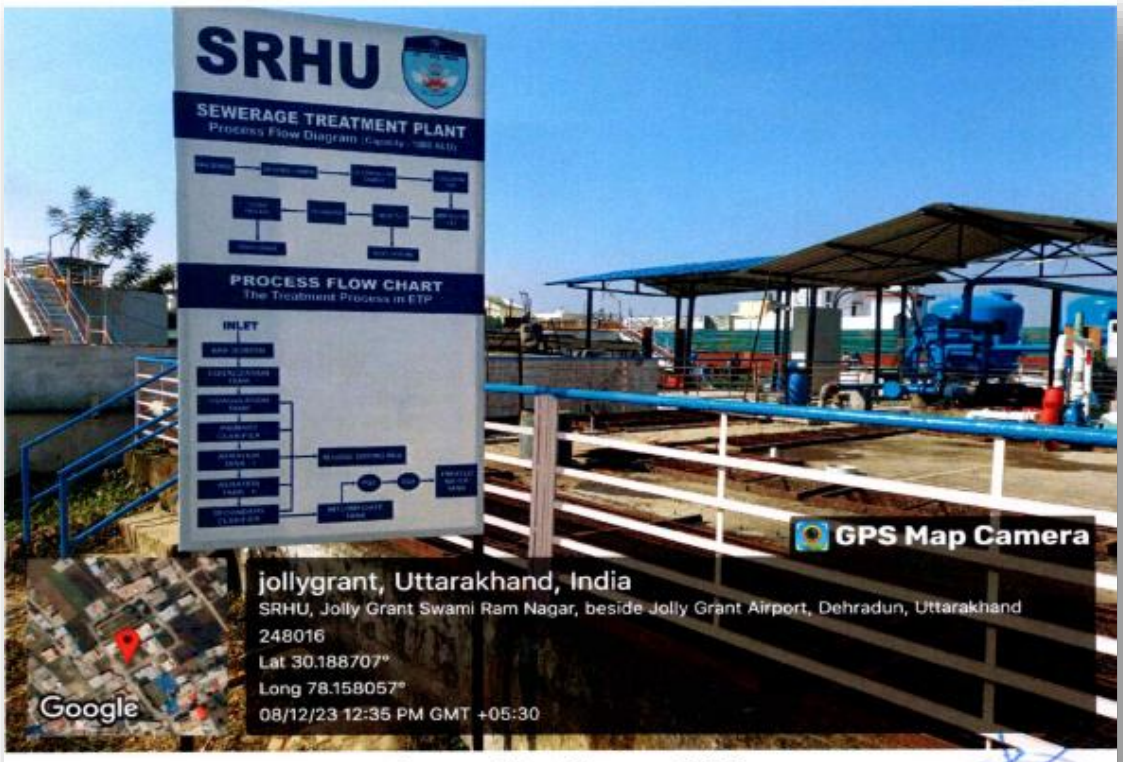
3. **Sanitation Systems:** Recycled water is used for flushing toilets and cleaning purposes, conserving potable water.

4. **Laboratory Practices:** Water recycling technologies are integrated into laboratories to reuse water in experiments and processes.

5. **Monitoring and Maintenance:** Regular monitoring ensures the quality of recycled water, while maintenance practices keep the systems efficient and operational.

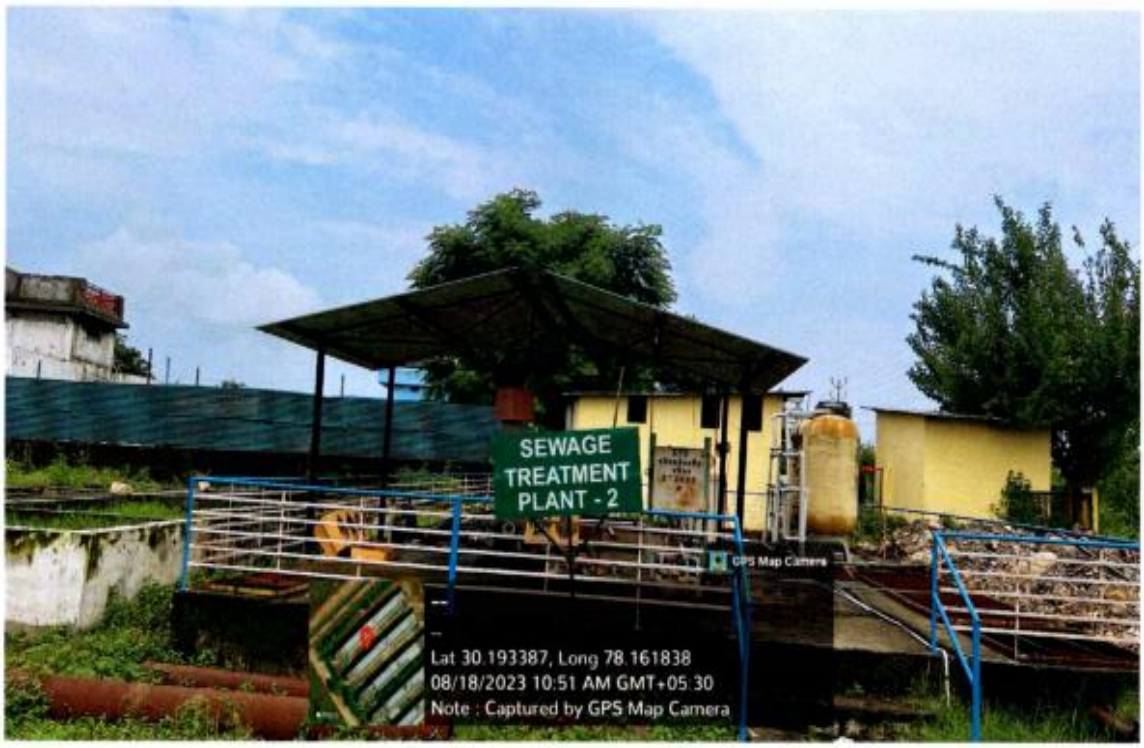
6. **Awareness Programs:** Workshops and awareness drives educate students and staff about the importance of water recycling and its role in sustainability.

Sewage Treatment Plant (STP)

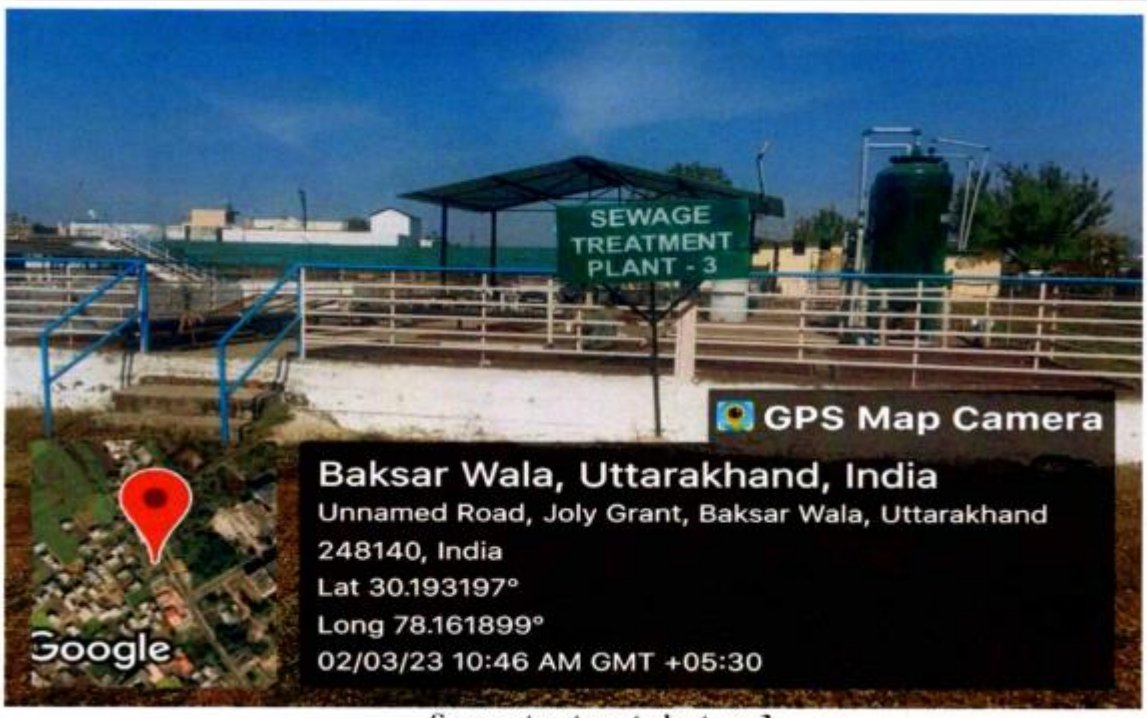


Process Flow Diagram (STP)

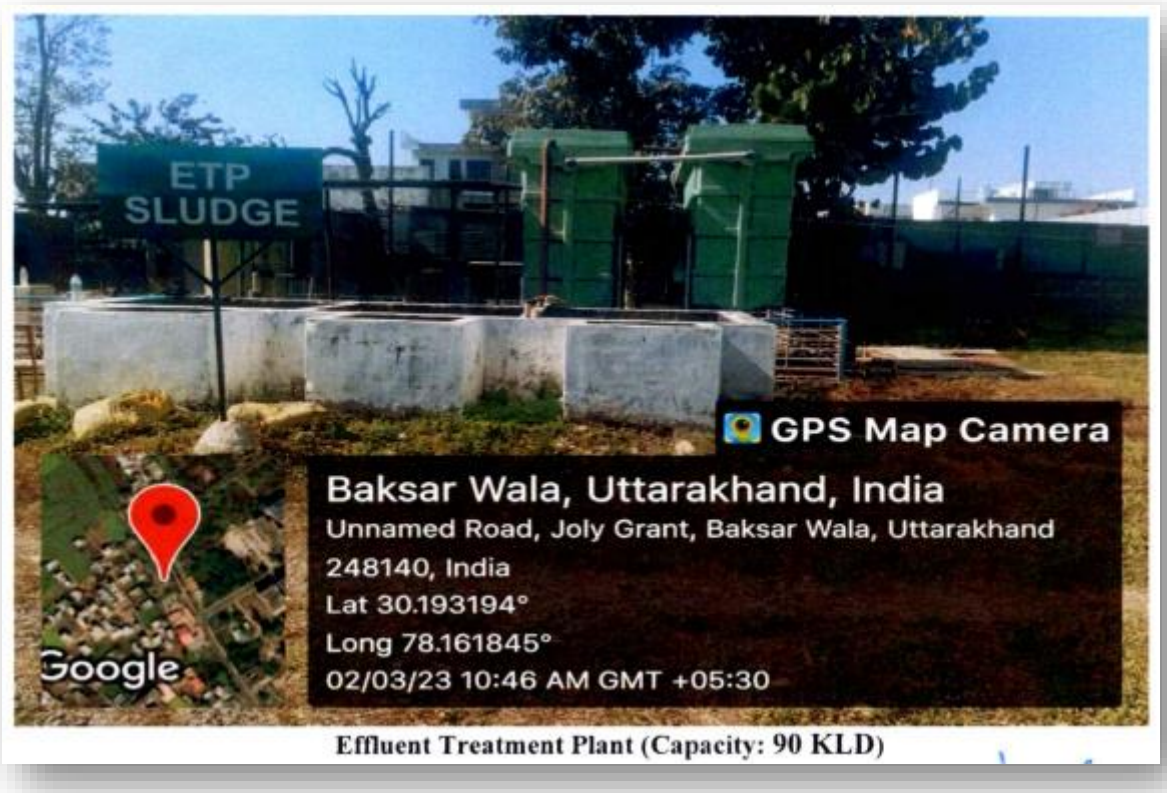
Sewage Treatment Plant no. 1



Sewage Treatment Plant no. 2



Sewage treatment plant no. 3

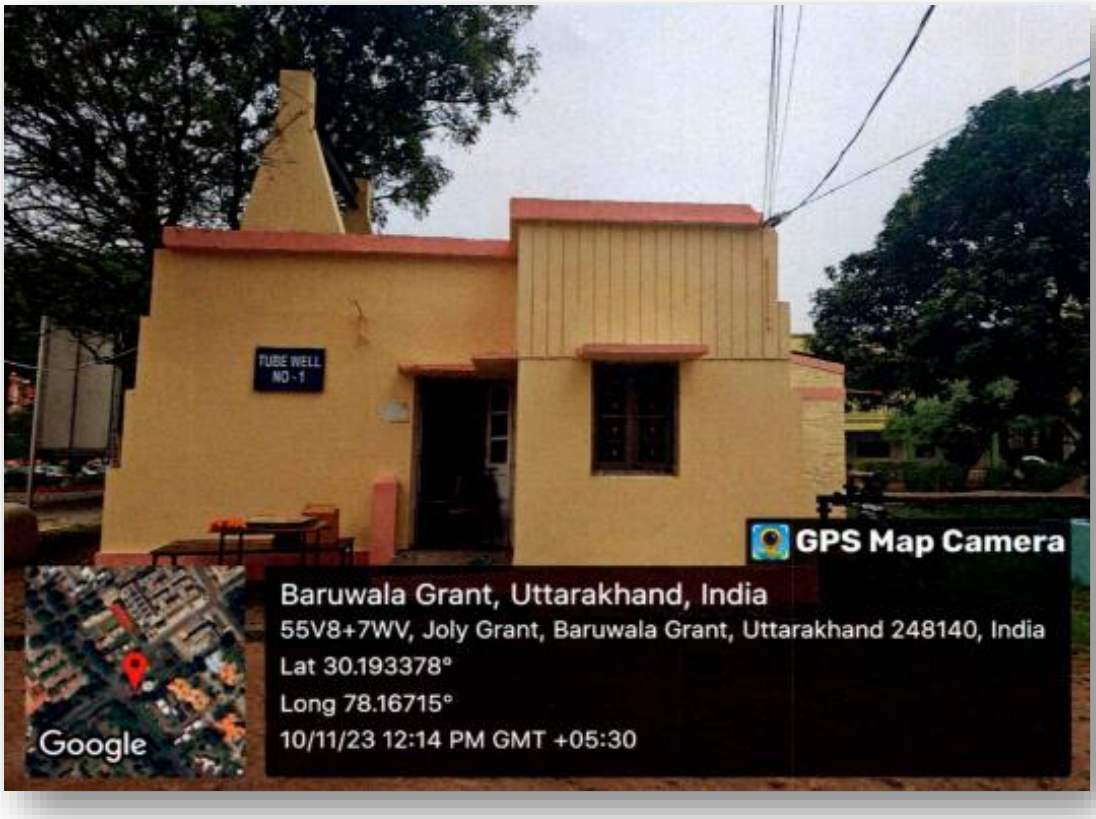


Effluent Treatment Plant (Capacity: 90 KLD)

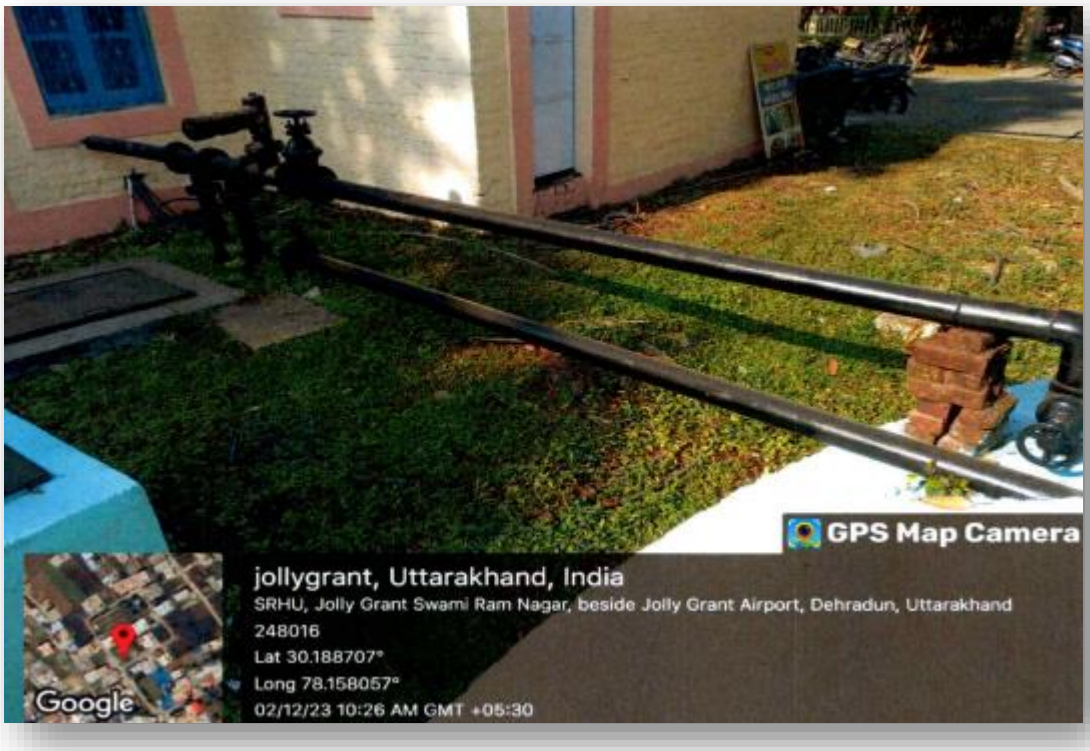
Maintenance of water bodies and the water distribution system

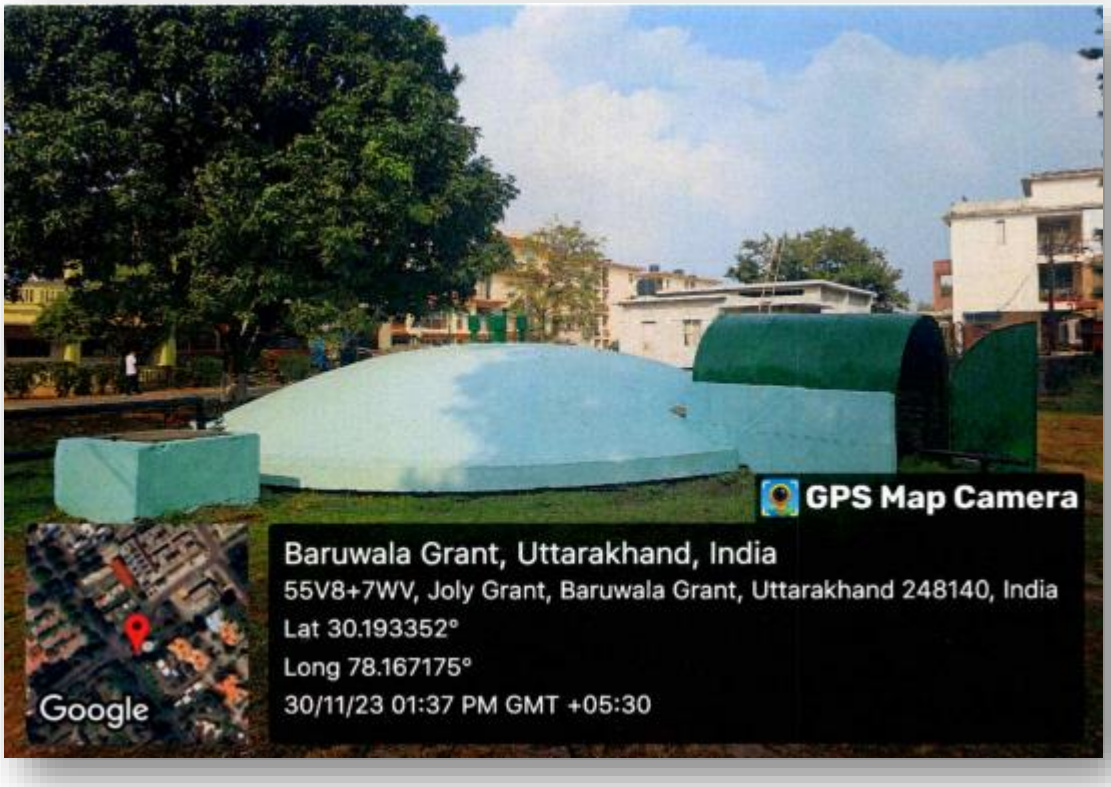
SRHU ensures the proper maintenance of water bodies and the water distribution system within the campus to support sustainable water management. Key initiatives include:

- Periodic Cleaning and Desilting: Regular cleaning of water storage tanks, ponds, and recharge pits to prevent contamination and maintain water quality.
- Leakage Detection and Repairs: Timely identification and repair of leaks in pipelines to minimize water wastage.
- Water Quality Monitoring: Routine testing of water quality to ensure compliance with safety and health standards.
- Pipeline and Pump Maintenance: Regular inspection and servicing of pipelines, pumps, and valves to ensure uninterrupted water supply.
- Green Landscaping Practices: Incorporating sustainable landscaping techniques that reduce water consumption and promote groundwater recharge.
- Awareness Campaigns: Organizing awareness programs for staff and students on water conservation practices and distribution system management.

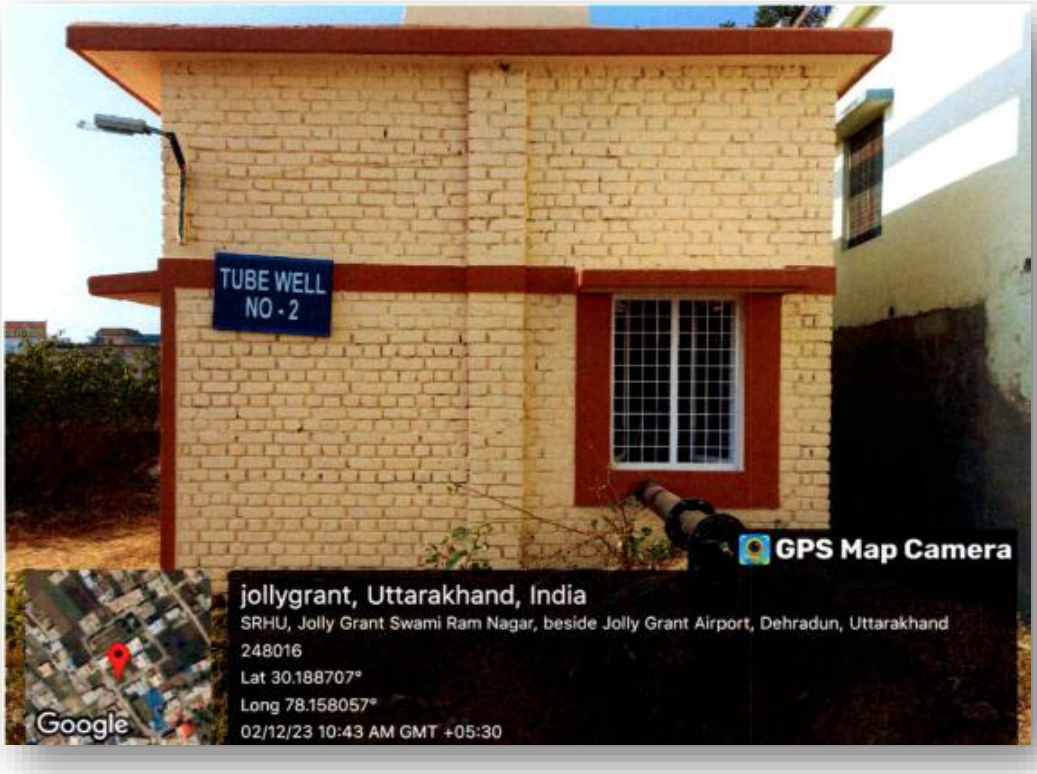


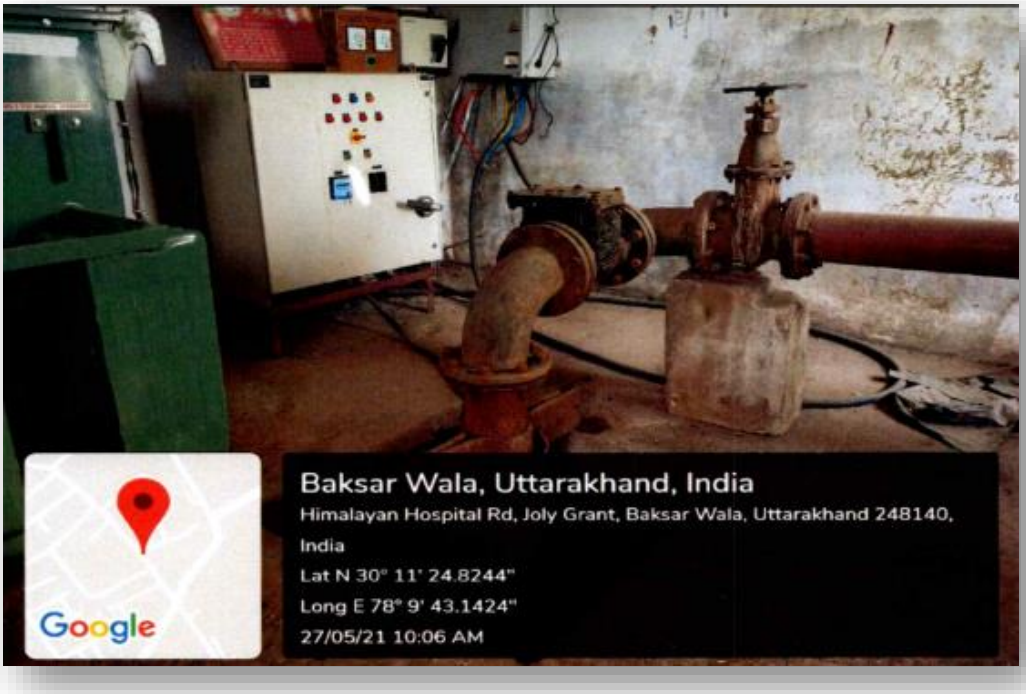
Main Tubewell and the distribution valve



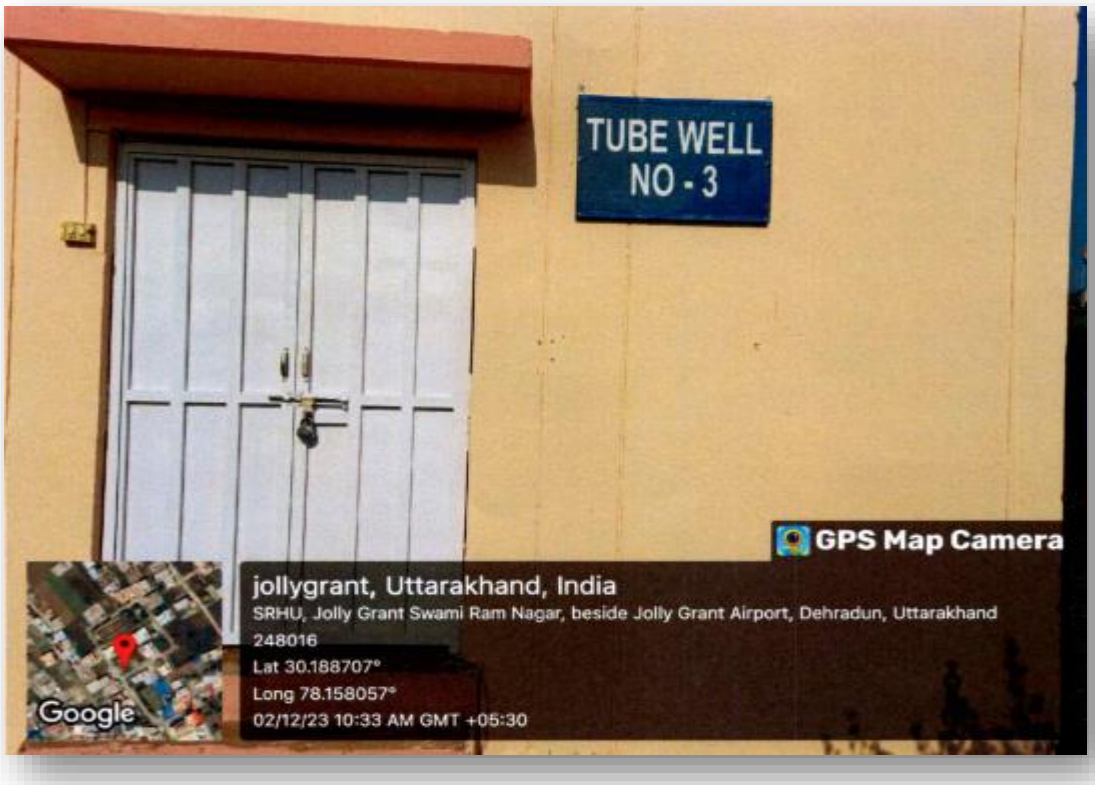


Distribution pipe from the tubewell to underground well

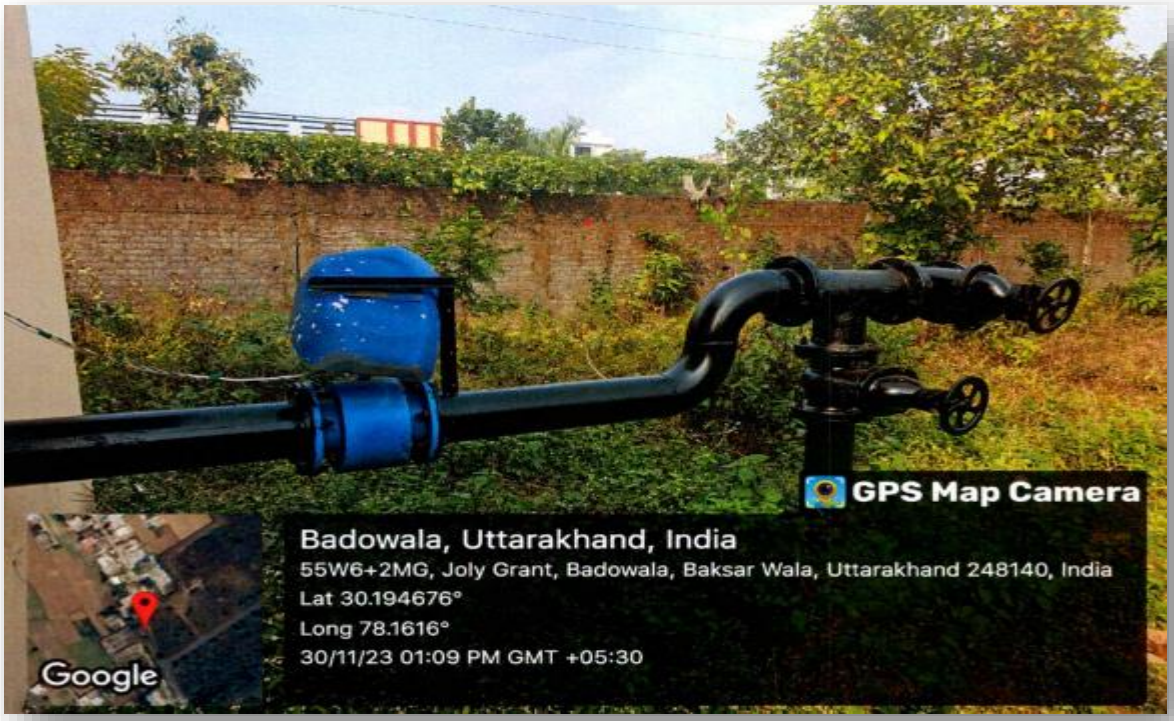




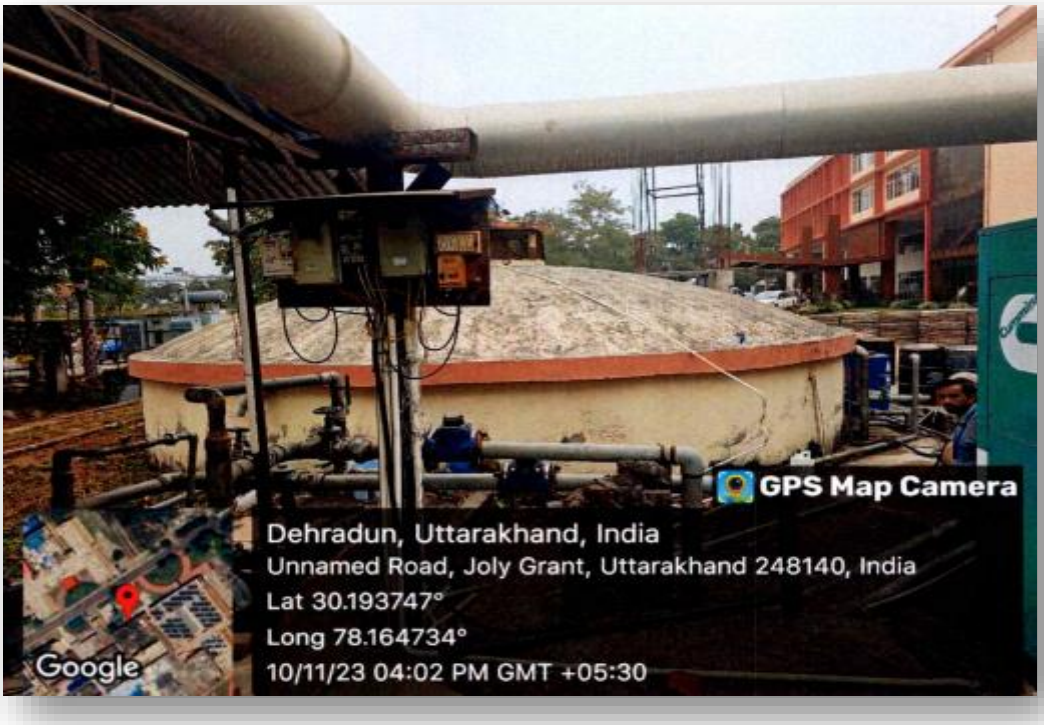
Tubewell No 2 with the distribution pipe

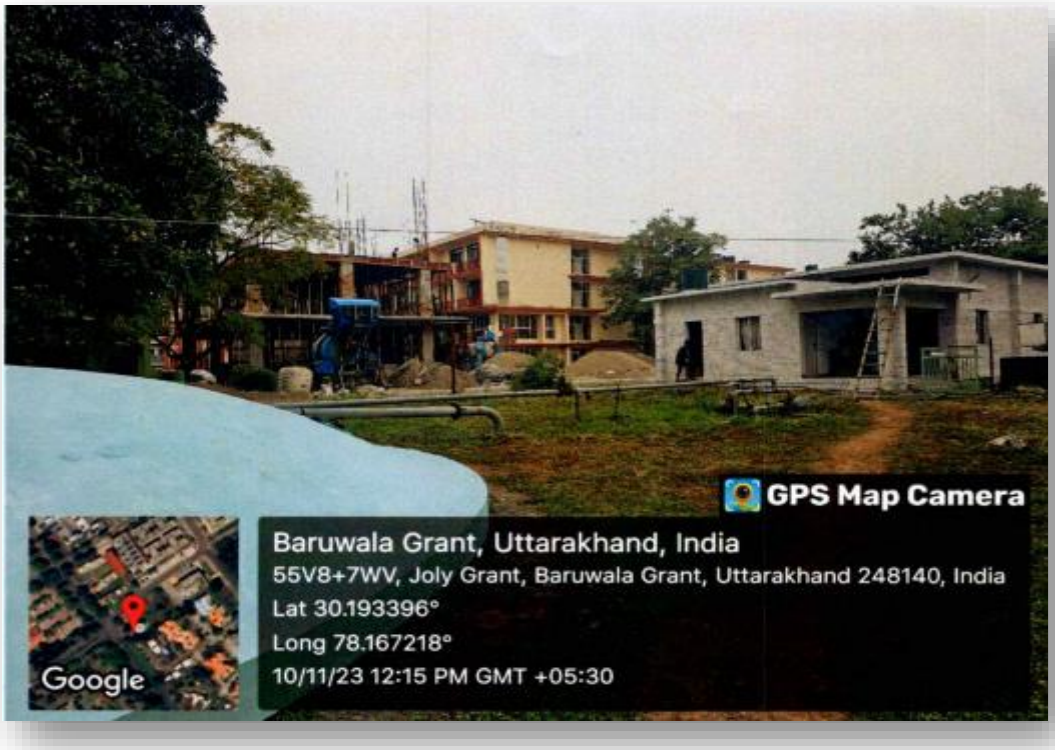


Tubewell No.3 with chlorination and distribution system



Tubewell No. 3 with chlorination and distribution system



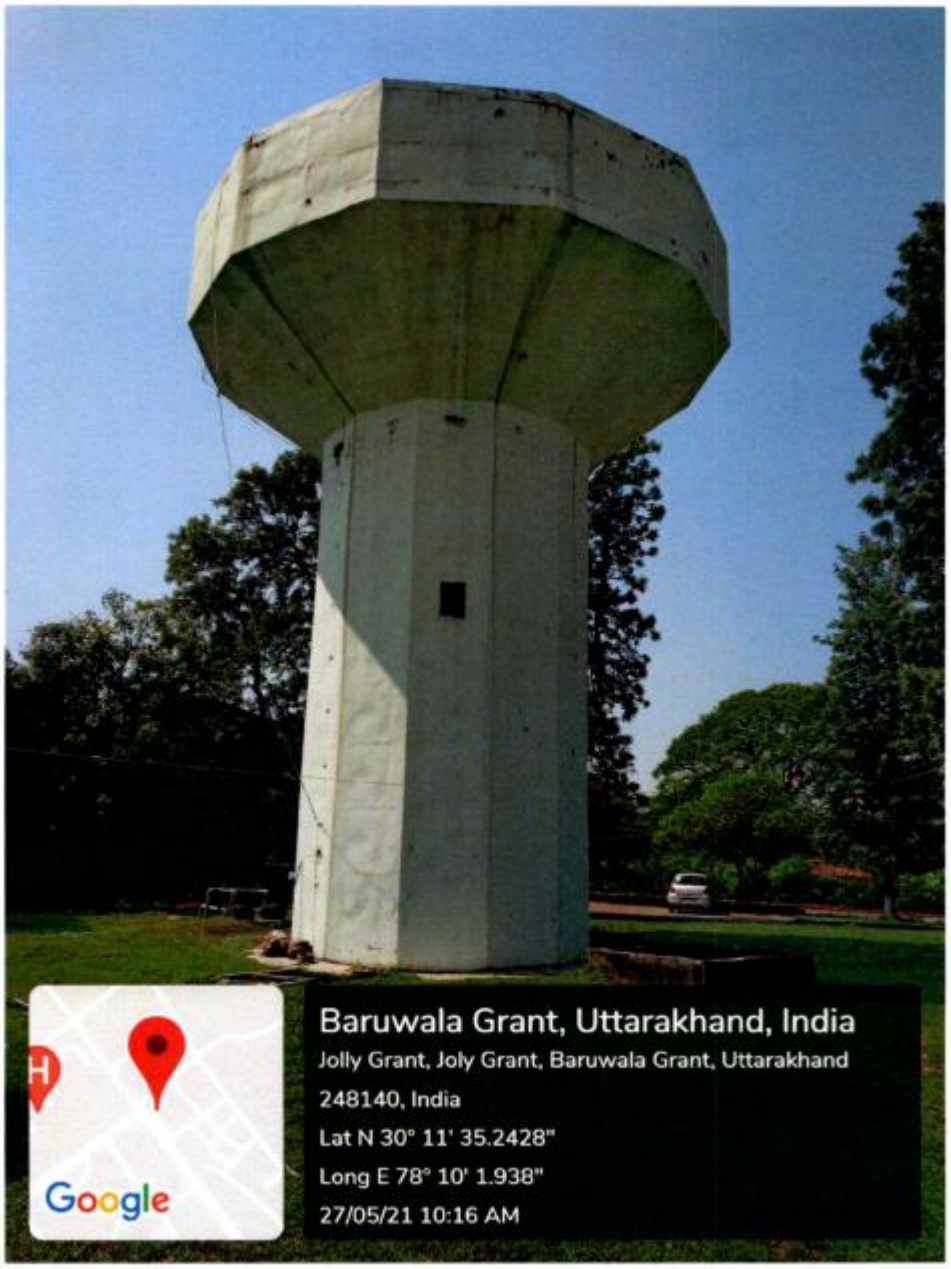


Pipelines for the distribution through underground water tanks

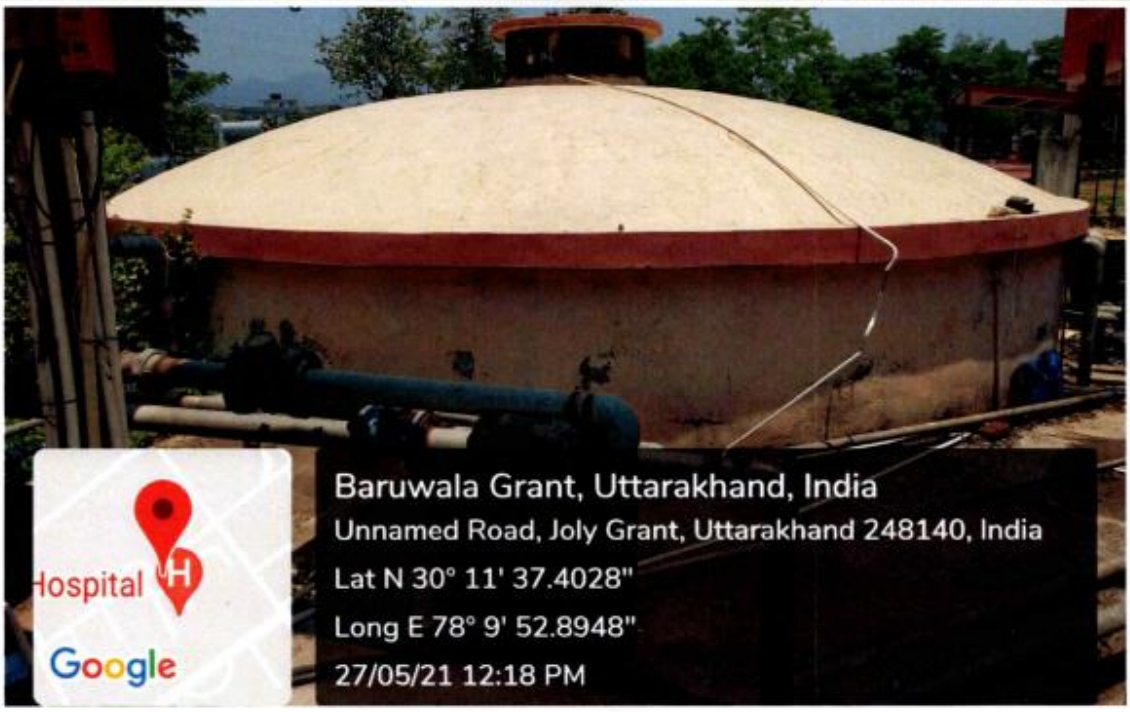
Tanks and Bunds

SRHU emphasizes the use of tanks and bunds as an integral part of its sustainable water management practices. These structures are vital for conserving water, preventing soil erosion, and supporting groundwater recharge. Key initiatives include:

1. **Water Storage Tanks:** Constructing large tanks to store rainwater and treated water for irrigation and other non-potable uses.
2. **Bunding Systems:** Establishing bunds in key areas to capture surface runoff and direct it to recharge pits or water bodies.
3. **Erosion Control:** Using bunds to prevent soil erosion and enhance soil moisture retention in landscaped and agricultural areas.
4. **Groundwater Recharge:** Designing tanks and bunds to channel excess water into aquifers, thereby maintaining groundwater levels.
5. **Community Awareness:** Educating the campus community on the importance and functioning of tanks and bunds in sustainable water management.
6. **Integration with Landscaping:** Incorporating tanks and bunds into the campus landscaping plan to maximize water conservation benefits.



Overhead Tank (Tubewell Chowk) with capacity of 250 KL



Underground water tanks (Tube well Chowk- 150 KL and behind the main Hospital building- 175 KL)

Policy on Liquid waste management: (View Document)

SRHU follows a well-defined liquid waste management policy to ensure environmentally safe disposal and treatment of liquid waste. Key features include:

1. **Wastewater Treatment Plants:** Advanced treatment plants are installed to process liquid waste generated from laboratories, hostels, and other facilities.
2. **Segregation and Collection:** Liquid waste is segregated at source, collected, and directed to treatment plants.
3. **Treatment Processes:** Biological, chemical, and physical treatment methods are used to neutralize contaminants and make the water reusable.
4. **Reuse and Disposal:** Treated water is reused for irrigation, flushing systems, and cleaning purposes, while excess treated water is safely discharged following environmental regulations.
5. **Regular Monitoring:** Periodic checks and tests are conducted to ensure compliance with pollution control norms.
6. **Awareness and Training:** Staff and students are regularly trained in proper waste disposal techniques and the importance of liquid waste management.

Research Initiatives:

Aligned with Sustainable Development Goal 6, the University undertakes innovative research to ensure the availability and sustainable management of water and sanitation. Key initiatives include developing advanced water purification technologies and low-cost wastewater treatment solutions to improve water quality and accessibility. Researchers focus on creating

efficient water recycling systems and sustainable irrigation practices to optimize water usage in agriculture and urban settings. Studies on the impact of climate change on water resources guide adaptive strategies for conservation and management. The University also explores the integration of smart technologies for real-time water quality monitoring and leakage detection, enhancing the efficiency of water distribution systems. By collaborating with government agencies, industries, and international organizations, the University contributes to innovative solutions that address water scarcity, pollution, and sanitation challenges, fostering sustainable development and resilience in water management.

Research Projects

The University provides research funds to promote the research for conduction of research (Intramural-Projects-Ongoing-2023.pdf, Intramural-Project-2024-Sanctioned-4.pdf). To name a few intramural projects funded by the university are:

S. No.	Name of the project	Duration of the project	Name(s) of the teacher(s) working in the project receiving seed money	The amount of seed money provided (INR in lakhs)	Year of receiving the seed money
1.	Demineralized Water Consumption: Unravelling Current Trends and Health Effects (Research article)	06 Months	Dr. Nupur Joshi, Dr. Nikku Yadav, Dr. Ashutosh Kumar Choudhary, Dr. Deep Shika, Ms. Shweta Samant	0.3	Till December 2023
2.	Emerging threats in Aquaculture: Bibliometric Analysis of Aeromonas sps. as an emerging pathogen	04 Months	Nupur Joshi, Dr. Geeta Bhandari, Dr Archna Dhasmana, Dr Vikash Singh Jadon, Dr. Sanjay Gupta	0.15	Till December 2023
3.	Roof Top Rain Water Harvester	09 Months	Dr. H.P. Uniyal	0.3	Till December 2023

The University actively secures extramural funding from national agencies to support research and initiatives aligned with Sustainable Development Goal 6 (SDG 6). These funds facilitate the development and implementation of projects aimed at improving water accessibility, quality, and sustainability. Extramural funding enables the University to establish state-of-the-art infrastructure, such as advanced water treatment and recycling facilities, and to conduct impactful research on innovative technologies for water purification, wastewater management, and groundwater recharge. Collaborative projects supported by these funds focus on addressing pressing issues such as water scarcity, pollution, and sanitation in rural and urban settings. Additionally, funding is utilized to organize community outreach programs, capacity-building workshops, and awareness campaigns that promote sustainable water usage and hygiene practices.

Research publications:

The University is committed to advancing Sustainable Development Goal 6 (SDG 6) through high-quality research and scholarly contributions. Faculty and researchers regularly publish their findings in peer-reviewed journals, highlighting innovative solutions for water and sanitation challenges. These publications address critical issues such as water purification technologies, wastewater treatment, rainwater harvesting, groundwater management, and the impact of climate change on water resources (Scopus - Swami Rama Himalayan University).

- Kumari, M., Bora, J., Dhasmana, A., Sinha, S., Malik, S. Nanotechnology for bioremediation of industrial wastewater treatment. Advanced Application of Nanotechnology to Industrial Wastewater, 2023
- Dhillon, N., Gupta, S., Kumar, V., Bhandari, G., Arya, S. Lipid. Journal of Pure and Applied Microbiology, 2023
- Naik, B.S.S.S., Vijay, K., Rizwanuddin, S., ...Mishra, S., Rustagi, S. Genomics, Proteomics, and Metabolomics Approaches to Improve Abiotic Stress Tolerance in Tomato Plant. International Journal of Molecular Sciences, 2023

- Kumari, S., Dwivedi, S., Khan, E.A.R., ...Dhasmana, A., Malik, S. The Challenges of Wastewater and Wastewater Management. Advanced and Innovative Approaches of Environmental Biotechnology in Industrial Wastewater Treatment, 2023
- Patel, N., Dhasmana, A., Kumari, S., ...Nayanam, S., Malik, S. Nanofiltration Applications for Potable Water, Treatment, and Reuse. Advanced and Innovative Approaches of Environmental Biotechnology in Industrial Wastewater Treatment, 2023
- Kumari, P., Dhasmana, A., Kishore, S., ...Mukherjee, N., Malik, S. Sustainable Green Approaches for Wastewater Purification. Advanced and Innovative Approaches of Environmental Biotechnology in Industrial Wastewater Treatment, 2023
- Vijaylakshmi,, Hemwati Nandan, R.M., Chaudhary, S., Bhandari, G. Microbial exopolysaccharides and their application for bioremediation of environmental pollutants. Advanced Microbial Technology for Sustainable Agriculture and Environment, 2023
- Gangola, S., Joshi, S., Bhandari, G., ...Bhandari, N.S., Mittal, A. Remediation of heavy metals by rhizospheric bacteria and their mechanism of detoxification. Advanced Microbial Technology for Sustainable Agriculture and Environment, 2023
- Malik, S., Kishore, S., Dhasmana, A., ...Minkina, T.M., Rajput, V.D. Wastewater. Water (Switzerland), 2023
- Rawat, G., Choudhary, R., Kumar, V.R. Microbial Biosurfactants and Their Implication Toward Wastewater Management. Handbook of Environmental Chemistry, 2023
- Malik, S., Dhasmana, A., Preetam, S., ...Singh, R.K., Rajput, V.D. Exploring Microbial-Based Green Nanobiotechnology for Wastewater Remediation: A Sustainable Strategy. Nanomaterials, 2022
- Bhatt, P., Bhandari, G., Bhatt, K., Simsek, H. Microalgae-based removal of pollutants from wastewaters: Occurrence, toxicity and circular economy. Chemosphere, 2022
- Bhatt, P., Bhandari, G., Turco, R.F., ...Bhatt, K., Simsek, H. Algae in wastewater treatment, mechanism, and application of biomass for production of value-added product. Environmental Pollution, 2022
- Rajput, V., Jaiswal, K.K., Dhatwalia, V.K., ...Kumar, S.K., Verma, M. Microalgae: A promising tool for pesticide mitigation in wastewater. Pesticides Bioremediation, 2022

- Gangola, S., Bhatt, P., Alagarasan, J.K., ...Bhatt, K., Rene, E.R. Biotechnological tools to elucidate the mechanism of pesticide degradation in the environment. Chemosphere, 2022

Patents and Innovations

The University actively contributes to Sustainable Development Goal 6 (SDG 6) by fostering innovation and translating research into practical solutions through patentable technologies. Researchers and faculty members focus on developing cutting-edge technologies and systems that address water and sanitation challenges, emphasizing sustainability and community impact.

S.No.	Title of Patent	Name of the innovator	Patent number	Status
1	Roof Top Rain Water Harvester	Er. H.P. Uniyal	202311053398	Click Here
2	A System for Injecting Treated Rain Water Directly to the Aquifers	ER. H.P. Uniyal	202311008945	Click Here
3	IoT based irrigation system for precision agriculture	Dr. Pramod Kumar	202411073181	Click Here

Key Initiatives taken under SDG 6 by RDI

The organization's commitment to enhancing water, sanitation, and hygiene (WASH) services in rural areas is notable. By implementing various WASH programs, it has successfully impacted over 550 villages, promoting sustainable health and hygiene benefits for these communities.

Key Focus Areas of WATSAN

- Integrated water resources management (Source recharge, rejuvenation, Source sustainability, Rain water, Springshed & Catchment area protection)
- Services (Water Supply Schemes, Rain Water Harvesting Tank, Springshed Management Sanitation, Environment & NRM, Community Education)
- Technical Support at Community and Institutional level
- Developing and Promoting Innovative Technologies (Existing technology vs. Innovative technology, Use of traditional wisdom & technology with scientific approach)

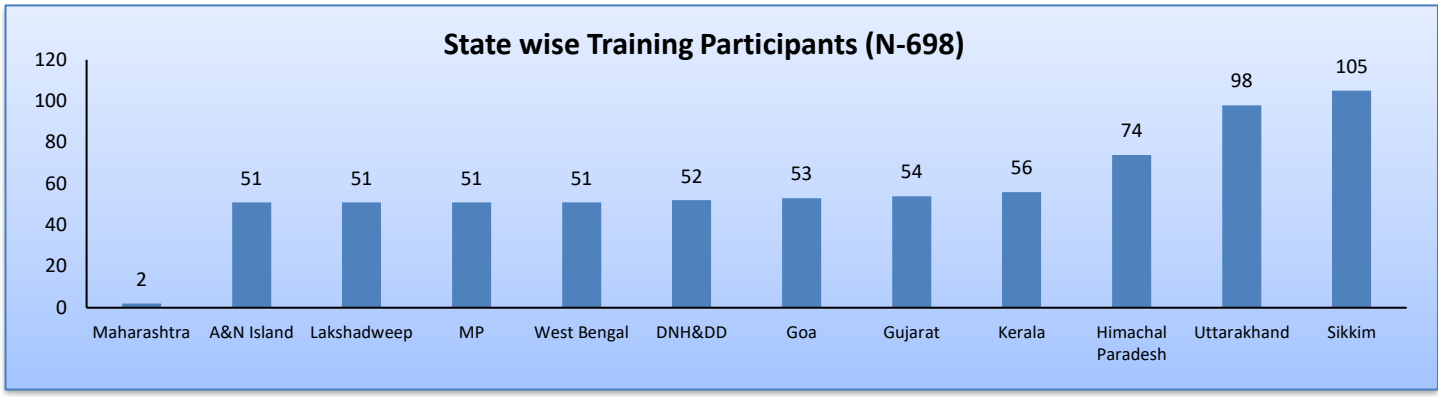
Key Resource Centre (KRC) under Jal Jeevan Mission

The Key Resource Centre (KRC) under the Jal Jeevan Mission focuses on capacity building and training for government officials, functionaries, and stakeholders involved in water and sanitation management. The program specifically targets Level-2 (Mid Management) and Level-3 (Community) participants. These training sessions are designed to enhance the skills and knowledge of individuals at these levels, improving their effectiveness in implementing and managing water and sanitation projects.

Capacity Building through 15 Batches of Three Days Residential Training Programs

As part of the capacity-building efforts, 15 batches of Public Health Engineers (PHEs) participated in three-day residential training programs across India. These programs covered five major themes and aimed to enhance the skills and knowledge of mid-level government officials. A total of 698 officials, including Executive Engineers, Assistant Engineers, and Junior Engineers from the Water Supply departments of various states, received training. Additionally, officials from the Panchayati Raj Department, Irrigation Department, and Rural Development Department in some states also took part in these programs

.



Training on Direct Injection of treated Rainwater in Aquifer Recharge, Revival of Springs & Springshed Management

The Key Resource Centre (KRC) under HIHT organized three training programs focusing on the direct injection of treated rainwater for aquifer recharge, the revival of springs, and springshed management. These programs were held in West Bengal, Uttarakhand, and Himachal Pradesh, with a total of 122 mid-level engineers participating.

The main objective of these training sessions was to raise awareness among Public Health Engineers about the integrated issues of rural water supply schemes and water resource management. The training emphasized innovative methodologies for:

Direct injection of treated rainwater into aquifers

Revival of natural springs

Management of springsheds

The programs aimed to build participants' capacities in these areas, equipping them with skills and knowledge to implement spring-based water supply systems. These systems are

designed to be safe, reliable, and effective for communities living in mountainous regions, ensuring sustainable water resources and improved water management.

Training on Operation and Maintenance of Water Supply Systems, Utility Approach & Tariff Collection Mechanism

Three training programs were conducted on the Operation and Maintenance (O&M) of Water Supply Systems, focusing on utility approaches and tariff collection mechanisms. These programs took place in Sikkim, Andaman & Nicobar Islands, and Lakshadweep Islands, with a total of 152 mid-level engineers participating.

The primary objective was to address cross-cutting issues related to rural water supply schemes and water resource management, specifically focusing on:

The operation and maintenance of water supply systems

Utility approaches to water management

Tariff collection mechanisms

Participants were educated on O&M practices in accordance with the 73rd Amendment Act and reforms in rural drinking water supply. The training also covered disinfection systems for potable water supply, enhancing participants' understanding and skills in managing safe and effective water supply systems.

Training on Revival of Traditional Water Bodies for Source Sustainability

Three training programs were held on the Revival of Traditional Water Bodies for Source Sustainability, targeting mid-level engineers from Kerala, Maharashtra, Himachal Pradesh, Uttarakhand, and Gujarat. A total of 118 engineers participated in these sessions.

The main objectives of the training were to highlight the cross-cutting issues related to rural water supply schemes and water resource management and focus on on the revival of traditional water bodies for ensuring the sustainability of water sources.

Participants were sensitized on:

The various types of traditional water bodies in different regions of India

Conservation practices for these water bodies, including community-based methods

Systematic approaches to water conservation historically used in India

The training also covered the processes involved in the recharge of watersheds, traditional water bodies and structures used for recharging and reviving these water bodies. These programs aimed to enhance participants' knowledge and capabilities in managing and conserving traditional water bodies, contributing to long-term water source sustainability.

Training on Grey Water management: Reduce, Reuse, Recycle and Recharge for enhancing water use efficiency (Circular economy and net-zero concept), Nature based Solutions and Technologies for Grey Water Management

Three training programs were conducted on Grey Water Management, focusing on the principles of reducing, reusing, recycling, and recharging grey water to enhance water use efficiency. The trainings were conducted in Dadar & Nagar Haveli and Daman & Diu, Kerala, and Goa, with a participationi of total of 157 mid-level engineers.

The training covered:

Basics and Issues of Grey Water Management: Understanding the fundamentals and the challenges associated with grey water management within the context of the Jal Jeevan Mission.

Need for Grey Water Treatment: Criteria for treatment, use of technologies, pollutant levels, and the impact of using undertreated water.

Planning and Designing Treatment Technologies: Methods for designing and planning grey water treatment systems and identifying suitable locations for these systems at the village or cluster level.

Community-Level Management: Strategies for managing grey water at the community level.

Net Zero Energy Concept & Circular Economy: Incorporating principles of circular economy and achieving net-zero energy in grey water management practices.

Reuse of Grey Water: Techniques and benefits of reusing grey water.

Functionality Assessment: Conducting assessments to ensure the effectiveness and functionality of grey water management schemes.

The training aimed to equip participants with the knowledge and skills necessary for effective grey water management, promoting sustainable water use and contributing to water resource efficiency.

Training on WASH Services during Disaster and Emergencies and Ensuring Climate Resilience System

Training programs on WASH Services during Disasters and Emergencies and ensuring Climate Resilience Systems were conducted in Madhya Pradesh, Uttarakhand, and Sikkim, with a total of 149 mid-level engineers participating.

The primary objectives of these training sessions were to:

Plan and Prepare: Develop strategies for managing WASH services during disasters and emergencies.

Mitigation Measures: Implement measures to mitigate the impact of such events on water, sanitation, and hygiene services.

Ensure Climate Resilience: Enhance the resilience of WASH systems to climate change and environmental challenges.

The programs aimed to improve participants' capabilities in planning and implementing effective WASH services in crisis situations, ensuring that systems are robust and adaptable to changing climate conditions.

Summary of L2 Trainings of at a Glance

	Direct injection of treated rain water in aquifer recharge, revival of springs & Spring shed Management	Operation and Maintenance of water supply systems, Utility approach & tariff collection mechanism	Revival of Traditional Water Bodies for Source Sustainability	Grey water management : Reduce, Reuse, Recycle and Recharge for enhancing water use efficiency	WASH Services during Disaster and Emergencies and Ensuring Climate Resilience System	Total
A & N Island		51				51
Dadra Nagar Haveli & Daman Diu				52		52

Gujarat			54			54
Goa				53		53
Himachal Pradesh	37		37			74
Kerala			4	52		56
Lakshadweep		51				51
Madhya Pradesh					51	51
Maharashtra			2			2
Sikkim		50			55	105
Uttarakhand	34		21		43	98
West Bengal	51					51
Total	122	152	118	157	149	698

Nyay Panchayat level Trainings on JJM to PRIs & VWSCs/ ASHAs & AWWs in 3 districts of Uttarakhand

Within the state of Uttarakhand, trainings for 109 Nyay Panchayat in Dehradun, Haridwar and Rudraprayag districts were conducted. 5492 functionaries including members of the Village Water Sanitation Committee (VWSC) and representatives of the Panchayati raj Institutions participated.

In Uttarakhand, training sessions on the Jal Jeevan Mission (JJM) were conducted at the Nyay Panchayat level across three districts: Dehradun, Haridwar, and Rudraprayag. A total of 109 Nyay Panchayats were involved in these sessions.

The training focused on:

Village Water Sanitation Committees, Panchayati Raj Institutions, ASHAs, AWWs

A total of 5,492 functionaries participated, including members of VWSCs and representatives from PRIs. The training aimed to enhance the knowledge and skills of these key stakeholders in implementing and managing water and sanitation services at the grassroots level, supporting the overall objectives of the Jal Jeevan Mission.