Shoolini University

6 CLEAN WATER AND SANITATION

SDG 6
CLEAN WATER AND SANITATION

2025



SHOOLINI UNIVERSITY

Solan, Himachal Pradesh, India

Introduction

Sustainable Development Goal 6 - Clean Water and Sanitation calls for the availability and sustainable management of water and sanitation for all. Achieving this goal requires reliable access to safe drinking water, effective wastewater treatment, prevention of water pollution and responsible use of freshwater resources. Higher education institutions contribute through sustainable campus operations, research, education and partnerships that extend practical solutions to surrounding communities.

Shoolini University integrates water stewardship into its infrastructure, institutional policies and daily practices. Located in the Himalayan foothills, the University recognises the importance of protecting local water sources and strengthening resilience to seasonal variations in availability. Its approach combines water-use monitoring, rainwater harvesting, groundwater recharge, efficient fixtures and the reuse of treated wastewater for suitable non-potable applications. During 2025, the University maintained monthly records of water received, consumed and recycled to support informed resource management. Its wastewater-treatment infrastructure includes a Sewage Treatment Plant with a capacity of 400 kilolitres per day. Treated water supports horticulture, landscaping, flushing and other appropriate uses, helping reduce freshwater demand. Free drinking-water facilities, filtration systems and routine quality testing complement these conservation measures by supporting the health and well-being of the campus community.

The University's commitment extends beyond physical infrastructure. Water-conscious building practices, drought-tolerant planting, conservation policies and awareness programmes encourage shared responsibility among students, faculty and staff. Research, educational opportunities and community engagement further connect institutional expertise with water conservation and pollution prevention beyond campus. This report presents Shoolini University's initiatives and documented progress during 2025 towards sustainable water management and the objectives of SDG 6.

Research and Innovation

Shoolini University advances research and innovation in support of SDG 6 through interdisciplinary work on water quality, wastewater treatment, conservation and sustainable resource management. Bringing together expertise in environmental sciences, biotechnology, chemistry and engineering, the University encourages research that addresses water-related challenges and explores practical approaches to protecting freshwater resources. Doctoral

research opportunities in water management support investigation into areas such as hydrogeology, water quality, irrigation, conservation and treatment technologies. These opportunities connect scientific inquiry with the need for efficient, accessible and environmentally responsible water-management solutions. The University's campus infrastructure also provides opportunities for applied learning. Sewage and effluent treatment facilities, rainwater-harvesting systems and water-use monitoring connect classroom knowledge with operational practices. Students and researchers can examine how treatment, reuse and conservation measures contribute to reducing freshwater demand and managing wastewater responsibly.

List of Publication for SDG 6 (Year 2025)

Title	Authors	Year	CiteScore (publication year)
Structural design of dual Z-scheme GCN/CdO/CaFe2O4 ternary heterojunction with high visible light activity: Photocatalytic performance and mechanism in the degradation of Congo red dye	Sudhaik, A.| Kumar, R.| Sharma, S.| Sharma, A.| Devi, S.| Raizada, P.| Le, Q.V.| Ahamad, T.| Nguyen, V.-H.| Singh, P.	2025	8.5
Harnessing nitrogen doped magnetic biochar for efficient antibiotic adsorption and degradation	Rana, P.| Soni, V.| Sharma, S.| Poonia, K.| Patial, S.| Singh, P.| Selvasembian, R.| Chaudhary, V.| Hussain, C.M.| Raizada, P.	2025	12
Synergy between dual Z-scheme heterostructured Vo-Bi2WO6/Bi2S3/Ag2S@Chitosan for the effective degradation of fuchsin basic dye	Sharma, K.| Sonu, S.| Singh, P.| Ahmad, T.| Kaya, S.| Katin, K.P.| Kumar, N.| Singh, A.| Hussain, C.M.| Raizada, P.	2025	11.7
Wildfires under changing climate, and their environmental and health impacts	Bolan, S.| Sharma, S.| Mukherjee, S.| Isaza, D.F.G.| Rodgers, E.M.| Zhou, P.| Hou, D.| Scordo, F.| Chandra, S.| Siddique, K.H.M.| Bolan, N.	2025	6.5
Applications of citrus peels valorisation in circular bioeconomy	Kumar, H.| Guleria, S.| Kimta, N.| Nepovimova, E.| Dhanjal, D.S.| Sethi, N.| Suthar, T.| Shaikh, A.M.| Bela, B.K.| Harsányi, E.	2025	9.8
Fabrication of Bi4O5I2/CuO S-scheme heterojunction photocatalyst with enhanced visible light degradation of Rhodamine B	Dhiman, P.| Sharma, J.| Kumar, A.| Verma, Y.| Sharma, G.| Kondal, N.| Lai, C.W.	2025	10.7
Application of Zero-Valent Iron and Its Derivatives in the Removal of Toxic Metal Ions from Groundwater	Verma, Y.| Verma, A.| Bhaskaralingam, A.| Dhiman, P.| Wang, T.| Kumar, A.| Sharma, G.	2025	6.7

Multi-mechanism synergistic adsorption of lead and cadmium in water by structure-functionally adapted modified biochar: A review	Zhang, D.| Wu, B.| Wang, T.| Yılmaz, M.| Sharma, G.| Kumar, A.| Shi, H.	2025	4.2
Synthesis of gum acacia-cl-acrylic acid-co-itaconic acid hydrogels for efficient removal of toxic dye rhodamine-B: A step for sustainable environment	Kumari, P.| Kaushal, D.| Chauhan, V.| Shandilya, P.| Kumar, M.	2025	11.4
Zeolites and their composites as novel remediation agent for antibiotics: A review	Verma, Y.| Sharma, G.| Kumar, A.| Wang, T.| Dhiman, P.| Mola, G.T.	2025	8.1
Activated carbon/polyacrylamide-cl-xanthan gum nanocomposite for adsorption of methylene blue dye	Verma, A.| Dhiman, P.| Peñas, A.G.| Sharma, G.	2025	11.4
Multi-interfaced SnS2/ZrO2/g-C3N4 ternary nanocomposites: Charge transfer mechanistic exploration and enhanced photodegradation efficiency towards Rhodamine B dye and ciprofloxacin antibiotic	Kumari, M.| Kumar, N.| Sharma, R.K.| Jain, S.| Tahir, M.| Singh, P.| Makgwane, P.R.| Raizada, P.	2025	8.5
Advances in microbial fuel cell technologies for bioremediation and energy recovery from wastewater	Bose, D.| Bhattacharya, R.| Gopinath, M.| Sarkar, A.| Pandya, R.S.| Jaiswal, A.	2025	7.3
Recent advances in rare earth metal ferrites-based heterojunctions for photocatalytic water treatment, hydrogen production and CO2 conversion	Rana, S.| Kumar, A.| Dhiman, P.| Sharma, G.| Wang, T.	2025	13.5
Advancement in Anaerobic Ammonia Oxidation Technologies for Industrial Wastewater Treatment and Resource Recovery: A Comprehensive Review and Perspectives	Singh, P.| Bisen, M.| Kulshreshtha, S.| Kumar, L.| Choudhury, S.R.| Nath, M.J.| Mandal, M.| Kumar, A.| Patel, S.K.S.	2025	7.5
Graphene oxide/chitosan hydrogels for removal of antibiotics	Verma, A.| Sharma, G.| Wang, T.| Kumar, A.| Dhiman, P.| Verma, Y.| Bhaskaralingam, A.| García-Penas, A.	2025	5.3
Photocatalytic norfloxacin degradation enabled by a dual S-scheme nanocellulose-based Ag2WO4/NiO/MoO3 tertiary heterojunction	Sambyal, S.| Chauhan, V.| Shandilya, P.| Priye, A.	2025	7.6
Revolutionizing Dye Degradation: Enhanced Photocatalytic Performance of CQDs-Mg-ZnO Nanocomposites via RSM Optimization	Ganbarpour, Z.| Mirshafiei, M.| Pourmadadi, M.| Yazdian, F.| Rashedi, H.| Rahdar, A.| Fathi-karkan, S.| Pandey, S.	2025	4.9
Exploring complex silver sulfide nano-systems as efficient photocatalysts for wastewater remediation and clean energy production: Toward sustainable and circular economy	Abhimanyu| Singh, K.| Sable, H.| Sonu, S.| Kumar, V.| Singh, P.| Kaushik, A.| Thakur, P.| Chaudhary, V.	2025	27

Next-Generation Wastewater Treatment with Emerging 2D MOF-Derived Photocatalysts	Thakur, N.| Panwar, A.| Soni, V.| Raizada, P.| Singh, P.| Khan, A.A.P.| Nguyen, V.-H.| Nguyen, C.C.| Yang, S.J.| Le, Q.V.| Kim, H.| Sonu, S.	2025	7.8
Constructing oxygen vacancy enriched ZnWO4/Ag-doped In2S3 visible light active S-scheme heterojunction with improved charge migration for doxycycline hydrochloride degradation in wastewater	Soni, V.| Sonu| Singh, P.| Ahamad, T.| Katin, K.P.| Kaya, S.| Kumar, N.| Nguyen, V.-H.| Hussain, C.M.| Raizada, P.	2025	9.9
Comprehensive insights on the detection, occurrence and modelling of pharmaceuticals in surface water, groundwater, and drinking water treatment plants	Mohapatra, S.| Tong, X.| Mukherjee, S.| Dubey, M.| Subhash, S.| Luhua, Y.| van der Hoek, J.P.| Gin, K.Y.-H.	2025	12.8
Development of guar gum-sodium alginate based hydrogel for sustainable and efficient removal of crystal violet dye from wastewater	Nike, T.| Kaushal, D.| Chauhan, V.| Shandilya, P.| Kumar, M.	2025	11.4
Insights into the photocatalytic removal of malachite green organic pollutant by highly efficient hard responsive Ba1 − xCoxDyyFe12−yO19 catalysts	Himanshi| Lal, B.| Verma, A.| Suman| Ahmed, J.| Singh, A.| Choon Kit, C.| Jasrotia, R.| Lakshmaiya, N.| Mehra, V.| Kandwal, A.	2025	6.4
A comprehensive review of sustainable hydrogels from lignin for advanced wastewater solutions	Raj, K.| Vora, T.| PadmaPriya, G.| Lal, B.| Devi, A.| Sharma, R.S.K.| Chahar, M.| Sudhakar, L.| RJ, S.| Nagraik, R.	2025	11.4
Graphitic carbon nitride (g-C3N4)-based magnetic photocatalysts for removal of antibiotics	Verma, A.| Sharma, G.| Wang, T.| Kumar, A.| Dhiman, P.| García-Peñas, A.	2025	10.5
Natural gums-derived hydrogels for adsorptive removal of heavy metals: A review	Zhi, J.| Bai, X.| Wang, Q.| Wang, T.| Verma, Y.| Sharma, G.| Kumar, A.| Dhiman, P.	2025	11.4
Recent trends in the plant based metal oxide nanoparticles and their application in biomedical and waste water remediation - A review	Kumar, S.| Kumar, M.| Chauhan, V.| Kaushal, D.	2025	10.1
Exploring the potential of MnWO4/MXene/carbon xerogel photocatalyst for photo efficient degradation of crystal violet	Verma, Y.| Naushad, M.| García-Peñas, A.| Kumar, A.| Dhiman, P.| Sharma, G.	2025	8
Insights into the enhanced photocatalytic degradation of congo red using advanced BaDyxFe12−xO19 catalytic hexamaterials	Himanshi| Makasana, J.| Ganesan, S.| Lal, B.| Naidu, K.S.| Ahmed, J.| Prakash, J.| Verma, A.| Lakshmaiya, N.| Jasrotia, R.| Yong, X.| Chan, C.K.	2025	6.4
Synergistic carbon source utilization in Biofloc aquaculture of common carp (Cyprinus carpio): impacts on growth, health, and environmental parameters	Rai, N.| Julka, J.M.| Panigrahi, A.| Das, S.P.	2025	6.5
Surfactant-Assisted Modification of Adsorbents for Optimized Dye Removal	Soni, I.| Kumar, P.| Shandilya, P.| Kumar, M.| Chauhan, V.	2025	7.8

Fabrication of S-scheme H-C3N4/FeNi2S4 heterojunction for visible light driven photocatalytic degradation of ciprofloxacin	Rana, S.| Kumar, A.| Dhiman, P.| Lai, C.W.| Sharma, G.| Wang, T.	2025	7.8
Interfacial charge transfer in g-C3N4/FeVO4/AgBr nanocomposite for efficient photodegradation of tetracycline antibiotic and Victoria blue dye	Priya dhull| Sonu, S.| Poonia, K.| Raizada, P.| Ahamad, T.| Kaya, S.| Katin, K.| Hussain, C.M.| Singh, P.	2025	16.5
Microalgae-based remediation of pharmaceutical contaminants: Emerging strategies and technological synergies	Narayanan, I.| Rajamanickam, R.| Singh, R.K.| Singh, P.| Prabhu, A.A.| Pandey, A.| Pradhan, N.| Nancharaiah, Y.V.| Kumar, V.| Selvasembian, R.| Mal, J.	2025	4.1
Chitin-cl-poly (acrylamide-co-guar gum) – Nickel oxide-Zirconium phosphate nanocomposite hydrogel as miniature adsorptional-photocatalysts units for removal of Tetracycline	Verma, Y.| Dhiman, P.| Wang, T.| García-Peñas, A.| Lai, C.W.| Mola, G.T.| Sharma, G.	2025	8.5
Recent progress in integration of photocatalysis and nanofiltration for advanced wastewater treatment	Kumar, A.| Rana, S.| Dhiman, P.| Sharma, P.| Lai, C.W.| Sharma, G.	2025	-
Mathematical Modelling for Fixed-Bed Column and Batch Adsorption Studies of Antibiotic and CO2 Capture Using Soybean Stover Biochar	Rathi, T.A.| Gomase, V.| Saravanan, D.| Pandey, S.| Jugade, R.	2025	4.9
Banana peel-derived biochar-modified Mg ferrite: a magnetically recoverable composite for adsorption-coupled photocatalytic degradation of crystal violet	Kumar, S.| Dhiman, P.| Rana, G.| Sharma, J.| Ram, P.	2025	7.8
Barium distribution, dynamics and fate in terrestrial and aquatic environments	Sharma, S.| Bolan, S.| Mukherjee, S.| Guimarães Guilherme, L.R.| Gomes Viana, D.| Duim Ferreira, A.| Bakke Myrvang, M.| Almås, Å.R.| Folven Gjengedal, E.L.| Cappuyns, V.| Bueno Guerra, M.B.| de Oliveira, C.| Lamb, D.| Siddique, K.H.M.| Bolan, N.	2025	16.5
Fabrication of visible light-driven magnetically separable Ag3PO4/Fe3O4/g-C3N4 photo catalyst for tetracycline degradation	Verma, A.| Dhiman, P.| Lai, C.W.| Naushad, M.| García-Peñas, A.| Kumar, A.| Sharma, G.	2025	4.9
Engineered boron-doped biochar for sustainable environmental remediation and circular energy systems: A review	Quang, H.H.P.| Nguyen, P.K.T.| Singh, P.| Raizada, P.| Nguyen, V.-H.	2025	10.2
Doubly pertinent p-nitrobenzaldehyde-grafted chitosan for adsorptive sequestration of aqueous anionic surfactant and gaseous CO2	Rathi, T.| Gomase, V.| Saravanan, D.| Pandey, S.| Jugade, R.	2025	10.3
Innovations in tannery wastewater management: a review of zero liquid discharge technology	Pundir, A.| Thakur, M.S.| Goel, B.| Radha| Kumar, A.| Prakash, S.| Kumar, M.	2025	8.2

A comprehensive review on photocatalytic sponges for dual wastewater treatment: Pollutant degradation and oil-water separation	Sharma, J.| Dhiman, P.| Lai, C.W.| Kumar, A.| Sharma, G.	2025	10.2
Alginate-based magnetic adsorbents for the adsorption of organic and inorganic pollutants	Verma, A.| Dhiman, P.| Kumar, A.| Maria, H.J.| Thomas, S.| Sharma, G.	2025	12.4
Recent advancements in polythiophene-based adsorbents for heavy metal ion removal: Modification, kinetics and mechanistic insights	Rana, P.| Kaur, B.| Poonia, K.| Soni, V.| Singh, P.| Thakur, S.| Huang, C.-W.| Nguyen, V.-H.| Raizada, P.	2025	8.5
Recent Advances in Biogenic Nanoparticles for Water Remediation via Drug/Dye Degradation and Heavy Metals Detection	Singh, H.| Kachore, A.| Aggarwal, V.| Bala, E.| Saima| Selvaraj, M.| Verma, P.K.	2025	14.6
Fabrication of novel S-type In2S3/Ag2S heterostructures with superior photocatalytic and electrochemical characteristics for remediation of organic contaminants in water	Jain, S.| Kumari, M.| Kumar, N.| Mittal, A.| Kumar, V.| Tahir, M.| Singh, P.| Rani, G.| Kataria, J.| Jogender	2025	8.5
From Challenges to Opportunities: Exploring Minimum Liquid Discharge and Zero Liquid Discharge Strategies for Wastewater Management and Resource Recovery	Radha| Sharma, N.| Prakash, S.| Kumari, N.| Sharma, D.| Laller, R.| Pundir, A.| Puri, S.	2025	-
A critical discussion of modelling, performance assessment, and design recommendations-based case study of solar dish Stirling system	Alkhalaf, Q.| Kumar, R.| Suri, A.R.S.| Thapa, S.| Lee, D.| Alwetaishi, M.| Ağbulut, Ü.	2025	6.2
Multicomponent interfaced Ag2S@In2S3/Bi2O3 dual Z-scheme with visible light activity for enhanced photocatalytic decontamination of organic pollutants	Jain, S.| Swati| Kumar, V.| Kumar, N.| Makgwane, P.R.| Singh, P.| Raizada, P.| Grover, S.| Makgato, S.	2025	10.3
Constructing a visible-active MgO/NiWO4 Z-scheme heterojunction for efficient photodegradation of malachite green	Sharma, P.| Kumar, A.| Wang, T.| Dhiman, P.| Sharma, G.| Rana, S.	2025	6.6
Biochar-based technologies for sustainable aquaculture: A review of synthesis, properties, and application in water quality improvement and nutrient management	Rai, N.| Kachore, A.| Julka, J.M.| Das, S.P.	2025	9.6
Evaluation of traditional uses, phytochemical constituents, therapeutic uses and future prospects of Pyracantha genus: a systematic review	Chauhan, A.| Banerjee, R.	2025	4.6
Emerging trends in photocatalytic energy and environmental	Dhiman, P.| Sharma, J.| Kumar, A.| Sharma, G.| Dawi, E.A.| Lai, C.W.	2025	13.9

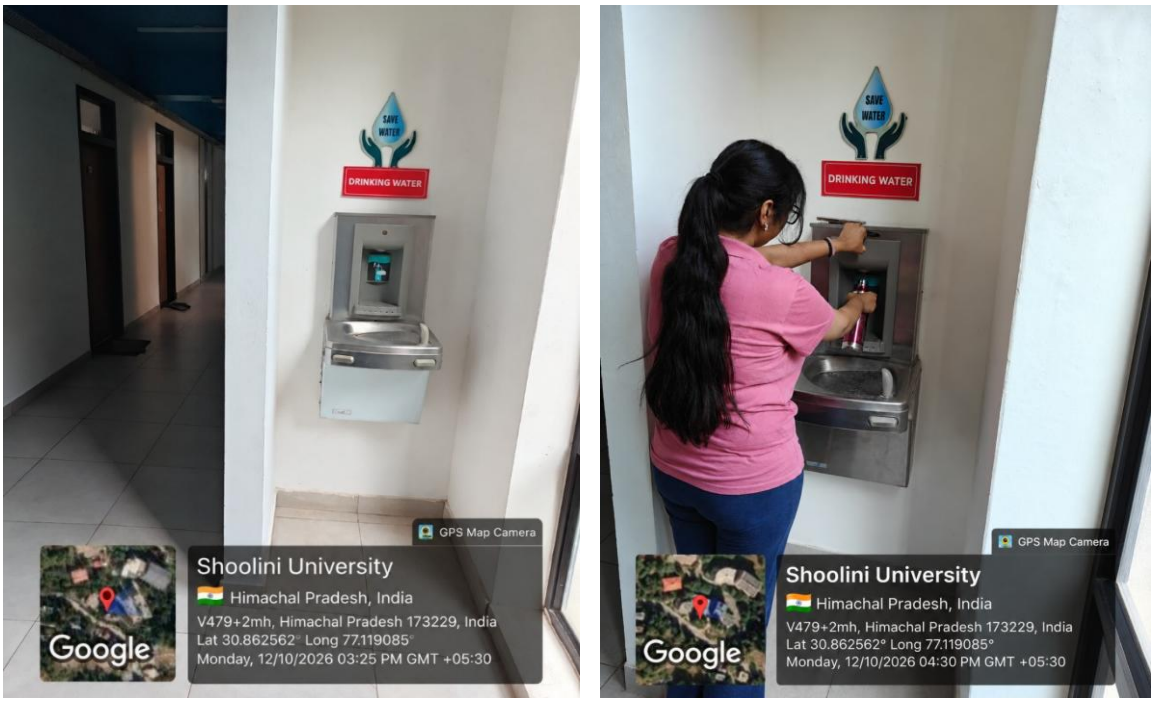
applications of CuBi2O4: A review of improvement strategies			
Recent developments in microbial cellulose applications for wastewater pollution removal: emphasis on photocatalyst immobilization	Nasr, M.M.| Rezvani, P.| Rashedi, H.| Yazdian, F.| Pourmadadi, M.| Rahdar, A.| Fathi-karkan, S.| Pandey, S.	2025	9.1
Treated wastewater irrigation for ornamental plants: a systematic review	Nagial, K.S.| Kumar, N.| Poddar, A.| Shankar, V.| Rustum, R.	2025	3.6
Sulfur vacancy modified S-scheme AgFeO2/ZnIn2S4 heterojunction with dual functionality for photocatalytic degradation of tetracycline and hydrogen evolution	Kumar, A.| Sharma, P.| Dhiman, P.| Raj, D.| Verma, P.| Lai, C.W.	2025	10.7
Study of Calcination Temperature Influence on Physicochemical Properties and Photodegradation Performance of Cu2O/WO3/TiO2	Chau, J.H.F.| Lai, C.W.| Leo, B.F.| Juan, J.C.| Lee, K.M.| Badruddin, I.A.| Kumar, A.| Sharma, G.	2025	8.3
ZIF-based hybrid magnetic nanocomposites for the removal of organic pollutants	Sharma, G.| Verma, A.| Wang, T.| Kumar, A.| Dhiman, P.| Mola, G.T.| Zhi, J.	2025	9.6
First evidence of microplastics in surface water of urban waterbodies in Bhopal city, India- abundance and their characteristics	Gupta, D.K.| Giri, A.| Choudhary, D.| Vishwakarma, A.| Mudgal, M.| Raizada, P.| Singh, P.| Singh, A.	2025	8.2
Advances in Membranes Based on PLA and Derivatives for Oil–Water Separation	Liang, W.| Verma, A.| Martin, O.| Sharma, G.| García-Peñas, A.	2025	11
The Advent of MXene-Based Synthetics and Modification Approaches for Advanced Applications in Wastewater Treatment	Soni, I.| Ahuja, M.| Jagtap, P.K.| Chauhan, V.| Raj, S.K.| Sharma, P.P.	2025	9.4
Valorization of flowers and their role in circular bioeconomy and sustainable development goals	Kumar, H.| Guleria, S.| Dhalaria, R.| Kimta, N.| Sethi, N.| Dhanjal, D.S.| Kaur, T.| Kumar, M.| Harun, H.B.C.| Mahajan, A.| Malik, T.| Nepovimova, E.	2025	9.7
Microalgae-Based Remediation of Contaminated Water: A Way Forward to Achieve SDG Goal 6	Kumar, S.| Utkarsh, K.| Nivedita| Kumar, P.| Khan, A.	2025	-
Efficient Application to Remove Arsenic and Antimony from the Water Environment Using Renewable Carbon-Based Materials: A Review	Wang, T.| Pan, Z.| Zhang, D.| Shi, H.| Yılmaz, M.| Kumar, A.| Sharma, G.| Liu, T.	2025	5.9
Revolutionizing wastewater treatment: Breakthroughs in carbon-based nanomaterials	Thakur, T.| Kang, M.| Pandey, S.	2025	-
Bioremediation processes for the treatment and reuse of water and wastewater	Yadav, D.| Khare, N.| Sharma, I.| Singh, A.| Chakraborty, M.| Pandey, S.| Mehta, D.	2025	-
Challenges of water remediation, waste-water treatment, and its future direction	Saruchi| Kumar, V.| Muskan| Dhiman, J.| Pandey, S.	2025	-

Addressing Fluoride Contamination: A Holistic Review on Its Occurrence, Sources, Health Effects, Detection, Remediation, Cost Analysis, and Waste Management	Choudhary, D.| Gupta, D.K.| Sharma, S.| Patidar, R.| Raizada, P.| Singh, A.	2025	3.1
Analytical methods for water and wastewater pollutant detection	Mishra, S.| Khare, N.| Gupta, A.| Sharma, I.| Sharma, V.K.| Pandey, S.	2025	-
Numerical investigation of the oxygen transfer rate in an open channel system	Puri, D.| Sihag, P.| Thakur, M.S.	2025	4.4
AI-Based Yield Prediction and Smart Irrigation	Das, S.| Nandy, S.K.	2025	2.4
Advancements in AgBiO3-based heterojunctions for environmental sustainability: Modification strategies and mechanistic insights	Bhardwaj, A.| Malhotra, M.| Sudhaik, A.| Singh, P.| Khan, A.A.P.| Singh, A.| Chaudhary, V.| Raizada, P.	2025	8.5
Invasive Species and Biodiversity: A Global Challenge for Conservation	Dadhwal, R.| Yadav, P.| Banerjee, R.	2025	-
Microbial Innovations for Sustainable Biocontrol and Bioremediation: Exploring Strategies in Wastewater Treatment and Environmental Restoration	Rana, S.| Sharma, G.	2025	-
A Machine Learning-based Smart Water Management Framework for Agricultural Irrigation using a Stacked Ensemble Model	Kannan, N.| Krishna, E.| Josephson, P.J.| Kant, R.| Rathnamma, M.V.| Bharathi, A.	2025	-
Advanced wastewater treatment technologies and the spectrum of recovered value-added products	Singla, V.| Rana, S.| Jain, A.| Sharma, G.| Chandel, H.	2025	-
Climate action: Impact of precision farming technologies on the sustainable conservation and management of its resources and nature preservation	Manikanta, L.| Sougandhika, G.| Singh, A.| Sarkar, S.| Thakur, S.	2025	0.9
Curriculum Learning in Cyber-Physical Systems: Anomaly Detection Using Digital Twins	Jonnalagadda, R.R.| Kalam, K.K.R.| Kiruthika, S.| Manojna, B.| Kunnathully, K.| Rizvi, H.A.	2025	-
Shaping the utility of future from wastewater treatment plants to water resource recovery facilities	Bisht, S.S.| Chatterji, T.| Khanna, N.| Pandey, S.	2025	-
BUBMO-based Bi-GRU-CNN model for crop classification with improved feature set: A bigdata perspective	Sharma, S.| Sharma, D.D.| Sharma, A.| Manas, M.	2025	-
Emerging wastewater treatment and reuse innovations in agriculture	Kumari, S.| Khare, N.| Pandey, S.| Sharma, I.| Chouhan, J.| Singh, D.| Pandey, S.	2025	-
Water Remediation Methods and Wastewater Treatment	Ayeleru, O.O.| Sadare, O.| Olubambi, P.A.| Pandey, S.	2025	-

Free drinking water provided

Shoolini University **provides free and safe drinking water to students, faculty, staff and visitors** across its campus. Drinking-water facilities, including water fountains, are available in academic buildings, faculty areas, and student residential facilities to provide convenient access to free drinking water **(Table 1).**

All drinking-water facilities are connected to advanced 3M water filtration units, which help improve water clarity, taste and odour while supporting the provision of filtered drinking water across the campus. Regular maintenance and timely replacement of filters help maintain the functionality and reliability of these facilities.



Free Drinking Water fountain at common area of Shoolini residences

Table 1: Distribution of Free Drinking-Water Facilities Across Campus

Free Drinking Water Access Locations	**Counts**
Academic Blocks	76
Faculty Residentials Buildings	11
Students Residentials Building (Hostels)	42
Other Locations (Basketball Court, Volleyball Court and other outdoor area)	8
Total	**137**

During the year 2025, the University **installed 22 advanced 3M water filtration units** and replaced old, damaged and non-functional filters as part of the upgradation and maintenance of its drinking-water infrastructure. These measures brought the total number of **advanced 3M water filtration units to 137**. The facilities demonstrate the University's commitment to health, hygiene, student welfare and sustainable campus management.

Key Features of the Advanced 3M Water Filtration Units: The advanced 3M water filtration units provide efficient, electricity-free and low-maintenance filtration, helping improve the clarity, taste, odour and hygienic quality of drinking water. Regular maintenance and timely replacement of filters support reliable access to clean drinking water across the University campus.

Moreover, to maintain microbiological safety, water is also disinfected through chlorination using dosing pumps, ensuring that harmful pathogens are eliminated before consumption. This dual approach of filtration and chlorination guarantees a continuous supply of safe drinking water to the campus community.

Monitoring of Water

The University follows a strict maintenance and monitoring protocol to preserve the efficiency of its water supply system. All filters are inspected and **cleaned once every month**, and the Department of Estate at the university oversees routine **testing of water quality**. Drinking water quality is assessed through Shoolini Lifesciences Private Limited (SLS) testing lab, sample collected from different campus locations, including the Library, Shoolini Village, Girl Hostel Block-C, A Block and Pine Court, during 2025. The samples were tested for colour, odour, pH, turbidity, total hardness, iron, chloride, free residual chlorine, fluoride, total dissolved solids, E. coli and total coliforms. The reported results were generally within the acceptable limits prescribed under IS 10500:2012, while **E. coli and total coliforms were absent in all tested samples**. The testing was conducted and documented by Shoolini Lifesciences Private Limited (SLS) through its 2025 laboratory test reports, providing evidence of regular monitoring of drinking-water quality across the University campus.

Water-conscious building standards

Shoolini University applies water-conscious building standards to design and construction new and existing infrastructure to minimise water consumption and reduce water wastage. These standards incorporate water-efficient fixtures, rainwater harvesting and storage, permeable surfaces for groundwater recharge, efficient rainwater drainage, dual-flush or low-flow toilets,

low flow taps and systems for the reuse of harvested rainwater for irrigation, flushing and other non-potable applications. Building projects incorporate these water-management provisions as part of sustainable campus development.

Table 1: Initiatives Taken for Water-Efficient Building Standards to Minimise Water Use

S. No.	Initiative	Implementation Area	Water-Saving Contribution
1	Sensor-Based Taps	Installation of automatic sensor-operated taps in campus washrooms	Reduces water wastage by automatically stopping water flow when not required
2	Dual-Flush Toilets	Installation of dual-flush systems in campus washrooms.	Reduces water consumption during toilet flushing.
3	Low-Flow Taps	Use of water-efficient taps in washrooms and handwashing areas.	Minimises unnecessary water flow and wastage.
4	Sustainability in Design and Construction	Rainwater harvesting rooftop systems to collect and manage rainwater on campus.	Supports water conservation and reduces dependence on external water sources.
5	Harvested rainwater supporting Construction Activities	Implementation of groundwater recharge measures and permeable surfaces across suitable campus areas.	Supports groundwater replenishment, reduces surface runoff, and promotes sustainable water conservation.
6	Water-Efficient Landscaping	Water-conscious landscaping and irrigation practices in campus green spaces.	Reduces water requirements for maintaining gardens and plants.
7	Wastewater treatment and reuse	Treatment of campus wastewater through the sewage treatment plant	Enables treated wastewater reuse for suitable non-potable purposes and reduces freshwater demand

Evidence:

Water-Efficient Building Standards to Minimise Water Use:

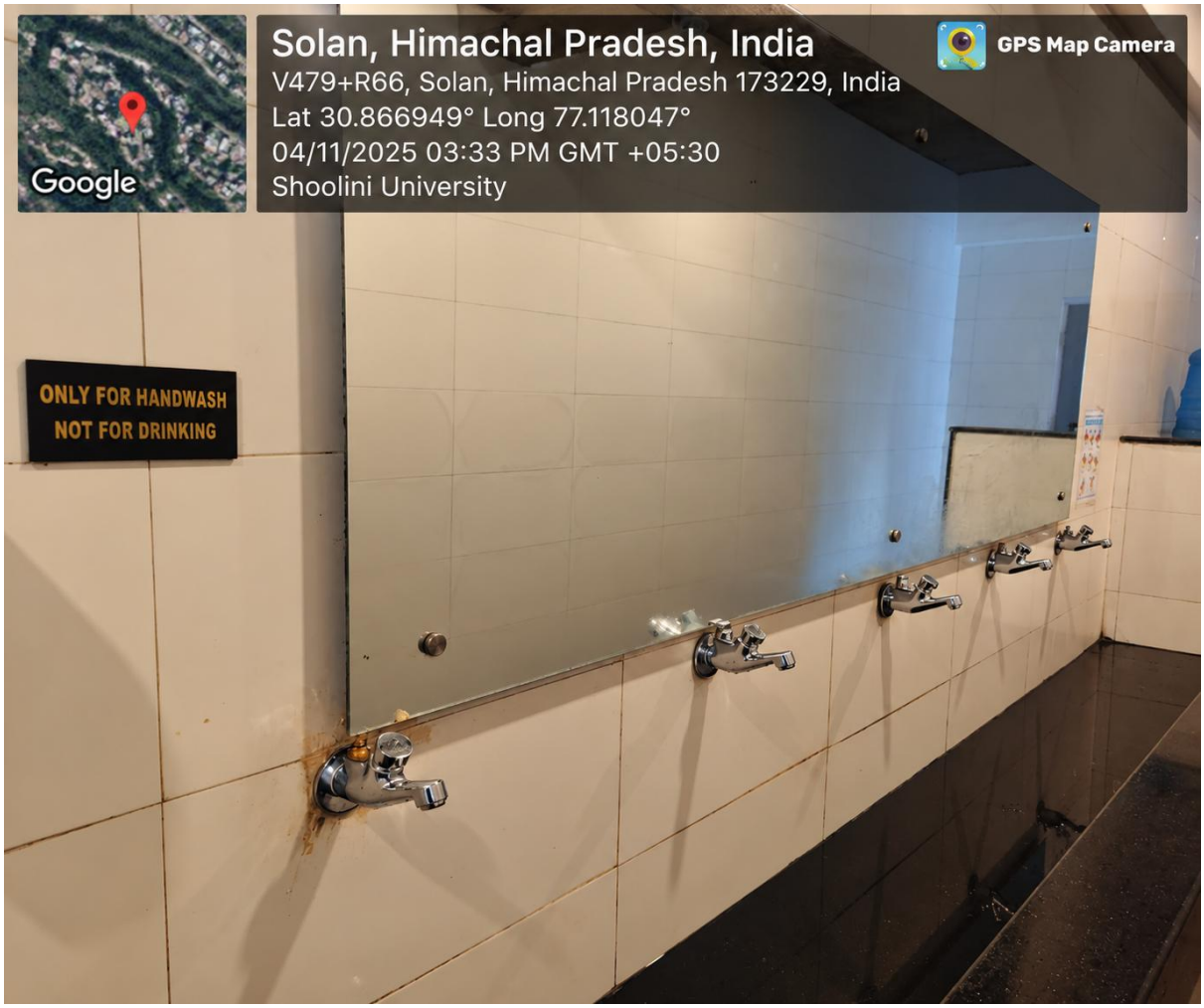
1. **Sensor-Based Faucets:** Installed in campus areas to automatically control and minimize unnecessary water flow.



Sensor-Based taps installed in A-Block

2. **Dual-flush toilet systems:** In campus washrooms as a water-efficient fixture, enabling users to select an appropriate flush volume and thereby reducing unnecessary water consumption and wastage.

3. **Low Flow taps:** Shoolini University has installed **609 low flow taps across the campus**. Reduces water consumption and minimises water wastage.



Low-flow taps installed in hostel mess for handwash

4. Sustainability in Design and Construction

The architectural design of our buildings reflects our commitment to sustainability. Each structure is meticulously planned to incorporate features that enhance energy efficiency and water conservation. For example, green roofs not only provide insulation but also facilitate rainwater collection, further reducing the demand for external water sources. Moreover, our campus layout promotes the use of permeable surfaces that allow rainwater to infiltrate the ground, reducing runoff and promoting groundwater recharge. This integrated approach to design ensures that every aspect of our campus contributes to our overarching goal of sustainability.

4.1 Rainwater harvesting

Shoolini University has adopted a range of innovative water management practices to ensure the sustainable use of this critical resource. The campus is equipped with a well-planned

rainwater harvesting system, which includes dedicated chambers for the collection and storage of rainwater from rooftops and open areas.

Harvested rainwater is used for irrigation, flushing and other non-potable purposes, while treated wastewater from the STP is reused for landscaping and other campus needs. To further reduce water consumption, University infrastructure incorporates water-efficient fixtures, permeable surfaces, rainwater recharge pits and efficient drainage systems, helping minimise water wastage and freshwater demand.



Roof-top rainwater harvesting system with downpipe in pharmacy block



Rooftop rainwater collection and conveyance system to dedicated chambers



Rooftop rainwater collection at A Block

5. Harvested rainwater supporting Construction Activities

Harvested rainwater is used to support construction activities across the University campus, reducing reliance on conventional freshwater sources. Integrating rainwater harvesting into construction projects promotes efficient water use, resource conservation and sustainable campus development. Each building project incorporates appropriate water-management systems, helping minimise freshwater consumption and strengthen the University's commitment to sustainable construction practices.

5.1 Groundwater Recharge and Surface Runoff Management

Shoolini University has implemented measures for groundwater recharge and surface runoff management, particularly considering the challenges associated with heavy rainfall in hilly terrain. A rainwater harvesting pond collects and stores excess rainwater during the monsoon season, which is subsequently used for irrigation, landscaping and other non-potable purposes.

These measures help reduce surface runoff, support groundwater recharge and minimise dependence on external water sources. This integrated system not only ensures the sustainable use of rainwater but also helps in reducing surface runoff, safeguarding campus infrastructure, and protecting nearby water bodies from erosion and contamination.



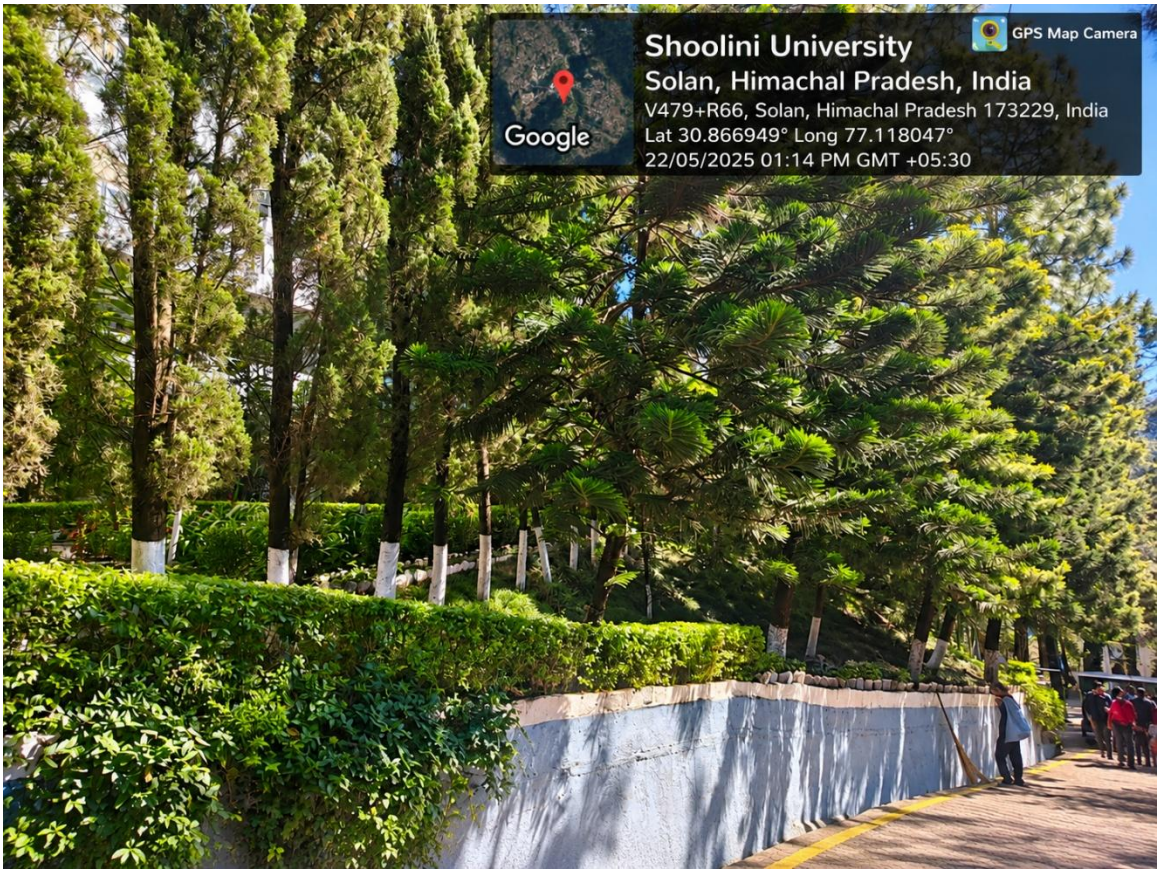
Water tank installed near the plant nursery to support plant irrigation



Groundwater Recharge and Surface water Run-off near Yogananda villa

6. Water-Efficient Landscaping

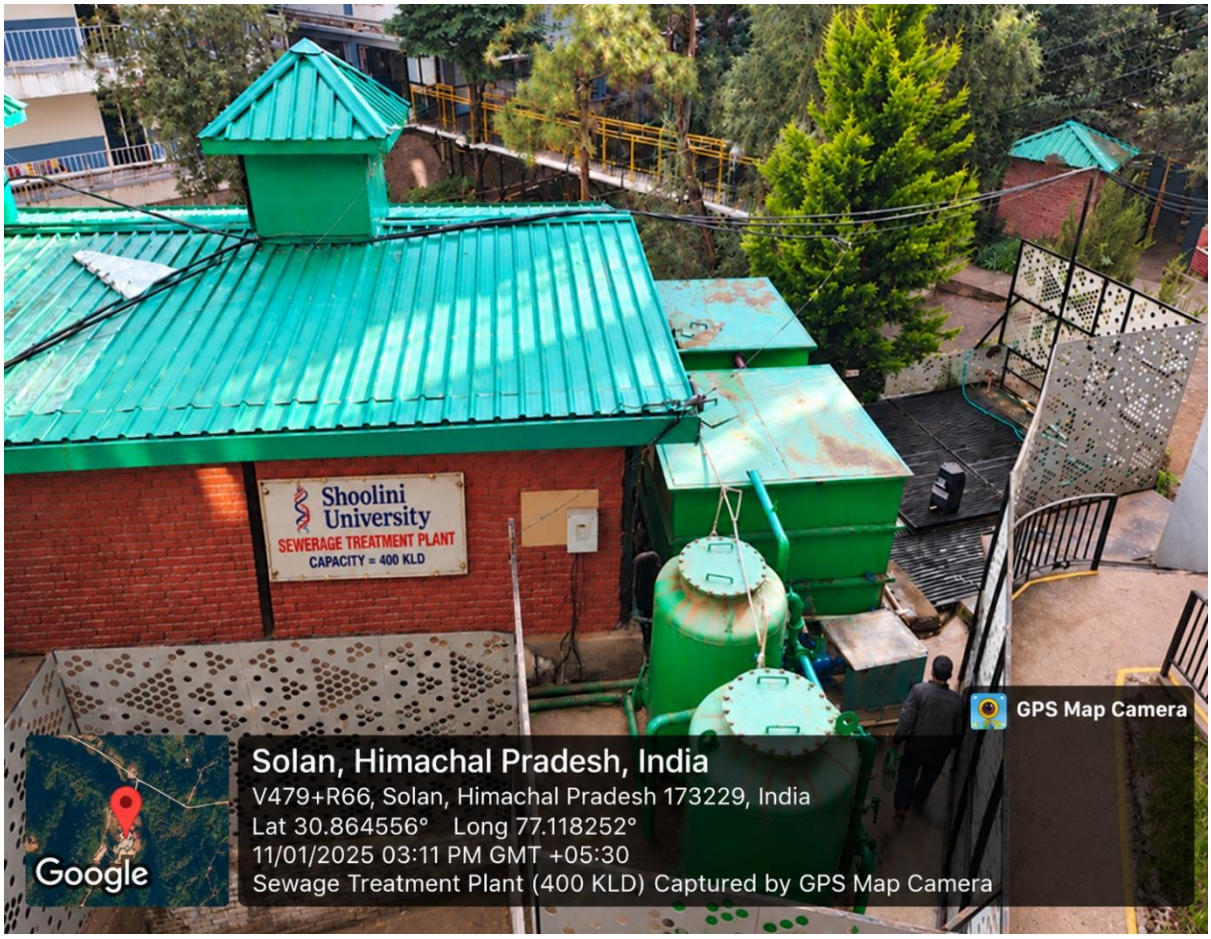
Shoolini University continued to strengthen its commitment to water-conscious landscaping and ecological sustainability through systematic plantation and expansion of campus green cover. During 2025, a total of 1,284 saplings representing 22 recorded species were planted across the University campus. The plantation included species such as Araucaria, Bottle Brush, Drake, Eugenia, Gooseberry, Golden Bottle Brush, Jamun, Jacaranda, Kachnar, Koelreuteria, Lagerstroemia, Nerium, Paltoform, Pencil Juniper, Punica, Putranjiva, Populur, Silver Oak, Tuni, Thuja, Weeping Willow, and Wild Cherry.



Landscape area outside the A block at campus

7. Wastewater treatment and reuse

Shoolini University has strengthened its commitment to responsible wastewater management and environmental sustainability through its upgraded Sewage Treatment Plant (STP). The University is dedicated to the effective treatment of wastewater and the maximum reuse of treated water for suitable non-potable purposes, thereby promoting water conservation and resource efficiency.



Sewage Treatment Plant having 400 KLD capacity

Water-conscious planting

In 2025, Shoolini University continued to strengthen its commitment to water-conscious landscaping and ecological sustainability through systematic plantation and expansion of campus green cover. During 2025, total of **1,284 saplings representing 22 recorded species** were planted across the University campus. The plantation included species such as Araucaria, Bottle Brush, Drake, Eugenia, Gooseberry, Golden Bottle Brush, Jamun, Jacaranda, Kachnar, Koelreuteria, Lagerstroemia, Nerium, Paltoform, Pencil Juniper, Punica, Putranjiva, Populur, Silver Oak, Tuni, Thuja, Weeping Willow, and Wild Cherry.

Of the total 1,284 sapling planted, **661 saplings representing 10 recorded species were drought-tolerant plants across** the University campus. The plantation included species such as Bottle Brush, Gooseberry (Amla), Golden Bottle Brush, Kachnar, Koelreuteria, Nerium, Paltoform, Pencil Juniper, Punica (Pomegranate), and Silver Oak. These species can contribute to sustainable campus landscaping, with drought-tolerant varieties helping reduce irrigation requirements once established, subject to local climatic conditions and appropriate

maintenance. The plantation programme contributed to the development and enhancement of green campus landscapes and supported the University's broader environmental sustainability objectives. These plantation initiatives were complemented by the University's water-management infrastructure, including rainwater harvesting, groundwater recharge systems, permeable surfaces, and the reuse of harvested water for landscaping. Together, these measures support sustainable campus landscape management and contribute to the University's broader efforts to promote responsible water-resource utilization.

Flora in, Special species and Native Trees around Shoolini University - 2025

Sr. No.	Scientific Name	Revised Quantity
1	*Pinus roxbarghii*	More than 432
2	*Rahus coutinus*	2
3	*Toona ciliata*	43
4	*Grewia optiva*	11
5	*Grewia subimusqualis*	40
6	*Bauhinia monandra*	32
7	*Celtis tetrandra*	5
8	*Erythrina stricta*	3
9	*Syzygium cumini*	1 (150+ years old heritage tree)
10	*Sapindus muskorossi*	2
11	*Pyrus pashia*	24
12	*Bambusa oliveriana*	8 groves
13	*Bambusa atra*	3 groves
14	*Araucaria columnaris*	9 groves
15	*Cedrus deodara*	8,634
16	*Ficus benghalensis*	8
17	*Ficus carica*	2
18	*Ficus elastica*	4
19	*Ginkgo biloba*	2
20	*Grewia tiliaefolia*	21
21	*Peltophorum pterocarpum*	79
22	*Pinus sylvestris*	1
23	*Quercus leucotrichophora*	1,079
24	*Podocarpus* spp.	19
25	*Myrica esculenta*	49
26	*Rhododendron arboreum*	40
27	*Salix babylonica*	35
28	*Eriobotrya japonica*	5
29	*Prunus crasoides*	17
30	*Magnolia grandiflora*	2

31	*Platanus orientalis*	28
32	*Aesculus hippocastanum*	69
33	*Populus ciliata*	42
34	*Ficus religiosa*	12
35	*Punica granatum*	5,396
36	*Lagerstroemia turbinata*	22
37	*Lagerstroemia floribunda*	11
38	*Koelreuteria paniculata*	931
39	*Jacaranda acutifolia*	25
40	*Juniperus chinensis*	5
41	*Juniperus bermudiana*	13
42	*Gigantochloa rostrata*	8
43	*Camellia japonica*	6
44	*Bambusa striata*	24
45	*Quercus leucotrichophora*	216
46	*Myrica esculenta*	27
47	*Rhododendron arboreum*	16
48	*Juniperus bermudiana*	16
49	*Embelia officinalis*	2
50	*Cryptomeria japonica*	12
51	*Bambusa vulgaris*	6

Species-wise Plantation and Number of Saplings Planted during 2025

Sr. No.	Plant/ Tree Species	Total Saplings Planted
1	Araucaria	48
2	Bottle Brush	39
3	Drake	45
4	Eugenia	38
5	Gooseberry	48
6	Golden Bottle Brush	37
7	Jamun	49
8	Jacaranda	56
9	Kachnar	53
10	Koelreuteria	246

11	Lagerstroemia	29
12	Nerium	37
13	Paltoform	32
14	Pencil Juniper	55
15	Punica	51
16	Putranjiva	44
17	Populur	43
18	Silver Oak	63
19	Tuni	37
20	Thuja	30
21	Weeping Willow	82
22	Wild Cherry	113
Total species		**1,284**

List of Drought-Tolerant Species and Number of Saplings Planted during 2025

Sr. No.	**Plant Species**	**Total Saplings Planted**
1	Koelreuteria	246
2	Silver Oak	63
3	Pencil Juniper	55
4	Kachnar	53
5	Punica (Pomegranate)	51
6	Gooseberry (Amla)	48
7	Bottle Brush	39
8	Golden Bottle Brush	37
9	Nerium	37
10	Paltoform	32
Total		**661**

Evidence:



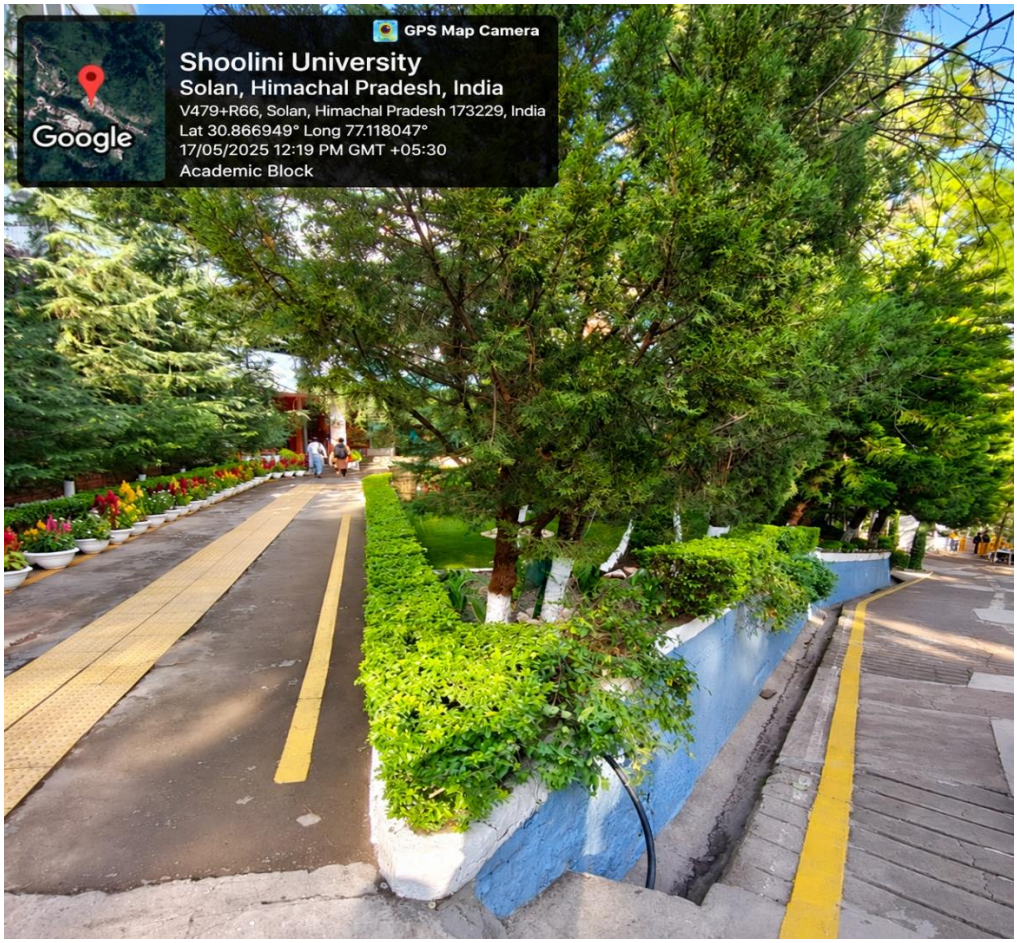
Landscape area below Yogananda library



Plants and trees near the library



Landscape area outside the A block at campus



Drought Plants at Academic Block

Water reuse measurement

Shoolini University measures and monitors the reuse of water across the university campus. During the year 2025, the University maintained monthly records of recycled/ reused water generated through its 400 KLD Sewage Treatment Plant (STP) water treatment system. A total of **75,881,194 litres (75,881.19 m3) of recycled/ reused water** was recorded during the year 2025. The treated/recycled water was beneficially reused for non-potable purposes, including irrigation of lawns and gardens, horticulture and landscaping, toilet flushing, cleaning of campus areas, and limited construction activities. These practices reduce the University's dependence on fresh water for non-potable applications and support sustainable water-resource management.

Water Reuse Measurement at the University, during the year 2025

WATER RECEIVED		WATER USED	
MONTH	**TOTAL WATER RECEIVED**	**WATER CONSUMPTION**	**RECYCLED WATER**
Jan-25	4832590	4768940	3810852
Feb-25	8730340	8730340	6727046
Mar-25	10550850	10550850	8067826
Apr-25	9201060	9201060	6931872
May-25	8709520	8709520	6652568
Jun-25	3735660	3780570	2990496
Jul-25	5076390	5073720	4053296
Aug-25	10167440	10153940	6565755
Sep-25	9864360	9733150	6317588
Oct-25	11474790	11449330	8263673
Nov-25	12441100	12407870	8777852.5
Dec-25	9901340	9746860	6722370
Total	**104685440**	**104306150**	**75881194**

The University maintains monthly measurements of recycled/ reused water throughout the reporting year, providing systematic quantitative evidence of water reuse across the campus. The annual recycled/ reused water volume of **75.88 million litres** represents approx. **72.75% of the total recorded water consumption of 104,306,150 litres** during the year 2025. Regular water quality monitoring (for pH, BOD, COD, TSS, and coliform count) ensures that all treated

water complies with Central Pollution Control Board standards. Verified reports by the HP State Pollution Control Board (2025) confirm the system's compliance and efficiency.

Key Performance Indicators – Water Reuse

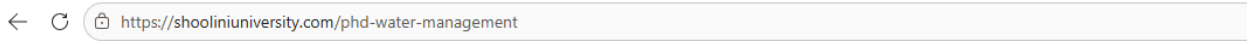
- **Total water consumption:** 104,306,150 litres/year.
- **Recycled/reused water:** 75,881,194 litres/year (75.88 million litres).
- **Water reuse rate:** 72.75% of total water consumption.
- **STP capacity:** 400 KLD.
- **Monitoring:** Monthly measurement and recording of recycled/reused water.
- **Reuse applications:** Irrigation, horticulture, landscaping, toilet flushing, campus cleaning and limited construction activities.

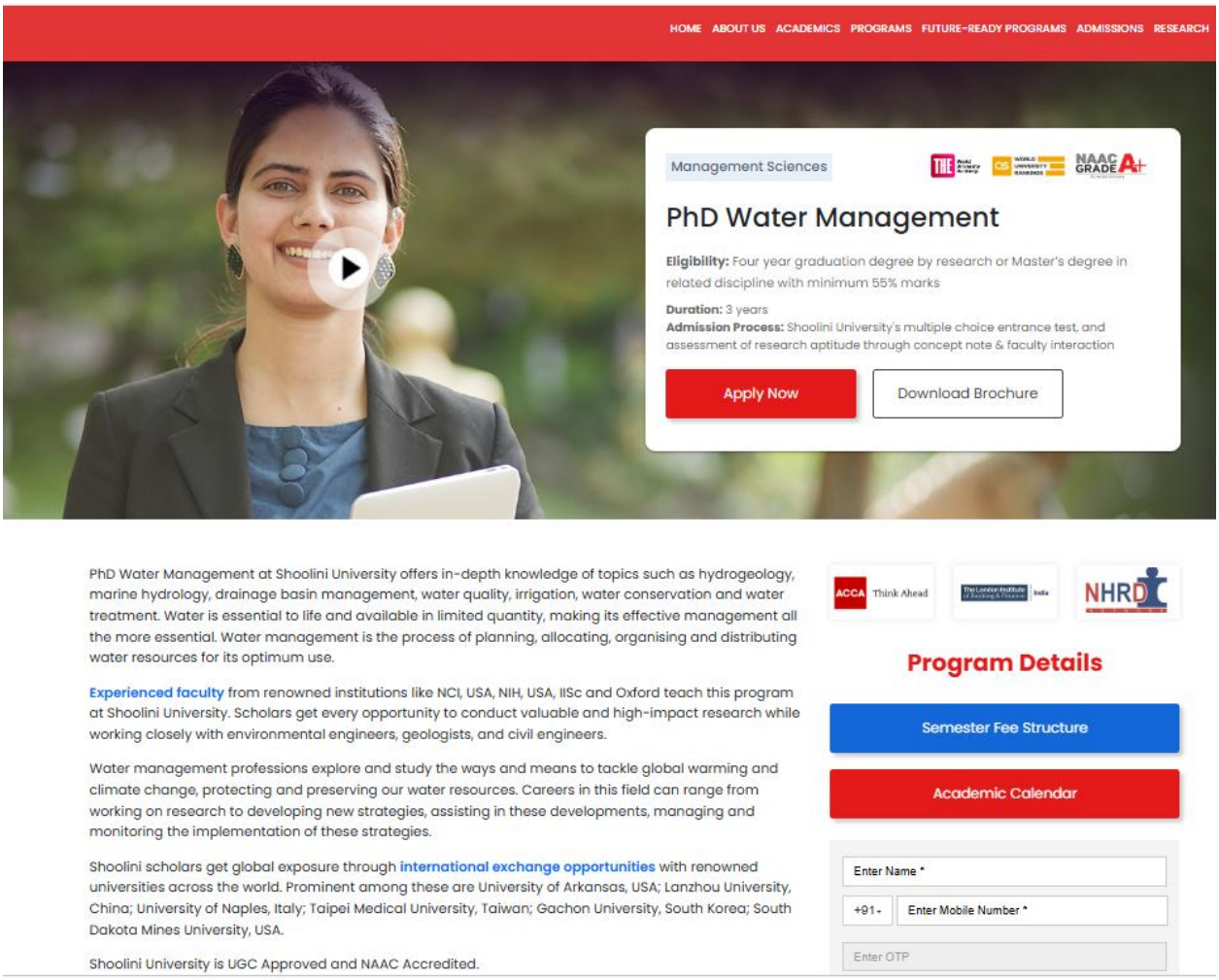
Water management educational opportunities

Shoolini University provides educational and practical opportunities to promote water management, conservation, responsible water use, and protection of water resources through the following initiatives:

- **Ph.D Program in Water Management**

  The University offers a Doctorate/PhD in Water Management, a three-year program covering areas such as hydrogeology, marine hydrology, drainage basin management, water quality, irrigation, water conservation, and water treatment. The program enables scholars to undertake valuable and high-impact research in water management while working with experts from environmental engineering, geology, and civil engineering.





Courses/ Minors related to water management

Shoolini University offers sustainability-oriented educational opportunities relevant to water and natural-resource management through courses such as Biotechnological Solutions for Environmental Challenges, Our Survival: Biodiversity & Sustainability, Sustainable Tourism in the Himalayas, Ecology and Environment History, and Environmental Economics. These courses provide interdisciplinary exposure to environmental conservation, sustainable resource utilization and ecological management relevant to responsible water-resource management.

Table: List of Courses/ Minors related to water management

S. No.	Course	Course Code	Introduction Year	Students Enrolled	Relevance to Water Management
1	**Chemistry of Environmental Pollution**	CSU2629	2025	43	Develops understanding of water pollution, contaminant behaviour, and nanotechnology-based photocatalytic

					methods for wastewater treatment and water purification.
2	**Biotechnological Solutions for Environmental Challenges**	CSU1431	2025	65	Explores environmental biotechnology applications in wastewater treatment, pollution control, and remediation of contaminated water resources.
3	**Our Survival: Biodiversity & Sustainability**	CSU637	2025	71	Biodiversity conservation, ecosystem sustainability and natural-resource management
4	**Sustainable Tourism in the Himalayas**	CSU655	2024	68	Sustainable management of Himalayan natural resources and ecosystems
5	**Ecology and Environment History**	CSU715	2024	39	Ecological systems, environmental conservation and natural-resource management
6	**Environmental Economics**	CSU1778	2025	63	Economic approaches to environmental-resource management and sustainability
7	**Organic Farming**	AGRM 123	2025	66	Sustainable agriculture and resource-efficient agricultural practices
8	**Sustainable Leadership for Environmental Happiness**	CSU2034	2025	70	Environmental sustainability and responsible resource management

Other Activates focused on Water management:

- **Water Management Awareness Camps**

  The University conducts awareness camps for students and local communities focusing on the importance of water conservation, responsible water use, and sustainable management of water resources.



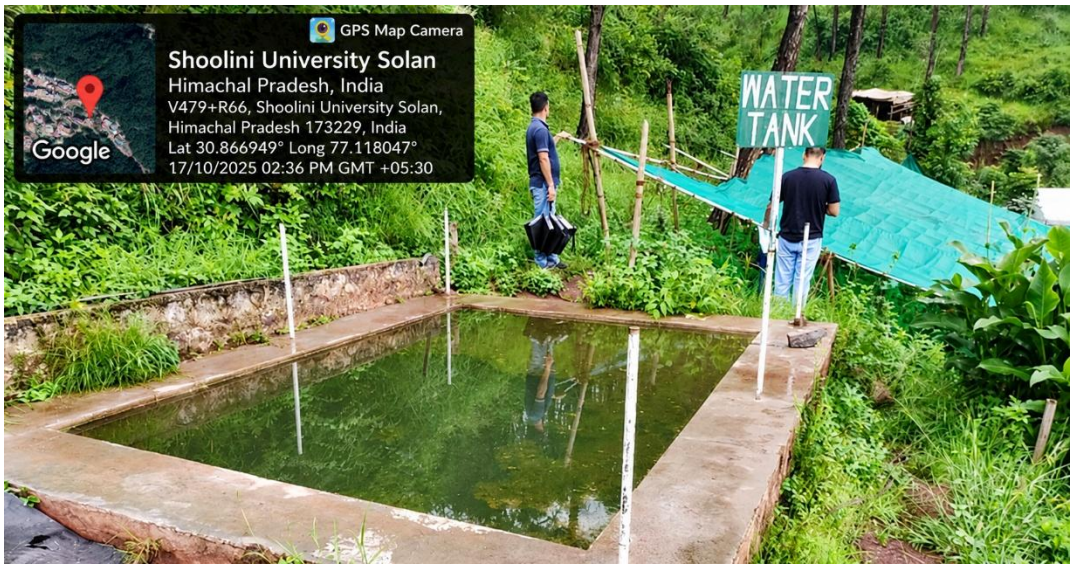
Awareness session on Sanol Gram Panchayat

- **Water Resource Cleaning and Conservation Activities**

  Awareness and outreach activities are also undertaken inside and outside the campus to promote the cleaning and protection of water resources and to sensitize participants about preventing water pollution and maintaining clean water sources.



Volunteer collecting litter from water-resource



Water tanks near the plant nursery

- **Recharge Pits for Water Conservation**

  The University has recharge pits within the campus as part of its water-conservation and groundwater-recharge practices. These facilities also provide an opportunity to demonstrate practical approaches to sustainable water management.



Rainwater collection reservoir near the Yogananda Villa

- **Rainwater-Harvesting Tanks**

  Rainwater-harvesting tanks are available on campus to support the collection and conservation of rainwater and to demonstrate sustainable water-resource management practices.



Rainwater harvesting pond near G & H block

Sustainability-focused campus orientation activities, including the Induction 2025 Campus Tour, introduce students to water management, water conservation, and responsible resource use, helping integrate water-awareness into student life.

Research Opportunities:

Students pursuing water management at Shoolini University engage in cutting-edge research focused on innovative water treatment technologies. The university's Sewage Treatment Plant employs a combination of biological treatment, including the Activated Sludge Process, and tertiary treatment using advanced activated carbon and pressure filters to achieve high-quality effluent. Research efforts are dedicated to developing eco-friendly, cost-effective, and

sustainable wastewater treatment technologies such as photocatalysis, aiming to improve water purification while minimizing environmental impact. Scholars have opportunities to pilot new treatment methodologies and contribute to high-impact publications and patents in the field.

Moreover, Shoolini University has been recognized as a Social Entrepreneurship, Swachhta & Rural Engagement Cell (SES REC) Institution by the Mahatma Gandhi National Council of Rural Education. This certification highlights the university's leadership in promoting water management, waste management, and sustainability initiatives in both campus and community settings.



Certificate

सत्यमेव जयते

Where there is Rural Wellbeing there is Universal Prosperity

This is to certify that Shoolini University of Biotechnology& Management Science, Solan is now a Recognized Social Entrepreneurship, Swachhta & Rural Engagement Cell (SES REC) Institution. The Institution has successfully framed the SES REC Action Plan and constituted ten working groups for improving facilities in the Campus and the Community/Adopted Villages in the areas of Sanitation & Hygiene, Waste Management, Water Management, Energy Conservation and Greenery post COVID-19, along with the observation of three environment, entrepreneurship and community engagement related days to inculcate in faculty, students and community, the practices of Mentoring, Social Responsibility, Swachhta and Care for Environment and Resources.

Date of Issue:
28/08/2020

Dr. W G Prasanna Kumar
Chairman

Mahatma Gandhi National Council of Rural Education
Department of Higher Education, Ministry of Education
Government of India

Certificate No.: MoE/SES REC/HP/Solan/02

Certificate received from SES REC

Ministry of Education

1.	Name of Institution	Shoolini University of Biotechnology and Management Sciences
2.	Address of Institution	Shoolini University, Bajhol, Solan, Himachal Pradesh-173229

3.	University Affiliation	UGC, HP Government
4.	District and State	Solan, Himachal Pradesh
5.	Name of Principle/HoI (Convenor of SES REC	Dr. Neeraj Gandotra
6.	Contact Number (Whatsapp Number)	9418247612/9218301016
7.	Email-id	neerajgandotra@shooliniuniversity.com

Table: Water- and Sustainability-Related Events /Activities in 2025

Sr. No.	Event / Activity	Date	Venue	Key Activity / Purpose
1	Bisleri's Bottles for Change: Cleaning Drive at Shoolini University Nearby	22 April 2025	Shoolini University Campus	Collection, segregation and responsible recycling of PET bottles and plastic waste; awareness on responsible consumption and environmental protection
2	Clean Today, Green Tomorrow – An Empathetic Cleaning Drive	22 November 2025	Ashwini Khad	Cleaning and segregation of waste from a natural water resource, with emphasis on removing plastic and non-biodegradable waste, protecting water quality and sensitizing the local community
3	Walking Into a Greener Tomorrow – Campus Tour (Induction 2025)	21–23 August 2025	Shoolini University Campus	Orientation of new students on water conservation, responsible water use, energy conservation and other

				campus sustainability initiatives

Activity 1:

Bisleri's Bottles for Change: Cleaning Drive at Shoolini University Nearby

SDG 13: Climate Action & SDG 11: Sustainable Cities and Communities

Date: 22nd April 2025

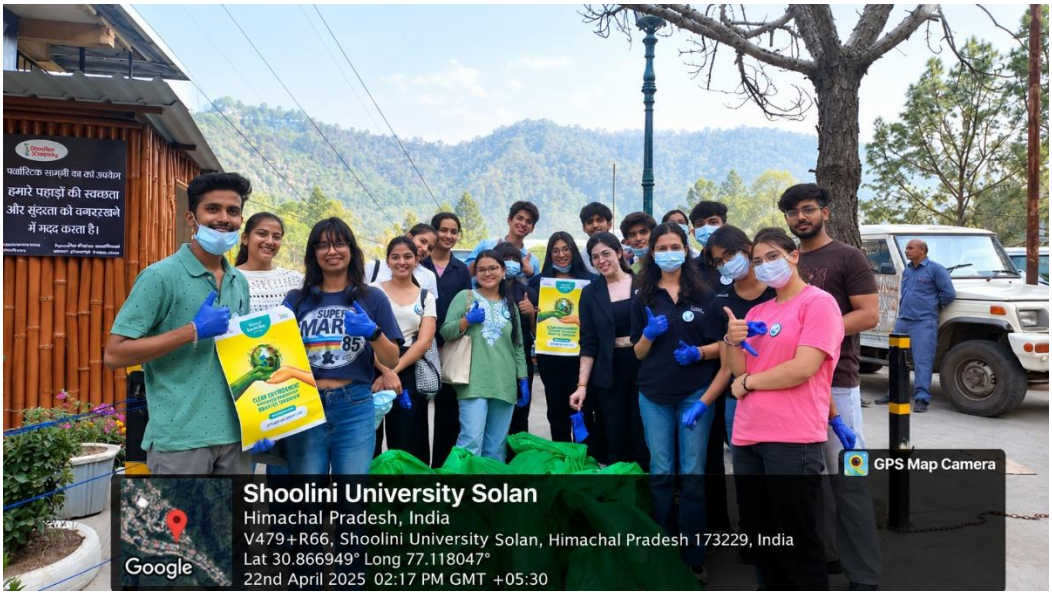
On this special Earth Day, Shoolini University joined hands with Bisleri's "Bottles for Change" initiative to take a bold step towards a cleaner, greener campus. The drive was a powerful reminder that small actions, when taken together, can spark big changes.

"Bottles for Change" is more than just a cleanup—it's a movement that transforms how we think about plastic waste. Instead of discarding PET bottles and plastic waste, the initiative encourages us to collect, segregate, and recycle responsibly, turning what was once trash into valuable resources. This circular approach to plastic is vital for protecting our environment and reducing pollution.

On April 22, a dedicated group of students and volunteers scoured the campus surrounding, collecting plastic waste with energy and enthusiasm. Each bottle picked up was a step towards breaking the cycle of plastic pollution and building awareness about sustainable living.

The drive not only cleared the campus but also instilled a deep sense of responsibility and environmental consciousness in every participant. It was a beautiful collaboration of youth passion, community spirit, and corporate commitment, perfectly aligned with global efforts to promote responsible consumption and climate action.

As we walked through the campus, collecting plastic and sharing smiles, we became part of a larger story—one where every bottle collected is a bottle for change.



Community Engagement in Cleaning the nearby area of campus



Volunteer Efforts to Reduce Litter

Activity 2:

Clean Today, Green Tomorrow – An Empathetic Cleaning Drive at Ashwini Khad

Date: 22 November, 2025

Venue: Ashwini Khad

Aligned with Sustainable Development Goals (SDGs): SDG 6 – Clean Water and Sanitation | SDG 11 – Sustainable Cities and Communities | SDG 13 – Climate Action

On 22nd November, volunteers of the National Service Scheme (NSS) undertook a meaningful cleaning drive at Ashwini Khad, driven by a shared sense of responsibility toward nature and the local community. The initiative aimed not only to clean the area but also to foster empathy toward the environment by highlighting the impact of human actions on natural ecosystems.

The volunteers actively engaged in the **collection and segregation of waste from water resources**, with a strong focus on removing plastic and other non-biodegradable materials that threaten water quality and harm aquatic life. As the drive progressed, participants observed firsthand how careless disposal of waste affects natural water bodies, reinforcing the importance of mindful and sustainable practices.

Beyond physical cleaning, the activity encouraged **reflection and dialogue** among volunteers about environmental degradation, water conservation, and the need for collective action. The drive served as a learning experience, reminding participants that protecting nature begins with awareness, care, and everyday choices. The shared effort strengthened teamwork and instilled a deeper sense of connection with the surroundings.

Local passersby and community members were also sensitized during the drive, as volunteers informally communicated the importance of maintaining cleanliness and respecting natural spaces. This interaction helped extend the message beyond the activity itself, encouraging broader community participation in environmental stewardship.

The cleaning drive at Ashwini Khad stood as a heartfelt reminder that **environmental care is an act of compassion**—for nature, for communities, and for future generations. Through this initiative, NSS reaffirmed its commitment to sustainable development, civic responsibility, and youth-led action, demonstrating how empathy and service can come together to create lasting positive change.

No. of Volunteers: 40



Volunteers group photograph after natural water-resource clean-up

Activity 3:

Walking Into a Greener Tomorrow: Campus Tour (Induction 2025)

SDG 3: Good Health & Well-being, SDG 4: Quality Education **SDG 6: Clean Water and Sanitation**, SDG 7: Affordable and Clean Energy, SDG 11: Sustainable Cities and Communities, SDG 12: Responsible Consumption and Production, SDG 13: Climate Action & SDG 15: Life on Land

Date: August 21-23, 2025

The Campus Tour organized during Induction 2025 between 21st and 23rd August was carefully designed to introduce freshers to their new academic home while embedding within them a sense of responsibility towards the environment responsibility and sustainable water management. More than just an orientation walk, it was a guided journey into the sustainable heartbeat of the university, where students were introduced to water conservation, responsible water use, energy conservation, and other green initiatives across the campus. Through awareness messages and sustainability-focused interactions, the tour encouraged students to understand the importance of conserving water and adopting responsible water-management practices as part of their daily lives.

One of the most memorable stops on the tour was the Yogananda Library—a symbol of both learning and sustainability. Students were welcomed by colorful, student-friendly posters placed throughout the library, each carrying engaging messages on themes such as energy conservation, water management, and responsible consumption. Walking through the aisles, freshers were not only introduced to academic resources but also to the green principles guiding the campus. Beyond the library, the tour covered a series of sustainability-rich spaces across campus. At the solar rooftops, students learned how clean energy powers classrooms and laboratories. Students were introduced to the importance of water conservation, responsible water consumption, and sustainable water-resource management at Shoolini University. The initiative highlights the role of students in preventing *water wastage, maintaining hygiene, protecting natural water resources, and promoting awareness of clean water and sanitation*. The tour also provides an opportunity to familiarise new students with campus water-management practices, including wastewater treatment and water reuse, where demonstrated during the visit.

Adding a fun and interactive element, the orientation also included classic campus games such as tug-of-war and sack races. These activities fostered team spirit, encouraged collaboration among students, and offered a lighthearted way to reinforce the values of participation, fairness, and community engagement.

The impact of the tour was both immediate and lasting. Over 400 students actively participated on each day, with sustainability-themed photographs uploaded during the event. Nearly all participants pledged to adopt eco-friendly practices in their daily routines. The library posters, in particular, received special appreciation for making sustainability messaging both visually appealing and academically relevant, turning the library into not just a space of knowledge, but also of environmental awareness.

In conclusion, the Campus Tour of Induction 2025 successfully oriented students not just to the university's infrastructure but to its values. By highlighting spaces like the library, and green zones, and by making sustainability fun through creative posters and interactive activities, the tour helped freshers recognize that they are part of a campus community where environmental consciousness is a shared responsibility.



Ms. Poonam Nanda, Director - Sustainability and student Engagement in Sustainability Awareness

Off-campus water conservation support

During 2025, Shoolini University extended its commitment to off-campus water conservation support through community-oriented environmental and sustainability initiatives. The University engaged students and community stakeholders in activities aimed at promoting awareness of water conservation, protection of natural water resources and prevention of water pollution. Student-led outreach activities included cleanliness drives around local water bodies and awareness initiatives focused on responsible water use and environmental protection.

The University also promoted sustainable approaches to natural-resource management through environmental education, biodiversity conservation and sustainable agricultural practices. These initiatives contribute to greater awareness of water-resource conservation and support environmentally responsible practices within the surrounding community. In addition, the University's experience with rainwater harvesting, groundwater recharge, wastewater recycling and efficient irrigation provides an institutional foundation for promoting sustainable water-management practices beyond the campus.

Activity 1:

Clean Today, Green Tomorrow – An Empathetic Cleaning Drive at Ashwini Khad

Date: 22 November, 2025

Venue: Ashwini Khad

Aligned with SDGs: SDG 6 – Clean Water and Sanitation | SDG 11 – Sustainable Cities and Communities | SDG 13 – Climate Action

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Volunteers after natural water-resource clean-up

The cleaning drive at Ashwini Khad stood as a heartfelt reminder that **environmental care is an act of compassion**—for nature, for communities, and for future generations. Through this initiative, NSS reaffirmed its commitment to sustainable development, civic responsibility, and youth-led action, demonstrating how empathy and service can come together to create lasting positive change.



Volunteer Participation in Natural Water-Resource Clean-Up Activities

Activity 2:

Bisleri's Bottles for Change: Cleaning Drive

SDG 13: Climate Action & SDG 11: Sustainable Cities and Communities

Date: 22nd April 2025

On this special Earth Day, Shoolini University joined hands with Bisleri's "Bottles for Change" initiative to take a bold step towards a cleaner, greener campus. The drive was a powerful reminder that small actions, when taken together, can spark big changes.

"Bottles for Change" is more than just a cleanup—it's a movement that transforms how we think about plastic waste. Instead of discarding PET bottles and plastic waste, the initiative encourages us to collect, segregate, and recycle responsibly, turning what was once trash into

valuable resources. This circular approach to plastic is vital for protecting our environment and reducing pollution.

On April 22, a dedicated group of students and volunteers scoured the campus grounds, collecting plastic waste with energy and enthusiasm. Each bottle picked up was a step towards breaking the cycle of plastic pollution and building awareness about sustainable living.

The drive not only cleared the campus but also instilled a deep sense of responsibility and environmental consciousness in every participant. It was a beautiful collaboration of youth passion, community spirit, and corporate commitment, perfectly aligned with global efforts to promote responsible consumption and climate action.

As we walked through the campus, collecting plastic and sharing smiles, we became part of a larger story—one where every bottle collected is a bottle for change.



Youth Engagement in Promoting Cleanliness Drive on Earth Day

Activity 3:

Nurturing Nature: Ashwini Khad Cleaning Drive by NSS Students

Date: November 16, 2025

NSS students from Shoolini University organized a cleaning drive at Ashwini Khad, focusing on environmental conservation and sustainability. The event aimed to promote awareness about the importance of waste management and community involvement in preserving the environment. The students actively collected litter and segregated it into recyclable and non- recyclable categories, ensuring proper disposal.

What made this drive unique was its incorporation of fun and engaging activities. Students participated in friendly waste-collection challenges and sustainability-themed scavenger hunts, making the event both productive and enjoyable. Creative workshops on upcycling allowed participants to transform waste materials into useful or decorative items, showcasing practical ways to reduce waste. Sustainability-themed quizzes and interactive skits further educated participants and locals on the significance of reducing, reusing, and recycling.

The cleaning drive emphasized teamwork, creativity, and community outreach, creating a lively atmosphere that inspired everyone involved. Local residents also joined in, fostering a sense of shared responsibility for the environment. This initiative highlighted Shoolini University's commitment to sustainability, showcasing how small actions, combined with awareness and engagement, can make a significant impact. By blending education with hands- on efforts, the Ashwini Khad cleaning drive served as a model for promoting environmental consciousness and community involvement.

By combining education with hands-on action, the Ashwini Khad cleaning drive not only promoted sustainability but also strengthened bonds within the community, leaving a lasting impact.



Volunteers participating in a riverbank cleaning drive, collecting waste

6.5.4 Sustainable water extraction on campus

Shoolini University follows an integrated approach to sustainable water extraction on campus by combining multiple water sources, rainwater harvesting, wastewater recycling, and water-efficient infrastructure. The University uses groundwater from borewells, water supplied through the IPH/municipal network, and natural sources. Rainwater harvesting and groundwater-recharge measures further support responsible management of available water resources.

The University also recycles treated wastewater through its Sewage Treatment Plant (STP). Recycled water is utilised for **horticulture, landscaping, flushing, and other non-potable applications**, thereby reducing the requirement for fresh water. Water-efficient practices, including drip irrigation, support efficient distribution and help minimise water losses. The University's building and campus infrastructure also incorporate measures such as rainwater

harvesting, permeable surfaces and groundwater-recharge facilities to support water conservation.

Sources of Water:

The principal sources contributing to the University's water supply during 2025 included:

- **Groundwater:** Water extracted through borewells.
- **Municipal/IPH supply:** Water received through the institutional/municipal distribution network.
- **Natural sources:** Water obtained from natural sources, including springs and related campus sources.
- **Rainwater harvesting:** Harvested rainwater supporting irrigation, landscaping and other non-potable requirements.
- **Recycled wastewater:** Treated wastewater from the STP reused for horticulture, flushing, landscaping and other suitable non-potable applications.

Water Consumption and Recycling – 2025

The University's monthly water records demonstrate systematic monitoring of **water received, water consumption and recycled water**. The data show substantial reuse of treated wastewater throughout the year, with recycled water generally accounting for approximately **70–80% of recorded water consumption** on a monthly basis.

For example, in **March 2025**, the University recorded **105.51 lakh litres of water received and consumed**, while approximately **80.68 lakh litres were recycled**. Similar recycling levels were maintained across the remaining months, demonstrating the continued use of treated wastewater for non-potable requirements.

WATER RECEIVED		WATER USED	
MONTH	**TOTAL WATER RECEIVED**	**WATER CONSUMPTION**	**RECYCLED WATER**
Jan-25	4832590	4768940	3810852
Feb-25	8730340	8730340	6727046
Mar-25	10550850	10550850	8067826
Apr-25	9201060	9201060	6931872
May-25	8709520	8709520	6652568

Jun-25	3735660	3780570	2990496
Jul-25	5076390	5073720	4053296
Aug-25	10167440	10153940	6565755
Sep-25	9864360	9733150	6317588
Oct-25	11474790	11449330	8263673
Nov-25	12441100	12407870	8777852.5
Dec-25	9901340	9746860	6722370
Total	**104685440**	**104306150**	**75881194**

Sustainable Extraction Practices

1. **Rainwater Harvesting**: Rooftop structures and dedicated collection systems capture rainwater, which is stored in high-capacity tanks for irrigation and construction purposes.



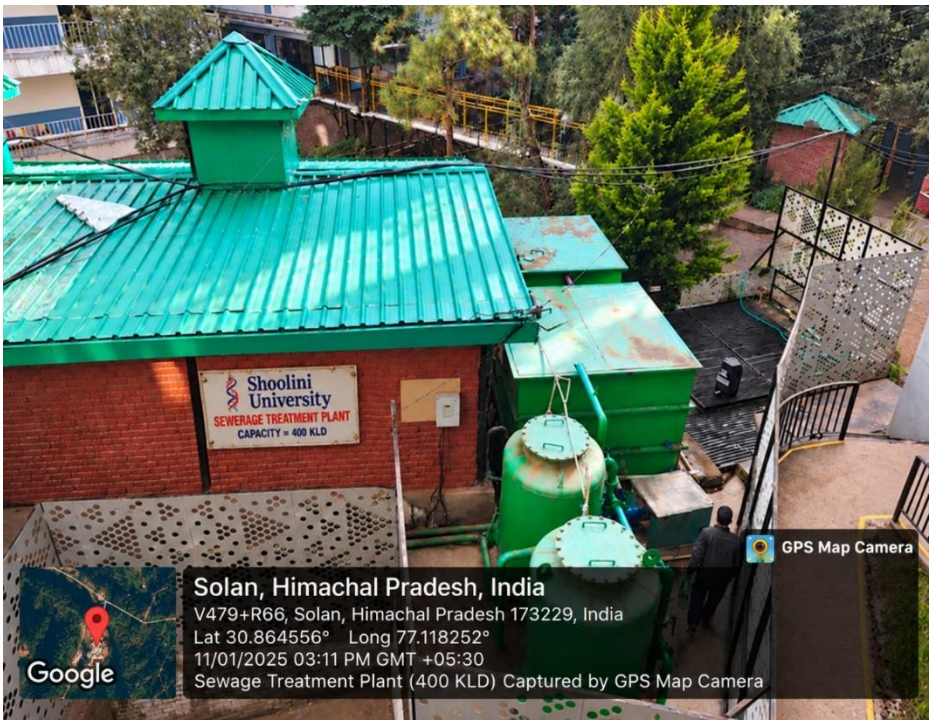
Rooftop building structures

2. **Groundwater Recharge**: Borewell extraction is balanced with recharge pits and permeable campus surfaces, allowing rainwater to replenish aquifers naturally.



Recharge pits near Yogananda Villa

3. **Sewage Treatment Plants (STPs)**: Recycled water from STPs is extensively reused across the campus, reducing the load on fresh water sources.



Sewage Treatment Plant having 400 KLD capacity

4. **Water Bowsers as Backup**: During periods of shortfall, bowsers ensure continuity of supply without over-exploiting local natural sources.
5. **Monitoring and Technology Integration**: Smart meters and monitoring systems track consumption and recycling, enabling data-driven decision-making for sustainable use.

The University achieved comprehensive *integration of sustainable water extraction practices*, which include the regulated withdrawal of groundwater, recharge of aquifers through percolation and rainwater harvesting wells, and the reuse of treated wastewater for landscaping, horticulture, and other non-potable applications. These measures ensure that water resources are managed responsibly, extraction remains within sustainable limits, and the overall ecological balance of the campus is maintained.

Cooperation on water security

Shoolini University recognizes water security as a shared institutional and societal responsibility requiring collaboration among government agencies, academic institutions, industries and local communities. During 2025, the University strengthened its engagement in water security through collaborations focused on water conservation, wastewater treatment, water recycling, water-quality assessment and sustainable water-resource management.

The University's collaborative approach complements its internal water-management infrastructure, including rainwater harvesting, sewage and effluent treatment, wastewater recycling and groundwater-recharge measures. These activities support the University's contribution to SDG 6: Clean Water and Sanitation.

Shoolini University's Commitment to Water Security

Shoolini University actively collaborates with government initiatives and partner organizations to promote sustainable water security solutions at local, regional, and national levels.

1. Local Government

Shoolini University Collaboration with Sanol Gram Panchayat

Shoolini University engages with the local community, including Sanol Gram Panchayat, to promote environmental sustainability and responsible management of natural resources. Potential areas of cooperation on water security include raising awareness about water

conservation, protecting local water sources, and encouraging responsible water use. Community awareness activities can highlight the importance of preventing water pollution and maintaining clean water bodies. Student and community participation can further strengthen local efforts toward sustainable water management. Such initiatives align with SDG 6: Clean Water and Sanitation and support long-term water security.



Students and villagers attending the awareness session in Sanol panchyat

2. Regional Government

HIMCOSTE and Shoolini University signed an agreement

Shoolini University has signed a concessionaire agreement with the Himachal Pradesh Council for Science, Technology, and Environment (HIMCOSTE) to manage and curate the upcoming State Science Museum and Planetarium in Shimla, while also collaborating on water treatment and environmental sustainability initiatives. The partnership, signed in the presence of Chief Secretary Mr. Prabodh Saxena, aims to promote science education and practical learning through the establishment of the Centre for Science, Learning, and Creativity at Shoghi. Under this collaboration, both institutions will work jointly on wastewater treatment, water recycling, and sustainable innovation projects, aligning with national goals for clean water and climate resilience. This marks a major step toward integrating scientific education with environmental conservation in Himachal Pradesh.

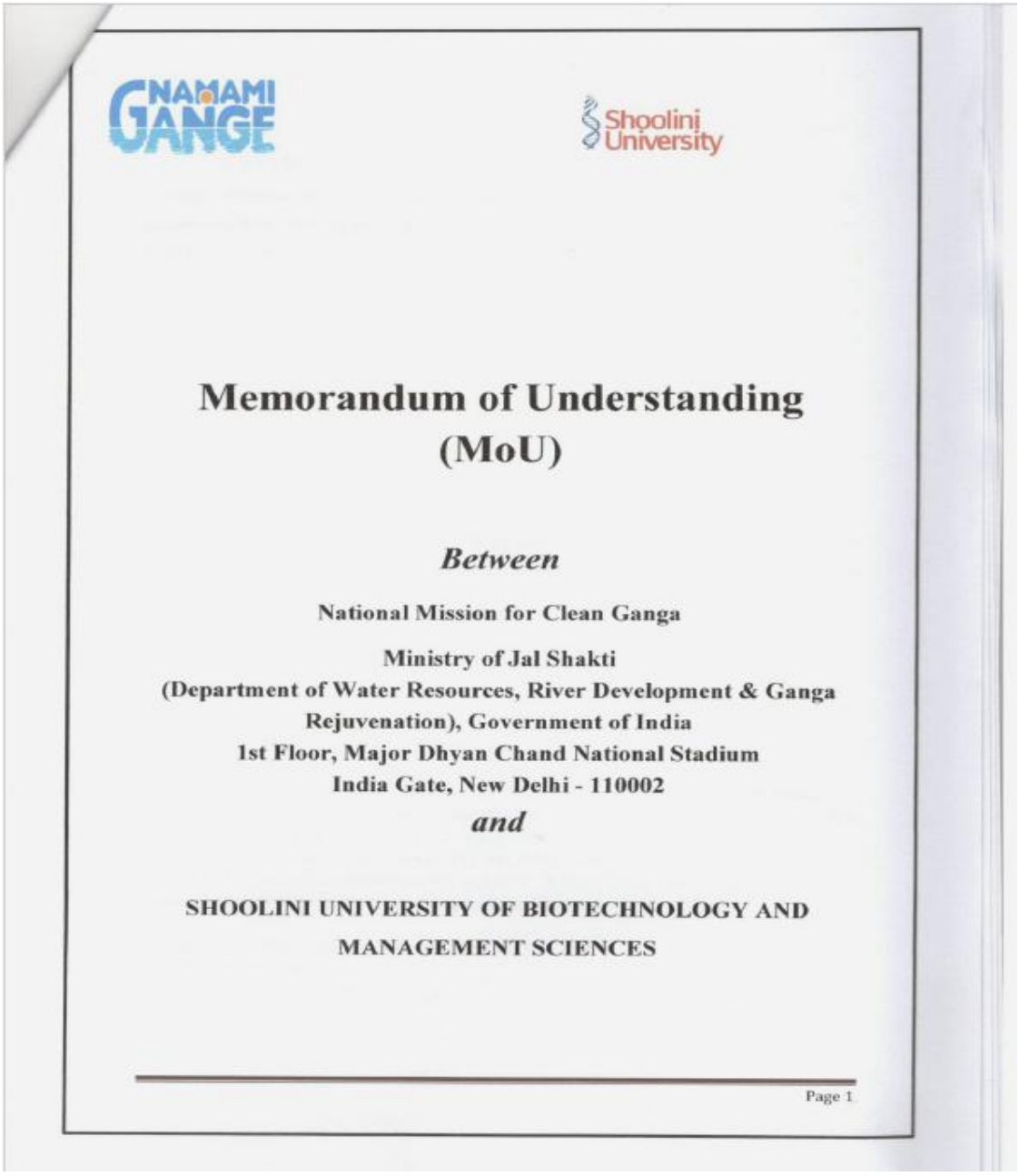


HIMCOSTE and Shoolini University Partner to Curate State Science Museum and Planetarium in Shimla

3. National Government

MoU signed with the Ministry of Jal Shakti

Shoolini University has developed strong collaborations with the Government of India to advance sustainable water management and conservation efforts. A key milestone in this direction is the Memorandum of Understanding (MoU) signed with the Ministry of Jal Shakti, which aims to promote efficient water resource management, conservation practices, and community awareness initiatives. Through this partnership, the university leverages its academic expertise, research capabilities, and technological innovations to contribute to national priorities under flagship programs such as the Jal Shakti Abhiyan, Atal Bhujal Yojana, and the National Water Mission. This collaboration strengthens the university's role in driving evidence-based policy interventions and implementing sustainable solutions for water security at both regional and national levels.



NAMAMI GANGE

Shoolini University

Memorandum of Understanding (MoU)

Between

National Mission for Clean Ganga

Ministry of Jal Shakti
(Department of Water Resources, River Development & Ganga Rejuvenation), Government of India
1st Floor, Major Dhyan Chand National Stadium
India Gate, New Delhi - 110002

and

SHOOLINI UNIVERSITY OF BIOTECHNOLOGY AND MANAGEMENT SCIENCES

Page 1

Shoolini University MOU with Ministry of Jal Shakti

4. Global governments

Shoolini University Collaboration with Healing Himalayas Foundation

Shoolini University collaborates with Healing Himalayas Foundation to promote environmental conservation, responsible waste management and community participation in the Himalayan region. With activities across India, Nepal and Bhutan, the Foundation encourages collective efforts to protect Himalayan ecosystems. The University's collaboration

engages students in cleanliness drives and environmental awareness initiatives, strengthening their commitment to conserving natural resources and supporting sustainable development.

HEALING HIMALAYAS

25th April 2025

Shoolini University,
Kausauli Hills,
Solan, Himachal Pradesh
173229

A NOTE OF APPRECIATION FOR VOLUNTEERING WITH HEALING HIMALAYAS

The addressed university is based in Himachal Pradesh since 2009, in Solan District. The private university aims to bring innovative dynamics in academic sector while following the virtues of honesty, compliance and integrity. The university considers its social responsibility along with reaching to its academic purpose. The students of the university are taught with a telos of raising learned and responsible youth of society.

The university has not left any stone unturned in educating their students to qualify with a sense of sensitivity towards society, its ecology and other agents thereby making students an example to other academic institutions. Since the past three years, Shoolini University has been participating and inculcating a habit of responsible Waste-Management among its students through active participation in the cleaning drives conducted by our organisation. The university bears immense enthusiasm in serving the environment. For every cleaning drive the university allow us number of volunteers from student community to ease our solid waste management. Together we aspire for a healthy and sustainable future of pupil/people.

The approach of the university has prima facie brought a responsible attitude among its students. The youth population is indeed an advantage but when the group becomes responsible it brings glory to an entire nation. No wonder Shoolini University has been one amongst the institutes which is contributing in bettering our tomorrow.

We appreciate the participation of the University for all these years and hope for more participation in forthcoming drives. It is to our delight that we get to experience such young and responsible participation from your students.

Thank You.
Pradeep Sangwan,
Founder-Healing Himalayas

HEALING HIMALAYAS
Registered Office: B-24,Anarkali Garden, Jagatpuri, New Delhi-110051
Contact No. +91- 9278626960, 7827097975
Email Address: Pradeep@healinghimalayas.org

Appreciation letter from Healing Himalyas

Shoolini University's joint activities with Healing Himalayas Foundation include cleanliness drives in Shimla and surrounding areas, environmental awareness initiatives and tree plantation programmes. These activities provide students with practical opportunities to contribute to environmental conservation and community service while strengthening their sense of environmental responsibility.

The collaboration supports the University's commitment to the United Nations Sustainable Development Goals (SDGs), particularly SDG 6 (Clean Water and Sanitation), SDG 13 (Climate Action) and SDG 15 (Life on Land). These activities reflect its commitment to environmental protection and a cleaner, greener future.



Volunteers during clean-up water resources

Registered Patents during 2025 related to Water Security

Shoolini University stands at the forefront of research and innovation addressing the complex challenges of water security through the development of advanced, practical, and sustainable technologies. The university's strong focus on applied research has resulted in several patents filed and granted by its researchers, reflecting its dedication to finding real-world solutions for water conservation, purification, and management. These innovations demonstrate Shoolini's commitment to supporting both environmental sustainability and community well-being by integrating scientific research with social impact.

Sr. No.	Title	Inventors	Application No.
1	Youth-Led Digital Innovations in Water & Sanitation (WASH)	Ms. Sarita Sundari Rout, Prof. Kesari	6160/2025-CO/L
2	Ai-Based Air Removal System for Water Pipes in Low-Water Conditions	Dr. Raj Kumar Saini, Dr. Robin Thakur, Er. Amita Verma	202511020061
3	Ai-Powered Smart Water Management System for Leak Detection and Dynamic Flow Control	Dr. Raj Kumar Saini, Simran Bogia	202511028250
4	A Chlorine Doped Nanocomposite for Efficient Dye Removal from Wastewater	Sonali Palsra, Rohit Kumar, Pankaj Raizada	202511056245
5	Water Watch	Agastya Sethi, Richika, Himanshu Sharma, Vinmre Kaushal	462832-001
6	A Ternary Dual Z-Scheme Heterojunction Photocatalyst for Wastewater Treatment and Method Thereof	Pankaj Raizada, Kusum Sharma, Pardeep Singh	202511065596
7	An Apple Pruning Waste Derived Nanocomposites for Dye Contaminated Water Treatment	Akshay Verma, Dr. Pooja Dhiman, Dr. Amit Kumar, Dr. Gaurav Sharma	202511065597

8	An Advanced Dual Z-Scheme Photocatalyst for Efficient Treatment of Dye-Contaminated Wastewater	Anita Sudhaik, Rohit Kumar , Pankaj Raizada, Pardeep Singh	202511073973
9	An S-Scheme Based Carbon Xerogel Photocatalyst for Efficient Pharmaceutical Wastewater Treatment	Sahil Rana, Dr. Pooja Dhiman, Dr. Amit Kumar, Dr. Gaurav Sharma	202511082150
10	A Biodegradable Polysaccharide Hydrogel for Wastewater Treatment	Yaksha Verma, Dr. Gaurav Sharma, Dr. Pooja Dhiman, Dr. Amit Kumar	202511088330
11	A Modular Biodegradable System for Soil Erosion Control and Water Harvesting	Tanishta Verm, Prof. Somesh Sharma	202511128577

Through these innovations, Shoolini University continues to strengthen its role as a research-driven institution contributing to India's water security agenda. The university's patent-driven approach underscores its mission to combine scientific advancement with sustainability, ensuring that technology serves both people and the planet.

Promoting conscious water usage on campus

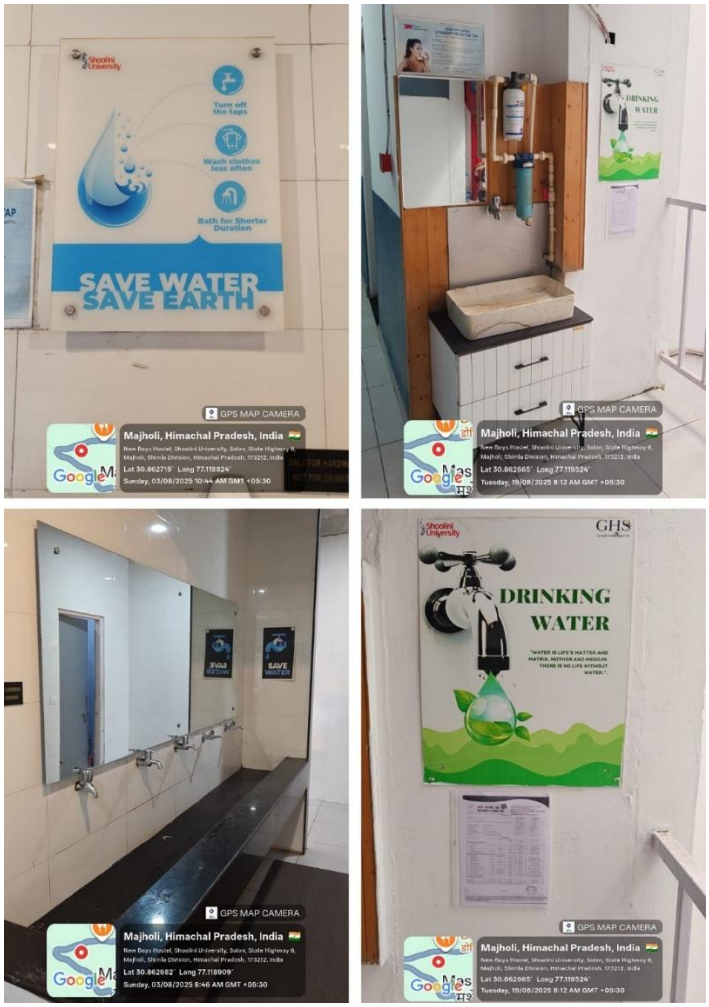
Shoolini University actively promotes responsible water consumption through awareness campaigns, educational initiatives and water-efficient practices. The University encourages students, faculty, staff and visitors to minimise water wastage and adopt sustainable water-use habits through the following initiatives:

- **Posters and Signboards:** Displaying water conservation messages and slogans near taps, washbasins and drinking-water facilities.
- **Water Conservation Workshops:** Organising educational sessions on water conservation and rainwater harvesting in collaboration with EIACP and HIMCOSTE at the CSLC Science Museum.
- **Water-Efficient Fixtures:** Promoting conservation through sensor-based taps, dual-flush toilets and 609 low-flow taps across the campus.
- **Rainwater Harvesting:** Collecting and reusing harvested rainwater for irrigation, flushing and other non-potable purposes.

- **Groundwater Recharge:** Using recharge structures and permeable surfaces to reduce runoff and support groundwater replenishment.
- **Wastewater Reuse:** Treating wastewater through the 400 KLD STP and reusing treated water for suitable non-potable applications.

Displaying Posters and Signboards

To promote water conservation across the campus, the University displays water conservation posters, signboards and awareness messages at strategic locations, particularly near washbasins, drinking-water facilities and other water-use areas.. These visual reminders encourage students, faculty, staff, and visitors to use water responsibly and adopt water-saving practices in their daily activities. Through these awareness measures, the University reinforces a culture of water conservation and responsible resource management.



Signboard and Posters in various Locations of Shoolini Campus

Water Conservation Workshops

Centre for Science Learning and Creativity (CSLC) Science Museum, Shoghi, Shimla
Workshop Highlight: Water Conservation and Rainwater Harvesting

CSLC, Science Museum, is operated and managed by Shoolini University, which oversees its functioning, activities, and related initiatives. Shoolini University hosted a week-long workshop on Water Conservation and Rainwater Harvesting in CSLC Science Museum, jointly organised by EIACP (Environmental Information, Awareness, Capacity Building and Livelihood Programme) and Himachal Pradesh Council for Science, Technology and Environment (HIMCOSTE). Throughout the week, participants engaged in informative sessions and practical activities focusing on water conservation, rainwater harvesting techniques, and their role in addressing water-related challenges amid changing climatic conditions. The workshop strengthened awareness of sustainable water management and encouraged participants to connect scientific knowledge with practical conservation measures. The initiative highlighted the importance of responsible water stewardship and collective action in protecting water resources, supporting SDG 6: Clean Water and Sanitation.



Group photographs of workshop held in CSLC Science Museum

Conclusion

Shoolini University's initiatives during 2025 strengthened its contribution to SDG 6: Clean Water and Sanitation. The University provided **137 free drinking-water facilities** across campus. Regular testing, filtration and maintenance supported drinking-water quality. Its **400 KLD Sewage Treatment Plant facilitated wastewater treatment and reuse**. Annual records documented **75.88 million litres** of recycled water, equivalent to **72.75%** of total water consumption. **Treated water supported suitable non-potable uses, including irrigation, landscaping and flushing**. Rainwater harvesting and groundwater-recharge measures complemented these efforts. **Water-efficient fixtures and drought-tolerant planting encouraged conservation**. Research, academic programmes and community activities promoted knowledge and participation in sustainable water management. Together, these measures demonstrate the University's commitment to responsible water use and long-term water security.