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Times Higher Education
Sustainability Impact Ratings





SUSTAINABLE DEVELOPMENT GOAL 6 CLEAN WATER AND SANITATION

SUSTAINABLE DEVELOPMENT GOALS

Table of Contents

Section No.	Section Title	Page No.
1	**Executive Summary**	**6**
2	**Impact Framework – SDG 6: Clean Water and Sanitation**	**6**
3	**SDG 6 Impact at a Glance (2025)**	**8**
4	**Water Consumption Tracking and Efficiency**	**9**
4.1	Water Sources and Consumption	9
4.2	Integrated Water Pathway: Supply, Treatment and Reuse	10
4.3	IoT-Enabled Water Monitoring Architecture	11
4.4	Water Monitoring Dashboard and Consumption Analytics	12
4.5	Water Consumption per Person	13
5	**Wastewater Treatment and Reuse – "Wastewater to Life Water"**	**14**
5.1	Treatment Capacity and Operational Performance	15
5.2	Sequencing Batch Reactor Treatment Process	16
5.3	BOAST Pond Rejuvenation and Beneficial Reuse	17
5.4	Treatment Verification and Monitoring	18
6	**Water Reuse Measurement**	**18**
6.1	Reporting Scope, Reuse Sources and Applications	19
6.2	Measurement Methodology	21
6.3	Water Reuse Performance and Institutional Impact	23
6.4	Evidence, Monitoring Records and Public Disclosure	24
6.5	Outcomes, Targets and Continuous Improvement (2026–2030)	25
7	**Preventing Water System Pollution**	**27**
7.1	Institutional Policies and Governance	28
7.2	Pollution Prevention at Source	29
7.3	Wastewater, Drainage and Receiving-Water Protection	29
7.4	Monitoring and Accidental-Discharge Response	29
8	**Free, Safe Drinking Water for the Campus Community**	**28**
8.1	Drinking-Water Infrastructure and Access Points	29
8.2	Water-Quality Monitoring and Laboratory Verification	29
8.3	Operation, Maintenance and Continuity of Supply	31
9	**Water-Conscious Building Standards**	**32**
9.1	Applicable Building Standards	32
9.2	Water-Efficient Fixtures and Plumbing	32
9.3	Building Water Systems and Smart Controls	34
9.4	Rainwater Harvesting, Reuse and Efficient Irrigation	34
10	**Water-Conscious Planting and Campus Landscapes**	**34**
10.1	Campus Vegetation and Landscape Diversity	35
10.2	Water-Wise Plant Species and Zoning	35
10.3	Landscape Design Practices	36
10.4	Smart Irrigation and Alternative Water Sources	36
10.5	Ecological Benefits	37
11	**Water Management Education for Local Communities**	**37**
11.1	NABARD-Sponsored Watershed Management Training	37
11.2	Hands-on Training in Water-Efficient Aquaculture	38
11.3	Village-Level Learning and Freshwater Stewardship	39

11.4	Demonstration Facilities	40
11.5	Community Participation	40
12	**Off-Campus Water Conservation Support**	**41**
12.1	Solar-Powered Irrigation in Rural South Odisha	41
12.2	Rainwater Harvesting and Community Water Infrastructure	42
12.3	Restoration of Jamakhala Community Pond	42
13	**Sustainable Water Extraction on Campus**	**43**
13.1	Extraction, Storage and Distribution Infrastructure	44
13.2	Balancing Extraction with Recharge and Reuse	44
13.3	Renewable-Energy Water Extraction beyond the Campus	44
14	**Cooperation on Water Security**	**44**
14.1	Local Cooperation	45
14.2	Government and District-Level Cooperation	45
14.3	National Institutions	45
14.4	International Organisations	46
15	**Promoting Conscious Water Use on Campus**	**46**
15.1	Awareness and Communication	47
15.2	Participation of Students, Faculty and Staff	47
15.3	Infrastructure that Supports Responsible Behaviour	47
16	**Promoting Conscious Water Use in the Wider Community**	**48**
16.1	Community Freshwater Stewardship at Jamakhala Pond	48
16.2	Village-Level Water-Resource Awareness	48
16.3	World Water Day Awareness with UNICEF and Youth4Water	48
16.4	Promoting Water-Efficient Practices in Rural Communities	49
17	**Results Matrix – SDG 6 (2025)**	**50**
18	**Interlinkage Wheel – SDG 6 and Connected Goals**	**51**
19	**Conclusion**	**52**

List of Figures

Figure No.	Figure Title	Page No.
Fig. 1	SDG 6 Impact Pathway – from Inputs to Impact	6
Fig. 2	SDG 6 Impact at a Glance (2025)	8
Fig. 3	University Water Management Dashboard – Consumption by Source and Function	9
Fig. 4	Water Supply by Source and Water Use by Function (2025)	10
Fig. 5	Campus Water Supply, Treatment, Reuse and Recharge Pathway	11
Fig. 6	IoT-Enabled Water Monitoring Architecture: Sources, Storage, Pumping, Gateway, Dashboard and Reuse	12
Fig. 7	Water Storage Tanks, Borewell Points and Distribution Infrastructure on Campus	12
Fig. 8	Campus Water Monitoring Dashboard: Campus-wise Consumption, Source Shares, Trends, Pump Status and Alerts	13
Fig. 9	Water Consumption per Person: Inbound Water by Source and Campus-wise Daily Allocation (2025)	14
Fig. 10	Integrated SBR–BOAST System: from Campus Wastewater to Beneficial Reuse	15
Fig. 11	University-wide Wastewater Treatment and Reuse (2025)	16
Fig. 12	SBR-Based Wastewater Treatment at CUTM and Transfer to the Pond for BOAST Secondary Treatment	16
Fig. 13	BOAST Aerators in the Campus Pond and IoT Water-Quality Sensing	17
Fig. 14	Wastewater to Life Water: Treatment, Pond Rejuvenation and Cage-Based Fish Farming	17
Fig. 15	Integrated Water Reuse Cycle: from Wastewater Treatment to Beneficial Use	19
Fig. 16	Smart Water Monitoring and Measurement Architecture for Campus Reuse	21
Fig. 17	2025 Water Reuse Performance Dashboard: Campus Wastewater Treatment and Reuse at a Glance	23
Fig. 18	Preventing Water System Pollution – from Source Control to Safe Discharge and Reuse	28
Fig. 19	Free, Safe and Clean Drinking Water – from Source Monitoring to Campus-wide Access	29
Fig. 20	pH Monitoring Report: Water-Quality Assessment at 14 Boring and Water Points (ESP32 Sensor Readings)	31
Fig. 21	Water-Efficient Water Closets, Urinals and Wash Basins Installed on Campus	33
Fig. 22	Deployment of Water-Efficient Sanitary Fixtures (2025)	33
Fig. 23	Water-Conscious Campus Infrastructure: Polyhouse Irrigation, Drip and Sprinkler Systems, Conservation Ponds and Storage	34
Fig. 24	Efficient Irrigation in Campus Landscapes: Drip, Lawn and Sprinkler Systems	35
Fig. 25	Water-Conscious Planting and Campus Landscapes	35
Fig. 26	IoT-Enabled Smart Irrigation and Water Control	36
Fig. 27	Community Water-Management Education and Engagement Pathway	37
Fig. 28	Farmers in a Community Water-Management Training Session	38
Fig. 29	Practical Aquaculture Training for Farmers at the University's Demonstration Facilities	39
Fig. 30	Village-Level Learning and Freshwater Stewardship	39
Fig. 31	Community Participation in Water-Management Learning Activities (2025)	40
Fig. 32	Integrated Water Resources Management (IWRM): Efficient Irrigation, Rainwater Harvesting and Pond Restoration	41
Fig. 33	Solar-Powered Pumping, Irrigation and Community Water Infrastructure	42
Fig. 34	Shelter to Habitat Project: Solar-Powered Community Infrastructure – Solar Lighting, Solar Panels and Elevated Water Storage	42
Fig. 35	Jamakhala Pond – a Restored Freshwater Ecosystem and Its Native Biodiversity	43
Fig. 36	Institutional and Community Cooperation Supporting Freshwater Management and Water Security	45
Fig. 37	Water-Conservation Awareness on Campus	46

Fig. 38	Integrated Campus Water-Management System: Efficient Fixtures, Smart Irrigation and Leak Prevention	47
Fig. 39	Village-Level Freshwater Resource Mapping and Community Engagement	48
Fig. 40	Water-Efficient Aquaculture Technologies for Rural Communities	49
Fig. 41	SDG 6 Interlinkage Wheel	51

1. Executive Summary

Centurion University of Technology and Management (CUTM) treats water as a shared resource that must be measured, conserved, cleaned and returned to people and ecosystems in better condition. Guided by its vision of "Shaping Lives and Empowering Communities", the University manages water across its six campuses in Odisha through an integrated system that links source monitoring, efficient buildings, wastewater treatment and reuse, safe drinking water, water-wise landscapes and community engagement.

The University supplies 1,221,525 litres of water per day to a campus population of 17,897 students, faculty and staff, equivalent to 445,856.6 m^3 a year, 24.91 m^3 per person per year and 68.25 litres per person per day. Municipal supply provides 57.1% of this volume and borewell groundwater 42.9%. Water is tracked by source and by function through inlet meters, borewell flow totalisers, tank-level sensors, pump-status signals and an IoT-enabled dashboard.

Wastewater is treated through a combined installed capacity of 1,000 kilolitres per day (KLD). Of the 1,110 KLD of wastewater generated, 975 KLD (87.8%) is treated, and 375 KLD of treated water is reused for landscaping and farm irrigation. A Sequencing Batch Reactor (SBR) plant discharges into a campus pond managed under the BOAST framework (Bubbles, Oxygenation, Aeration and Sustainable Technology), creating a "Wastewater to Life Water" pathway that supports irrigation and cage-based fish farming. Three institutional policies adopted in 2024, drainage screen filters, waste segregation and controlled handling of biomedical and hazardous waste keep pollutants out of drains and receiving waters.

Every student, employee and visitor has free access to drinking water purified by reverse osmosis (RO) and supplied through a dedicated pipeline to coolers and dispensers in academic buildings, hostels and common areas. Source water is screened at 14 borewell and supply points with digital sensors and verified after treatment in the University's Environmental Assessment and Research Laboratory against IS 10500. Buildings follow national water-efficiency references, with 100% dual-flush water closets (544), 100% low-flush or waterless urinals (180) and 445 water-efficient wash basins and taps, while rooftop harvesting captures an estimated 41 lakh litres of rainwater a year. Campus landscapes hold more than 31,000 plants and are managed through drought-adapted species, hydrozoning, mulching and drip, sprinkler and IoT-controlled irrigation.

Beyond the campus, the University's Schools of Fisheries and Agriculture trained farmers in watershed management and water-efficient aquaculture, surveyed water bodies in 14 villages with 44 final-year students, and supported 730 solar-operated drip irrigation systems, 82 rural homes with rainwater harvesting and the restoration of Jamakhala Pond, which now supports 30 indigenous aquatic species. Partnerships with NABARD, ICAR–IISWC, ICAR–CIFA, the District Fisheries Office, the Government of Odisha's ATMA programme, UNICEF and Youth4Water extend this work into regional water security.

Together, these measures show how a university can manage its own water responsibly while equipping surrounding communities to do the same, advancing SDG 6 alongside SDG 2 (Zero Hunger), SDG 3 (Good Health and Well-Being), SDG 13 (Climate Action), SDG 14 (Life Below Water) and SDG 15 (Life on Land).

2. Impact Framework – SDG 6: Clean Water and Sanitation

The Impact Framework links each SDG 6 initiative of the University to the UN SDG target it serves, its 2025 data, the outputs delivered, the impact achieved and the direction set for 2030. The pathway below shows how institutional inputs translate into lasting outcomes for the campuses and the wider community.

The framework is organised under six dimensions that together spell IMPACT: Infrastructure and Efficient Water Use, Management of Wastewater and Pollution, Potable Water for All, Action on Conservation and Landscapes, Community Education and Outreach, and Ties and Partnerships for Water Security.

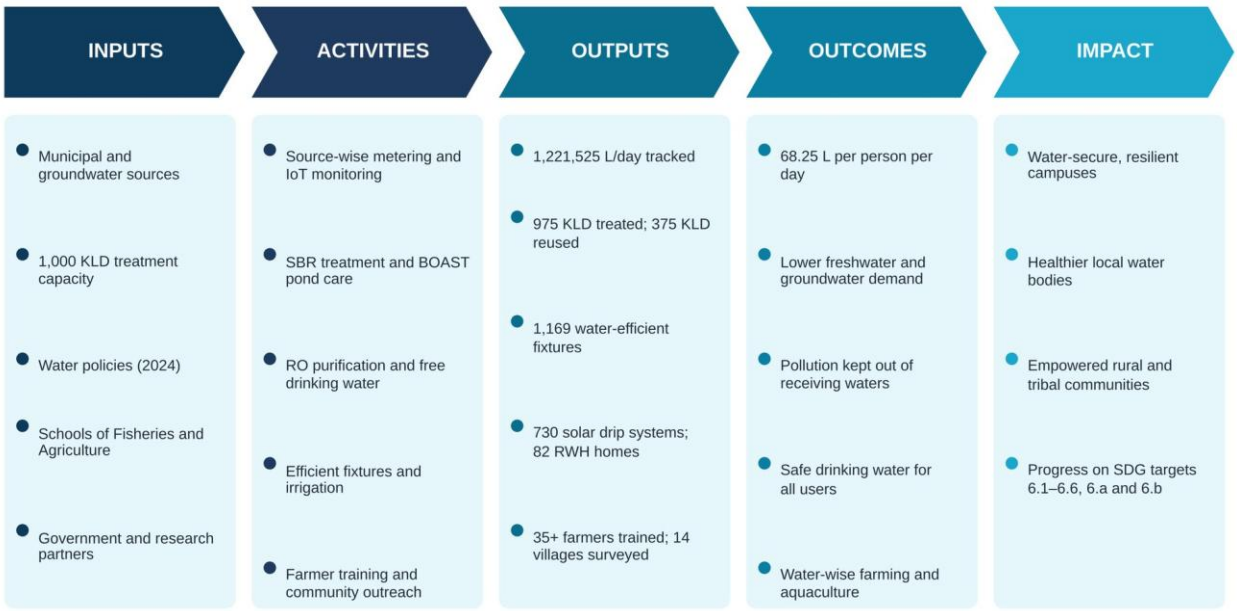


Fig. 1: SDG 6 Impact Pathway – from Inputs to Impact

Dimension	SDG Target	Initiative	2025 Data	Output	Impact	2030 Direction
Infrastructure and Efficient Water Use	6.4	Source-wise water accounting and IoT monitoring	1,221,525 L/day; 445,856.6 m³/year; 57.1% municipal, 42.9% groundwater	Inlet meters, borewell totalisers, tank sensors and a central dashboard	Consumption visible by source and use; basis for demand reduction	Metering on every source with monthly public reporting
	6.4	Per-person water consumption	68.25 L/person/day; 24.91 m³/person/year for 17,897 people	Annual per-capita efficiency benchmark	Measurable benchmark for water efficiency	Progressive reduction in per-capita use
	6.4	Water-efficient fixtures	544 dual-flush WCs (100%); 180 efficient urinals (100%); 445 of 1,656 taps (26.87%)	1,169 of 2,380 fixtures water-efficient (49.12%)	Lower demand at the point of use	Water-efficient technology on all taps and basins
	6.4	Sustainable groundwater extraction	523,525 L/day from borewells	Metered abstraction linked to recharge and reuse	Balanced use of aquifers	Borewell-level metering and recharge matching
Management of Wastewater and Pollution	6.3	SBR treatment and BOAST pond rejuvenation	1,000 KLD capacity; 975 KLD treated (87.8% of generation)	Biological treatment with IoT water-quality monitoring	Cleaner receiving water and restored pond ecology	Treatment of all wastewater generated
	6.3	Treated water reuse	375 KLD reused (38.5% of treated); ~136,875 m³/year	Landscaping and agricultural irrigation	Reduced freshwater demand	Higher reuse share; outlet-level metering

Dimension	SDG Target	Initiative	2025 Data	Output	Impact	2030 Direction
	6.3	Pollution prevention	Three water and waste policies (2024); screen filters at drainage ducts; authorised biomedical and e-waste agencies	Multi-barrier source control and discharge standards	Drains and water bodies protected from contamination	Regular discharge testing and incident drills
Potable Water for All	6.1	Free RO-purified drinking water	Dedicated pipeline; coolers in academic buildings and hostels; 14 source points screened	Free treated drinking water for students, staff and visitors	Health and well-being of the campus community	Post-treatment testing at every dispenser cluster
Action on Conservation and Landscapes	6.4 / 6.6	Rainwater harvesting and groundwater recharge	About 41 lakh litres harvested a year	Rooftop harvesting, recharge pits and percolation structures	Groundwater replenishment	Expanded recharge capacity
	6.6	Water-conscious planting	31,116 plants in campus inventories; micro-forest of 425 plants and 68 species	Hydrozoning, mulching, drip, sprinkler and IoT irrigation	Green campus with lower irrigation demand	Water-wise design in all new landscapes
Community Education and Outreach	6.a / 6.b	Water-management education	35 farmers (NABARD); 20 (Rasoor); 25 (NMAET–ATMA); 50 fish farmers; 70 farmers and SHG members; 14 villages	Training, demonstrations and village surveys	Water-wise farming and aquaculture	Wider farmer training network
	6.4 / 6.b	Off-campus water conservation	730 solar drip systems; 10 portable systems for 200 farmers; 11 borewells revived; 82 homes with rainwater harvesting	Efficient irrigation and rainwater capture	Water access for small and tribal farmers	More villages with solar irrigation and harvesting
	6.6	Jamakhala Pond restoration	30 indigenous aquatic species; 50+ students in fieldwork	Wastewater diversion, restoration and awareness	A revived community water body	Model replicated for other village ponds
	6.b	Conscious water use	Signage, awareness events, World Water Day, student innovation	Water-saving behaviour on campus and in villages	Shared responsibility for water	Campus-wide water-saving campaign each year
Ties and Partnerships for Water Security	6.a	Cooperation on water security	NABARD; ICAR–IISWC MoU (29 June 2025); ICAR–CIFA; District Fisheries Office; ATMA; UNICEF and Youth4Water	Joint training, research and technology transfer	Stronger regional water security	Joint watershed projects with partners

3. SDG 6 Impact at a Glance (2025)

The figures below summarise the scale of the University's water stewardship during the reporting year, from daily water accounting and treatment to community action.



Fig. 2: SDG 6 Impact at a Glance (2025)

Metric	2025 Value	Metric	2025 Value
Daily water supplied	1,221,525 L	Wastewater treated	975 KLD (87.8%)
Annual water use	445,856.6 m³	Treated water reused	375 KLD
Water use per person	24.91 m³/year (68.25 L/day)	Rainwater harvested	About 41 lakh litres a year
Groundwater share	42.9%	Water-efficient fixtures	1,169 of 2,380 (49.12%)
Installed treatment capacity	1,000 KLD	Solar drip-irrigation systems	730

4. Water Consumption Tracking and Efficiency

The University meets its water requirements from two freshwater sources: municipal or mains supply and groundwater drawn from borewells. Water from both sources passes through inlet measurement points and pumping systems into storage tanks, from where campus pipelines distribute it to hostels, staff quarters, academic buildings, sanitation facilities, laboratories, landscaping and agricultural areas. A consolidated water-consumption matrix records the daily volume by source and by function for all six campuses.

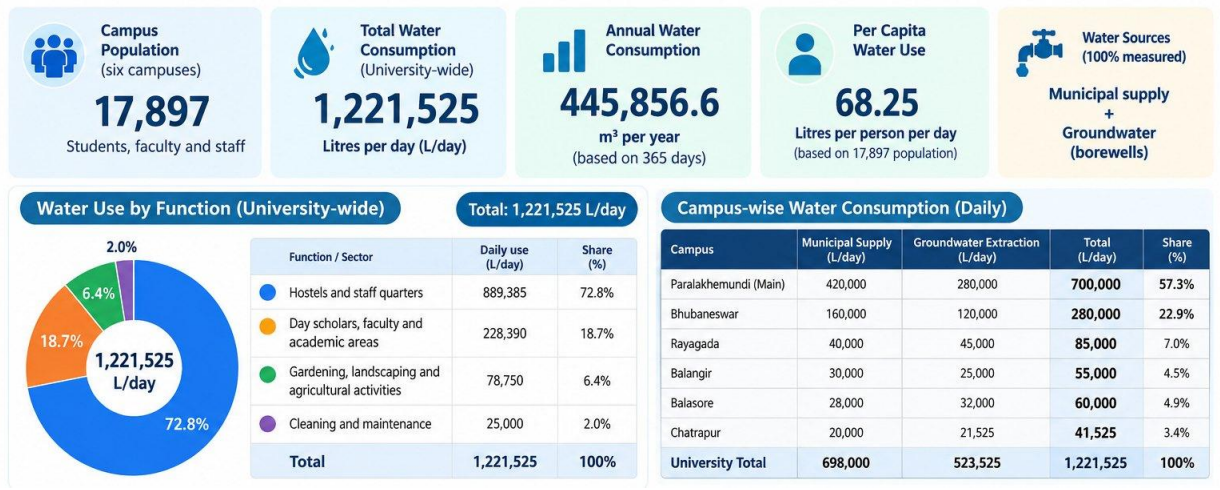


Fig. 3: University Water Management Dashboard – Consumption by Source and Function

4.1 Water Sources and Consumption

Inbound Water Source	Daily Volume (L/day)	Annual Volume (m³/year)	Share of Total
Municipal / mains supply	698,000	254,770.0	57.1%
Groundwater (borewells)	523,525	191,086.6	42.9%
Total inbound water	**1,221,525**	**445,856.6**	**100.0%**

Campus-wise water sources and consumption

The consolidated matrix allocates the University's daily supply across its six campuses at Paralakhemundi, Bhubaneswar, Rayagada, Balangir, Balasore and Chatrapur. The table below gives each campus's municipal and groundwater supply, its share of the University total and the annualised volume, calculated on 365 days of equivalent daily use.

Campus	Municipal / mains (L/day)	Groundwater (L/day)	Campus total (L/day)	Share of University total	Annualised total (m³/year)
Paralakhemundi	420,000	280,000	700,000	57.31%	255,500.000
Bhubaneswar	160,000	120,000	280,000	22.92%	102,200.000
Rayagada	40,000	45,000	85,000	6.96%	31,025.000
Balangir	30,000	25,000	55,000	4.50%	20,075.000
Balasore	28,000	32,000	60,000	4.91%	21,900.000

Campus	Municipal / mains (L/day)	Groundwater (L/day)	Campus total (L/day)	Share of University total	Annualised total (m³/year)
Chatrapur	20,000	21,525	41,525	3.40%	15,156.625
University total	**698,000**	**523,525**	**1,221,525**	**100.00%**	**445,856.625**

Paralakhemundi accounts for the largest share of total water supply, followed by Bhubaneswar. These campus-wise estimates help the University prioritise extraction monitoring, pumping efficiency, groundwater recharge and freshwater-demand reduction where they will have the greatest effect.

Residential facilities account for the largest share of water use. Hostels and staff quarters use 889,385 litres a day (72.8%) for drinking, bathing, washing and sanitation, followed by academic buildings and day scholars at 228,390 litres (18.7%). Gardening, landscaping and agricultural activities use 78,750 litres (6.4%), and cleaning and maintenance, including solar-panel cleaning, use 25,000 litres (2.0%).

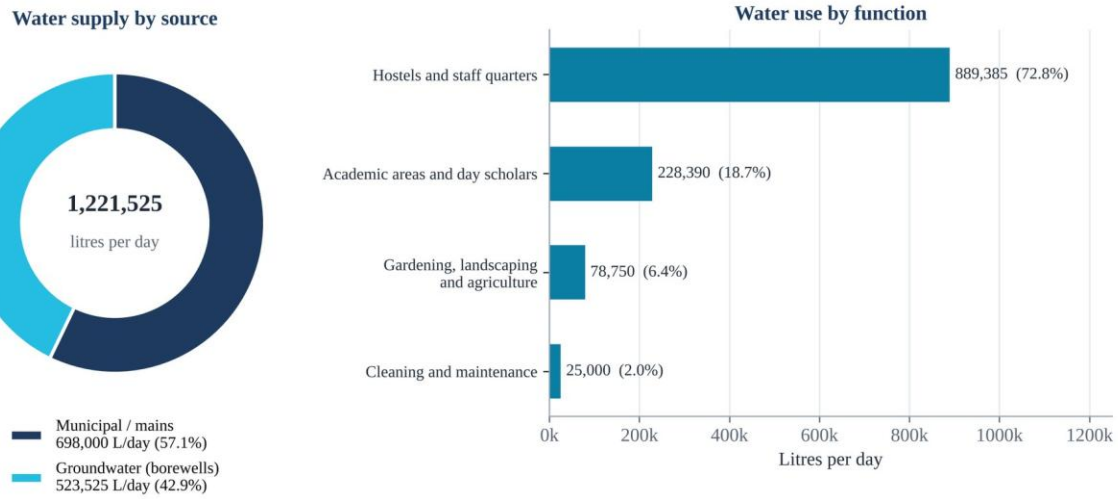


Fig. 4: Water Supply by Source and Water Use by Function (2025)

Use Category	Daily Use (L/day)	Share of Total	Use Profile
Hostels and staff quarters	889,385	72.8%	Drinking, bathing, washing and sanitation
Day scholars, faculty and academic areas	228,390	18.7%	Academic buildings, washrooms and related use
Gardening, landscaping and agriculture	78,750	6.4%	Irrigation and agricultural activities
Cleaning and maintenance	25,000	2.0%	Floor and solar-panel cleaning, general hygiene
Total	**1,221,525**	**100.0%**	

4.2 Integrated Water Pathway: Supply, Treatment and Reuse

Water management at the University forms a closed loop. Supply from municipal mains and borewells is measured, stored and distributed; wastewater is collected and treated; and treated water is stored and reused for landscaping, farms and polyhouses. Rooftop rainwater harvesting and recharge or

percolation structures return water to the aquifer, with an estimated 41 lakh litres of rainwater harvested each year.



Fig. 5: Campus Water Supply, Treatment, Reuse and Recharge Pathway

4.3 IoT-Enabled Water Monitoring Architecture

Water monitoring is organised around six functional stages: water sourcing, storage and sensing, pumping and control, IoT communication, dashboard-based monitoring and distribution to end uses. Inlet flow meters and borewell totalisers quantify source-wise volumes from opening and closing readings for each reporting period. Ultrasonic level sensors and level controllers on storage tanks, together with pump-control panels, provide operational information, while an IoT gateway transmits data to a cloud-based dashboard for daily and monthly consumption reports, source-wise analysis and historical records.

- Flow measurement: inlet meters on municipal supply and flow meters or cumulative totalisers on borewells quantify water entering the system.
- Storage and sensing: tank-level sensors and level controllers regulate filling and prevent overflow.
- Pumping and control: pump-status signals show equipment operation and support the detection of unexpected shutdowns or abnormal flow.
- Dashboard and alerts: a central interface consolidates consumption trends, source shares and alerts on low tank levels or unusual demand, enabling a quick operational response and reducing wastage.

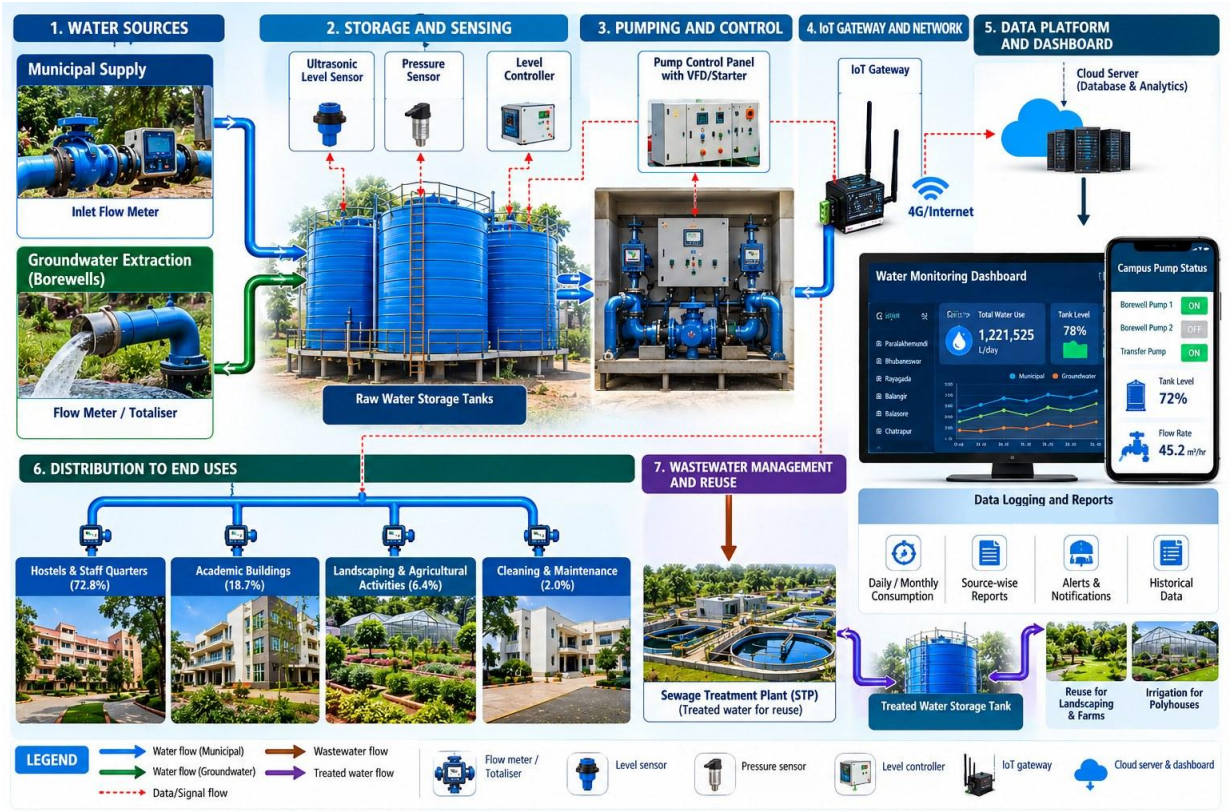


Fig. 6: IoT-Enabled Water Monitoring Architecture: Sources, Storage, Pumping, Gateway, Dashboard and Reuse



Fig. 7: Water Storage Tanks, Borewell Points and Distribution Infrastructure on Campus

4.4 Water Monitoring Dashboard and Consumption Analytics

The University's water-management framework brings water-source monitoring, pumping operations, storage management and consumption assessment together in one university-wide structure. The consolidated water-consumption matrix reports an estimated daily requirement of 1,221,525 litres for

a combined campus population of 17,897 students, faculty and staff – about 445,856.6 m³ a year on 365 days of equivalent daily use, or 68.25 litres per person per day.

The dashboard architecture combines campus-wise consumption, municipal supply, groundwater extraction and related operating parameters. This allows campuses to be compared, the main consumption areas to be identified and distribution requirements to be evaluated. The campus-wise quantities shown in the dashboard are indicative allocations of the reported University-wide total.

Daily and monthly consumption analysis is a core part of the University's water accounting. Consumption trends show how demand changes with residential occupancy, academic activity, irrigation requirements and the seasons, and graphs of daily and monthly use, together with the municipal and groundwater contributions, make unusual variations easy to spot.

Pump-status monitoring gives visibility of equipment operation, while flow meters and cumulative totalisers, where installed, quantify water extraction and supply. An alert-management interface can flag abnormal flow, unexpected pump shutdown, low tank levels and possible distribution irregularities, helping to reduce wastage, speed up the operational response and keep the campus supply reliable. The alert events, equipment readings and statuses shown in the dashboard figure are illustrative interface elements rather than documented incidents or live readings.



Fig. 8: Campus Water Monitoring Dashboard: Campus-wise Consumption, Source Shares, Trends, Pump Status and Alerts

4.5 Water Consumption per Person

Per-person consumption is calculated from the consolidated daily volume and the combined campus population of students, faculty and staff, using 365 days of equivalent daily use.

Calculation Step	Result
Convert daily litres to cubic metres	1,221,525 L/day ÷ 1,000 = 1,221.525 m³/day
Annualise the daily volume	1,221.525 m³/day × 365 days = 445,856.625 m³/year
Annual water use per person	445,856.625 m³/year ÷ 17,897 people = 24.91 m³/person/year
Daily per-person equivalent	1,221,525 L/day ÷ 17,897 people = 68.25 L/person/day



Fig. 9: Water Consumption per Person: Inbound Water by Source and Campus-wise Daily Allocation (2025)

At 68.25 litres per person per day, including residential use in hostels and staff quarters, the per-capita figure provides a clear benchmark against which the University tracks the effect of efficient fixtures, leak control, reuse and awareness campaigns.

Relevant SDGs: SDG 6 — Clean Water and Sanitation; SDG 11 — Sustainable Cities and Communities; SDG 12 — Responsible Consumption and Production.

5. Wastewater Treatment and Reuse – "Wastewater to Life Water"

Since 2022 the University has built wastewater-treatment infrastructure across all six campuses to manage wastewater from hostels, staff quarters, academic and administrative buildings, canteens and cleaning activities. The combined installed treatment capacity is 1,000 KLD, comprising four 75 KLD treatment units (300 KLD), a 250 KLD Sequencing Batch Reactor (SBR) plant and a further 450 KLD of treatment capacity across the remaining campuses.

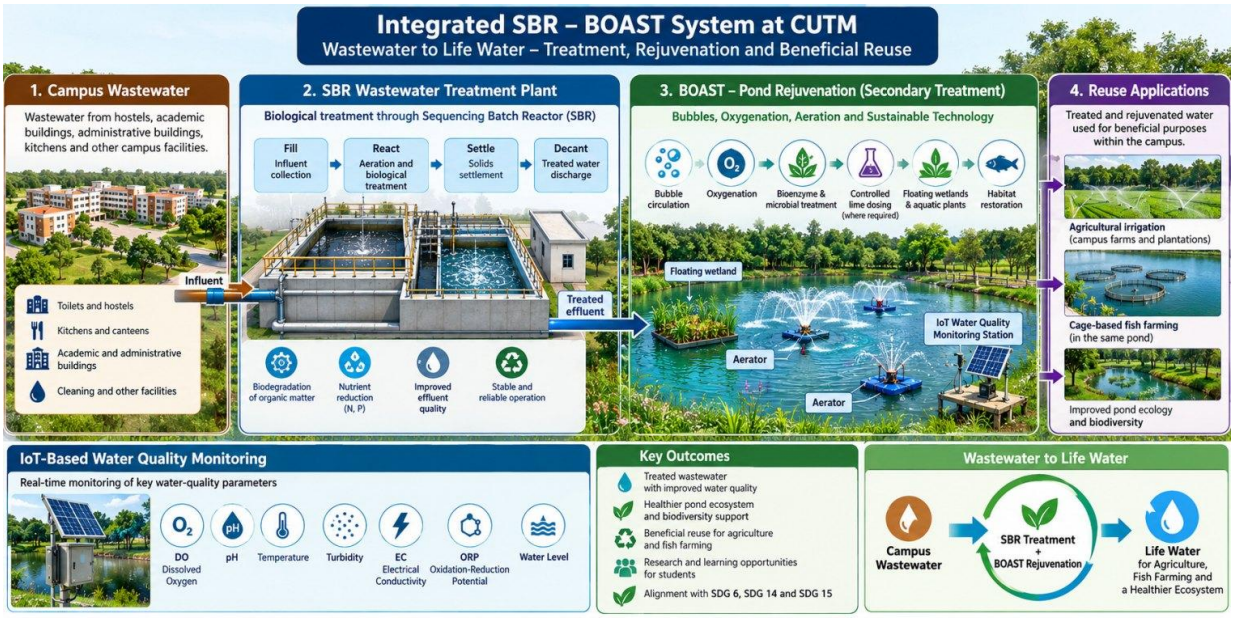


Fig. 10: Integrated SBR–BOAST System: from Campus Wastewater to Beneficial Reuse

5.1 Treatment Capacity and Operational Performance

Treatment Infrastructure	Installed Capacity (KLD)	Annual Design Capacity (m^3/year)
Four treatment units of 75 KLD each	300	109,500
SBR-based wastewater-treatment plant	250	91,250
Treatment plants at the remaining four campuses	450	164,250
Total – six-campus treatment infrastructure	**1,000**	**365,000**

Wastewater Management Parameter	Reported Quantity
Wastewater generated	1,110 KLD
Wastewater treated	975 KLD
Share of generated wastewater treated	87.8%
Treated wastewater reused for landscaping and agricultural irrigation	375 KLD
Estimated wastewater discharged	135 KLD

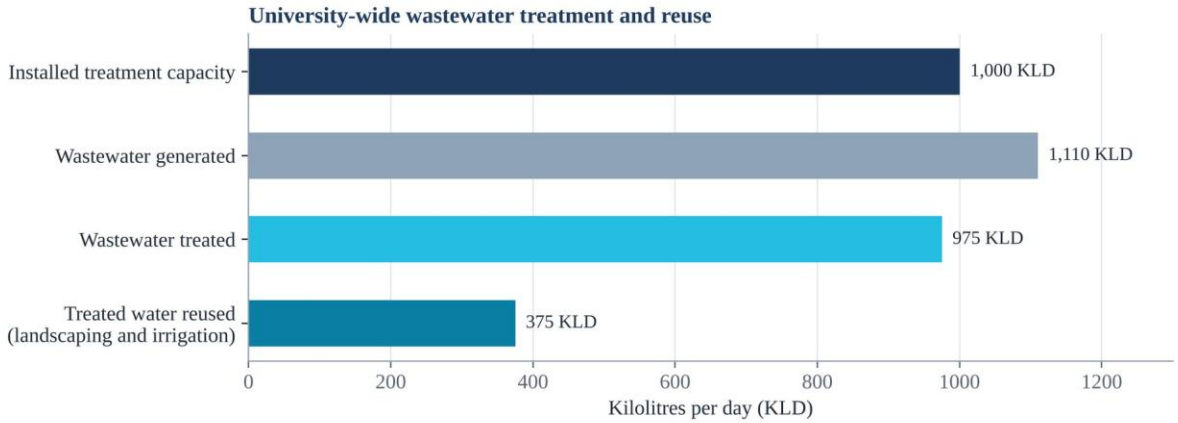


Fig. 11: University-wide Wastewater Treatment and Reuse (2025)

5.2 Sequencing Batch Reactor Treatment Process

The SBR plant provides the primary biological treatment stage. In this fill-and-treat process, each stage takes place in sequence within a single reactor:

- Fill: wastewater enters the reactor.
- Aeration and reaction: oxygen supports microorganisms that break down biodegradable organic matter.
- Settle: aeration stops so that biological solids separate from the treated liquid.
- Decant: the clarified supernatant is withdrawn for onward treatment.
- Sludge management: excess sludge is removed to maintain the correct solids concentration.

Treatment is preceded by coarse screening, oil and grease removal, settling in a pretreatment tank and storage in a buffer tank, and treated water is disinfected before irrigation use.

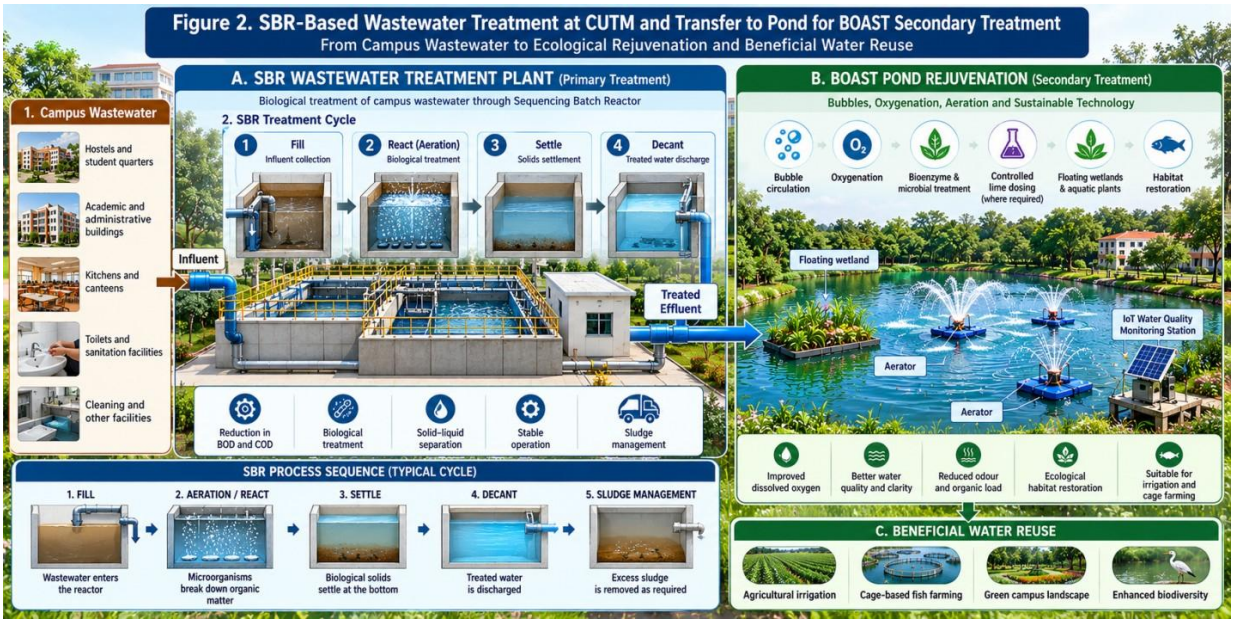


Fig. 12: SBR-Based Wastewater Treatment at CUTM and Transfer to the Pond for BOAST Secondary Treatment

5.3 BOAST Pond Rejuvenation and Beneficial Reuse

After SBR treatment, effluent flows to the campus pond, where the BOAST framework – Bubbles, Oxygenation, Aeration and Sustainable Technology – provides secondary, nature-based treatment. Bubble circulation, aeration and oxygenation work alongside bioenzymes and beneficial microbes, controlled lime dosing where required, aquatic plants and floating wetlands to maintain dissolved oxygen, break down residual organic matter and restore the ecological condition of the pond. A solar-powered IoT station monitors dissolved oxygen (DO), pH, temperature, turbidity, electrical conductivity (EC) and water level, with oxidation-reduction potential (ORP) where appropriate.



Fig. 13: BOAST Aerators in the Campus Pond and IoT Water-Quality Sensing

The rejuvenated pond supports agricultural irrigation of campus farms and plantations and cage-based fish farming within the same water body. This "Wastewater to Life Water" approach links engineered treatment with resource recovery, pond rehabilitation and sustainable agriculture, and provides students with a living laboratory for water-quality research.

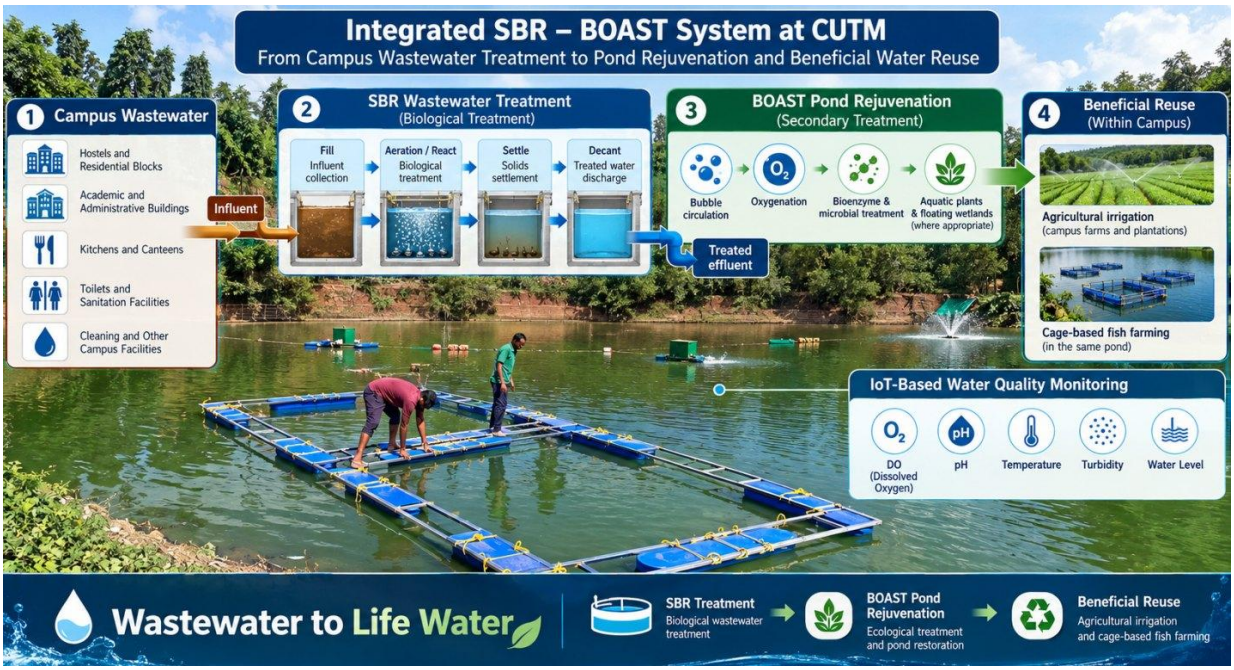


Fig. 14: Wastewater to Life Water: Treatment, Pond Rejuvenation and Cage-Based Fish Farming

5.4 Treatment Verification and Monitoring

Treatment performance is verified through plant operating logs, treatment-cycle and sludge records, and laboratory analysis of influent and treated effluent. In the pond, continuous IoT readings of DO, pH, temperature, turbidity, EC and water level allow operators to track water condition and adjust aeration or dosing promptly.

Relevant SDGs: SDG 6 — Clean Water and Sanitation; SDG 2 — Zero Hunger; SDG 14 — Life Below Water; SDG 15 — Life on Land.

6. Water Reuse Measurement

The University treats water reuse as an essential part of sustainable campus water management. Its integrated wastewater-treatment and beneficial-reuse framework reduces dependence on freshwater by treating wastewater from campus activities and directing suitable treated water to non-potable uses, particularly landscaping and agricultural irrigation.

In 2025 the University reported estimated wastewater generation of 1,110 KLD across its six campuses. About 975 KLD (87.8%) was treated, and 375 KLD of treated wastewater was reused for landscaping and agricultural irrigation – about 38.5% of the treated volume. Maintained over 365 days, this daily reuse corresponds to an indicative annual volume of 136,875 m^3. The annualised figure is calculated from the reported daily estimate and is not an independently verified annual meter reading.

Reuse is supported by wastewater-treatment infrastructure with a combined installed capacity of 1,000 KLD. At the Bhubaneswar campus, a Sequencing Batch Reactor (SBR) provides biological treatment, after which treated effluent passes to a campus pond managed under the BOAST framework. The pond supports further water-quality management and beneficial uses, including agricultural irrigation and campus fish farming, subject to water-quality and operational controls. Municipal inlet meters, borewell flow meters or cumulative totalisers, tank-level sensors, pump-status monitoring and an IoT-enabled dashboard support source-wise water accounting and operational monitoring.



Fig. 15: Integrated Water Reuse Cycle: from Wastewater Treatment to Beneficial Use

Indicator	Reported value (2025)
Estimated wastewater generated	1,110 KLD
Estimated wastewater treated	975 KLD
Treatment share of estimated generation	87.8%
Treated wastewater reused	375 KLD
Reuse as a share of treated wastewater	About 38.5%
Indicative annualised reuse volume	136,875 m³/year

6.1 Reporting Scope, Reuse Sources and Applications

The assessment covers the University's water-management operations across its six campuses in Odisha: wastewater generated by campus activities, its treatment in the available infrastructure, and the subsequent use of treated water for non-potable purposes. The reported reuse of 375 KLD is an aggregate University-wide operational figure; because no campus-wise breakdown is available, it is not apportioned among individual campuses. The reporting boundary includes:

- Wastewater generated from campus operations.
- Wastewater treated through the University's treatment systems.
- Treated wastewater reused for landscaping and agricultural irrigation.
- The treated-water management pathway associated with the BOAST pond system at the Bhubaneswar campus.
- Rainwater harvesting and other potential reuse streams, where actual reuse is established through operational records.

Each water stream is considered separately so that only water demonstrably reused is included in the quantified reuse total.

Treated wastewater reuse. Treated wastewater is the principal quantified reuse stream. Of about 975 KLD treated, 375 KLD is reused for irrigation of campus landscapes and green spaces, for agricultural irrigation and cultivation, and through the campus water-management pathway. The reuse quantity is part of the treated volume, not an addition to it.

BOAST pond-based water management. At the Bhubaneswar campus, the Sewage Treatment Plant (STP), campus pond and BOAST system form one pathway that links treatment with pond-based ecological management and beneficial uses, including agricultural irrigation and cage-based fish farming. Because pond inflow and the water later withdrawn for irrigation are not separately metered, they are not counted as additional reuse quantities.

Rainwater harvesting. Rooftop rainwater-harvesting potential is estimated at about 41 lakh litres a year. As the quantity of harvested rainwater subsequently used for flushing, irrigation or other purposes is not yet recorded, it is not added to the treated-wastewater reuse total; it will be included once collection, storage and end-use records are available.

Greywater reuse. No separately quantified greywater reuse volume or campus-wise record of greywater treatment and use is available for 2025, so greywater is not included in the current quantified total.

Water stream	Documented application or status	Treatment in this assessment
Treated wastewater	Landscaping and agricultural irrigation	375 KLD reported reuse
BOAST pond pathway	Pond-based water management, agricultural irrigation and cage-based fish farming	Described as an institutional reuse pathway; no additional volume counted
Harvested rainwater	About 41 lakh litres/year reported as harvesting potential	Excluded from quantified reuse pending evidence of actual reuse
Greywater	No separate quantified reuse record identified	Not included in quantified reuse total

Reporting principles and prevention of double counting

- Actual reuse rather than treatment capacity: installed treatment capacity is not treated as the volume of water reused.
- Reuse as a subset of treated water: the 375 KLD reused is included within the 975 KLD treated and is not added to it again.
- End-use confirmation: water is counted as reused only when its beneficial application is documented.
- No duplication across pathways: water transferred to a pond and later used for irrigation is not counted twice.
- Separate treatment of rainwater and greywater: these streams enter the reuse total only when actual reuse quantities and end uses are documented.

- Transparent reporting of limitations: where campus-wise or end-use measurements are unavailable, aggregate figures are reported without unsupported allocations.

6.2 Measurement Methodology

Reuse is assessed by identifying the volume of wastewater treated and the portion of that treated water subsequently used for beneficial non-potable applications. The 2025 operational quantities are wastewater generated of about 1,110 KLD, wastewater treated of about 975 KLD, treated wastewater reused of about 375 KLD and installed treatment capacity of about 1,000 KLD.

Measurement infrastructure and monitoring architecture

- Inlet water meters: monitor incoming water supplied to campus systems.
- Borewell flow totalisers: record groundwater abstraction.
- Water-level sensors: monitor water levels in storage tanks.
- Pump-status signals: monitor the operational status of pumping systems.
- IoT-based monitoring dashboard: provides a central view of available water-system information.



Fig. 16: Smart Water Monitoring and Measurement Architecture for Campus Reuse

Calculation of treated-water reuse

The principal reuse indicator is the proportion of treated wastewater that is subsequently reused:

Step	Calculation and result
Treated wastewater reuse rate (%)	(Volume of treated wastewater reused ÷ Total volume of wastewater treated) × 100
Applying the 2025 figures	(375 KLD ÷ 975 KLD) × 100 = 38.46%, about 38.5%
Indicative annual reuse volume	375 KL/day × 365 days = 136,875 KL/year (136,875 m³/year)

The annualised value assumes consistent operation throughout the year and is an estimate based on the reported daily quantity.

Outlet-level measurement procedure

To strengthen the reliability and auditability of water reuse reporting, the University can progressively establish a dedicated measurement procedure at major treated-water reuse points. The recommended procedure is:

- Record treated-water flow at the STP treated-water outlet.
- Record the volume transferred to each major reuse distribution line.
- Record the quantity supplied to landscaping and agricultural irrigation.
- Maintain daily meter readings, including opening and closing readings.
- Consolidate daily readings into monthly and annual reuse statements.
- Reconcile reuse quantities with the total treated-water volume.
- Retain supporting records, including meter photographs, operational logs and relevant water-quality test reports.

Where a reuse distribution line serves multiple applications, the University should record the end-use allocation separately wherever technically feasible.

Measurement and reporting register

Measurement parameter	Unit	Recording frequency
Treated wastewater at STP outlet	KL	Daily
Water supplied to landscaping	KL	Daily
Water supplied for agricultural irrigation	KL	Daily
Other qualifying reuse applications	KL	Daily
Total treated wastewater reused	KL	Daily and monthly
Total wastewater treated	KL	Daily and monthly
Treated-water reuse rate	%	Monthly
Water-quality test results	As applicable	As per monitoring schedule

For each measurement point, the register should identify the campus, meter identification number, end-use category, reading date, opening reading, closing reading, calculated volume and supporting evidence reference. It is a recommended reporting format and should be populated using actual meter readings and operational records.

Data validation and quality assurance

- Confirm that reuse volumes do not exceed the corresponding treated-water volume.
- Verify that meter readings are recorded consistently and in standard units.
- Check for missing readings, abnormal variations and meter faults.
- Reconcile daily records with monthly and annual totals.

- Ensure that water passing through a pond or intermediate storage is not counted again when it is later used.
- Retain calibration and maintenance records for measuring instruments.
- Maintain treated-water quality test reports that support the suitability of water for its intended use.

The University should also distinguish between measured values, operational estimates and annualised projections in all reporting tables.

6.3 Water Reuse Performance and Institutional Impact

Performance parameter	Reported value (2025)
Total wastewater generated	1,110 KLD
Wastewater treated	975 KLD
Wastewater treatment rate	87.8%
Treated wastewater reused	375 KLD
Treated-water reuse rate	38.5%
Indicative annualised reuse	136,875 KL/year
Installed treatment capacity	1,000 KLD
Principal reuse applications	Landscaping and agricultural irrigation
Measurement coverage	Aggregate institutional reporting
Further improvement required	Campus-wise and outlet-level reuse measurement

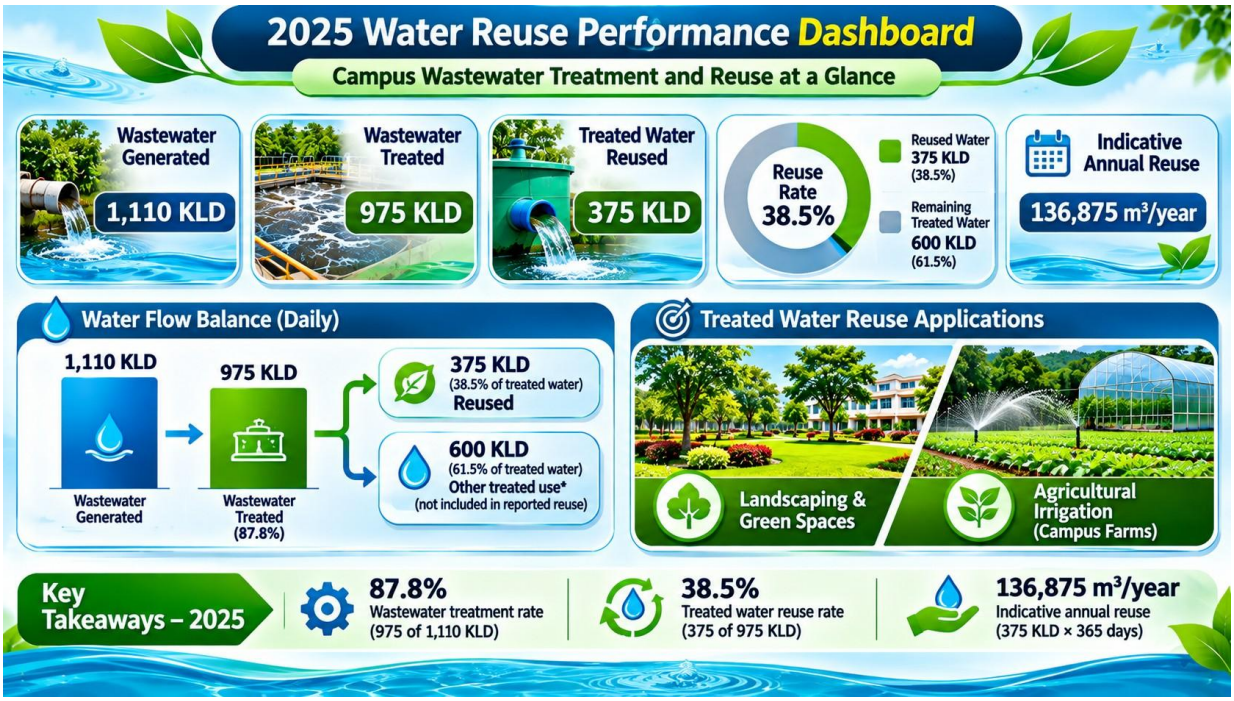


Fig. 17: 2025 Water Reuse Performance Dashboard: Campus Wastewater Treatment and Reuse at a Glance

Using treated wastewater for suitable non-potable applications reduces dependence on freshwater sources. Its principal contributions are:

- Reduced freshwater demand: treated wastewater provides an alternative source for selected non-potable uses.
- Support for campus greenery: reused water maintains landscaping and green spaces.
- Agricultural resource use: treated water supports agricultural irrigation and cultivation.
- Integrated wastewater management: treatment and subsequent use form part of the wider water-management strategy.
- Resource efficiency: reuse turns treated wastewater into a useful resource rather than treating it only as a disposal problem.

The BOAST pond pathway at the Bhubaneswar campus further demonstrates how treatment, pond management and beneficial use are integrated, supporting agricultural irrigation and cage-based fish farming. The University will continue to strengthen reuse through improved measurement, operational monitoring and documentation, moving towards a measurement-based framework in which treated volumes, actual reuse and end uses are reconciled through operational records.

6.4 Evidence, Monitoring Records and Public Disclosure

For effective assessment under THE Sustainability Impact Ratings 2026, Indicator 6.4.2 – Water Reuse Measurement, the University's submission should demonstrate three aspects:

- Measurement: the University has a process for measuring water reused across its campuses.
- Evidence: documentary and operational records that substantiate reported reuse activities and quantities.
- Public disclosure: publicly accessible information on its water reuse practices.

Evidence category	Information documented	Relevance to indicator 6.4.2
Wastewater generation	About 1,110 KLD	Establishes the wastewater-management baseline
Wastewater treatment	About 975 KLD treated	Demonstrates treatment operations
Treated-water reuse	About 375 KLD reused	Establishes the reported reuse quantity
Reuse applications	Landscaping and agricultural irrigation	Identifies beneficial end uses
Treatment infrastructure	Installed treatment capacity of 1,000 KLD	Demonstrates institutional treatment infrastructure
Water-monitoring architecture	Inlet meters, borewell flow totalisers, tank-level sensors, pump-status signals and IoT dashboard	Demonstrates the wider water-monitoring framework
BOAST pond pathway	Pond-based water management and beneficial applications	Supports the description of integrated water management

Supporting documentary evidence

To strengthen the submission, the University should compile the following supporting documents wherever available. Wastewater treatment and operational records:

- STP installation and treatment-capacity details, daily operational logs and daily treatment records.
- Treated-water outlet readings, where recorded, with maintenance and operational records.
- Relevant treated-water quality test reports.

Water reuse measurement records:

- Flow-meter readings at treated-water reuse outlets, and daily and monthly reuse registers.
- Landscaping and agricultural-irrigation water-use records, and campus-wise reuse statements where available.
- Reconciliation of treated-water volume with actual reuse volume.
- Meter calibration and maintenance records, where applicable.

Public disclosure and institutional transparency

The University should make its water reuse policy, practices and performance information publicly accessible through an institutional sustainability webpage or a published annual sustainability report. The public disclosure should include:

- A description of the wastewater treatment and reuse system.
- The reported treated-water reuse quantity and its principal applications, including landscaping and agricultural irrigation.
- A description of the water-monitoring framework.
- Photographs of treatment infrastructure and reuse applications.
- A clear statement of whether figures are measured, estimated or annualised.

6.5 Outcomes, Targets and Continuous Improvement (2026–2030)

Conservation of freshwater resources. Treated wastewater replaces freshwater for suitable non-potable applications, reducing freshwater demand for landscaping and agricultural irrigation.

Sustainable campus landscaping. Treated-water reuse maintains campus green spaces while reducing dependence on freshwater for non-potable needs.

Support for agricultural activities. Reuse for agricultural irrigation supports cultivation and shows the productive potential of treated wastewater in the University environment.

Integrated water-resource management. The BOAST pond pathway at Bhubaneswar links treatment infrastructure with pond management and beneficial water use.

Improved institutional water monitoring. Meters, groundwater flow totalisers, tank-level sensors, pump-status signals and the IoT dashboard provide a foundation for better water accounting and operational monitoring.

2025 baseline

Indicator	2025 baseline
Estimated wastewater generated	1,110 KLD
Estimated wastewater treated	975 KLD
Reported treated wastewater reused	375 KLD
Calculated treated-water reuse rate	38.5%
Indicative annualised reuse	136,875 KL/year
Principal reuse applications	Landscaping and agricultural irrigation

The baseline uses the aggregate operational quantities in the 2025 SDG 6 report and will be strengthened through direct reuse-outlet measurement and campus-wise reporting.

Water reuse improvement roadmap (2026–2030)

Period	Proposed institutional action	Expected outcome
2026	Identify major treated-water reuse points and establish a standard reuse register	Improved measurement and documentation
2027	Strengthen outlet-level flow measurement and campus-wise data collection	More reliable reuse accounting
2028	Review opportunities to expand treated-water use in landscaping and agricultural irrigation	Increased beneficial use, subject to water availability and quality
2029	Integrate reuse records with the IoT-based water monitoring system and validate data periodically	Improved operational visibility and traceability
2030	Review reuse performance and publish a consolidated annual water reuse statement	Transparent and verifiable reporting

These actions are proposed milestones. Their implementation and completion should be supported by institutional records.

Proposed performance indicators

Performance indicator	Measurement approach	Review frequency
Total wastewater treated	STP operational records and outlet measurements	Monthly
Total treated wastewater reused	Reuse-outlet flow-meter readings	Monthly
Treated-water reuse rate	Reused volume ÷ treated volume × 100	Monthly
Landscaping water reuse	Dedicated distribution readings or validated records	Monthly
Agricultural irrigation reuse	Irrigation supply readings or validated records	Monthly
Campus-wise reuse coverage	Consolidated campus reuse registers	Quarterly
Water-quality compliance	Relevant laboratory test reports	As per monitoring schedule
Public disclosure	Published annual water reuse statement	Annually

Priorities for strengthening water reuse

- Measurement infrastructure: identify or install dedicated flow meters at major treated-water distribution and reuse points.
- Campus-wise water accounting: introduce standard registers for treated-water reuse at each campus and major end-use location.
- Expanding beneficial applications: increase the use of treated wastewater for suitable non-potable applications, subject to water-quality requirements.
- Data integration: progressively integrate reuse measurements with the IoT-based monitoring framework.
- Water-quality monitoring: maintain treated-water quality records showing that water is suitable for its intended reuse.

By 2030 the University expects better measurement of treated wastewater reused, more comprehensive campus-wise reuse records, better visibility of water flows, stronger documentation of water-quality compliance, improved planning for non-potable water needs and more transparent sustainability reporting. Building on its 2025 baseline of about 375 KLD reused, the University will move from aggregate operational reporting towards a campus-wise, evidence-supported water reuse management framework.

Relevant SDGs: SDG 6 — Clean Water and Sanitation; SDG 2 — Zero Hunger; SDG 11 — Sustainable Cities and Communities; SDG 12 — Responsible Consumption and Production.

7. Preventing Water System Pollution

The University prevents water-system pollution through a multi-barrier approach that combines policy, physical screening, waste segregation, wastewater treatment, discharge controls and water-quality monitoring. Each barrier addresses a different route by which contaminants could reach drains, groundwater or receiving water bodies.



Fig. 18: Preventing Water System Pollution – from Source Control to Safe Discharge and Reuse

7.1 Institutional Policies and Governance

Institutional Policy or Framework	Principal Provisions for Water Pollution Prevention
Policy on Water Discharge Guidelines and Standards, 2024	Procedures for treated-water discharge at designated points, daily, weekly and monthly in-house testing, discharge-point quality assessment, safe operation and maintenance of treatment systems, staff training and emergency response to accidental discharges.
Policy on Hazardous Waste Disposal, 2024	Identification and inventory of hazardous waste, labelling, segregation, safe storage, handling precautions, staff training and appropriate disposal.
Policy on Preventing Marine Pollution, 2024	Control of land-based pollution pathways, laboratory and experimental effluents, agricultural runoff and litter so that pollutants do not reach drains, canals and natural water bodies.
Institutional waste-management framework	Waste segregation, biomedical-waste management, hazardous-material handling, e-waste collection and wastewater treatment across campus facilities.

The policies work together: the discharge policy governs the treatment and release of effluent, the hazardous-waste policy controls contaminating materials at source, and the pollution-prevention policy extends protection to land-based activities that could affect drainage and water bodies. The policies also require alignment with regulatory standards, periodic review, staff training and transparency, and encourage student and faculty research on treatment and discharge technologies.

7.2 Pollution Prevention at Source

- Screen filters at drainage ducts: filters installed ahead of drainage ducts intercept leaves, plastic fragments, food residues and other coarse debris before they enter the drainage network or treatment plants.
- Solid-waste segregation: separate bins for biodegradable and non-biodegradable waste prevent litter from entering drains; organic residues are composted and vermicomposted.
- Laboratory chemicals: hazardous chemicals are stored separately, and designated personnel handle laboratory liquid waste, acids and alkalis.
- Biomedical waste: biomedical solid waste is segregated into colour-coded containers and collected by an authorised agency, Saniclean Private Limited; biomedical liquid waste is treated with 1% sodium hypochlorite before entering the sewer.
- E-waste: electronic waste is collected separately and recycled through Shree Ganesh Recycling Pvt. Ltd. under a memorandum of understanding.

7.3 Wastewater, Drainage and Receiving-Water Protection

Sewage from toilets, bathrooms, kitchens and laboratories is collected separately from stormwater and conveyed to treatment plants, while rainfall runoff is directed to harvesting and recharge structures. Treated water is used for campus greening and the remainder is directed to an open pond for groundwater recharge, with overflow routed to the municipal sewage trunk line. Discharge takes place only at designated points, and the effectiveness of treatment is confirmed through water-quality testing rather than visual appearance.

7.4 Monitoring and Accidental-Discharge Response

The discharge policy specifies daily, weekly and monthly in-house tests and quality assessment at discharge points using standard methods. Emergency response to spills, leaks, treatment failures or unintended releases follows four stages:

- Identification and reporting of a spill, leak, abnormal discharge or suspected contamination to the responsible campus personnel.
- Source isolation and containment to stop the release and prevent spread into drains, stormwater channels or water bodies.
- Corrective action and safe handling of the released material and the cause of the incident.
- Verification and documentation through testing of affected water, recording of the incident and review of the response.

Relevant SDGs: SDG 6 — Clean Water and Sanitation; SDG 12 — Responsible Consumption and Production; SDG 14 — Life Below Water.

8. Free, Safe Drinking Water for the Campus Community

The University provides free drinking water to all students, faculty, staff and visitors. Source water is purified through reverse osmosis (RO) plants and supplied through a dedicated drinking-water pipeline that is kept separate from the network serving toilets, cleaning and irrigation. Drinking-water coolers

and dispensers are installed in academic buildings, hostels, canteens and common areas so that safe water is available wherever people study, work and live.



Fig. 19: Free, Safe and Clean Drinking Water – from Source Monitoring to Campus-wide Access

8.1 Drinking-Water Infrastructure and Access Points

Infrastructure Component	Function in Drinking-Water Provision
RO purification plants	Remove dissolved salts and impurities from source water before distribution.
Dedicated drinking-water pipelines and storage	Convey treated water separately from other campus supplies.
Drinking-water coolers and dispensers	Provide free access at academic buildings, hostels, canteens and common areas.
Source-water monitoring equipment	Assesses the quality of borewell and supply water before treatment.
Post-treatment quality monitoring	Verifies the quality of purified water supplied for drinking.

8.2 Water-Quality Monitoring and Laboratory Verification

Water quality is checked at source and after purification. Digital ESP32-based sensors measure pH, total dissolved solids (TDS), dissolved oxygen (DO) and oxidation-reduction potential (ORP) at borewell and supply points. A pH survey of 14 borewell and supply points recorded values from 4.65 to 6.87, confirming that source water varies from point to point and must pass through RO treatment before it is supplied for drinking.

The pH Monitoring Report – Water Quality Assessment at 14 Boring / Water Points records field measurements supported by ESP32-based digital sensor screenshots. The readings are a snapshot of source-water pH before treatment and are summarised below.

Sl. No.	Boring / sampling point	Recorded pH	Assessment against drinking-water pH range (IS 10500:2012)
1	New 5HP Boring	6.87	Within the specified pH range
2	Power House	5.38	Below the specified pH range
3	BH-3	6.24	Below the specified pH range
4	BH-2	4.94	Below the specified pH range
5	BH-06	4.65	Below the specified pH range
6	Store	4.97	Below the specified pH range
7	New Borewell – 1.5 HP	6.76	Within the specified pH range
8	Cricket Ground Motor	5.12	Below the specified pH range
9	BH-08	5.28	Below the specified pH range
10	Canteen Building	5.54	Below the specified pH range
11	Dhaba Motor	5.74	Below the specified pH range
12	Lawn Motor	5.89	Below the specified pH range
13	Swimming Pool	4.67	Below the specified pH range
14	Ladies Hostel – Inside	6.61	Within the specified pH range

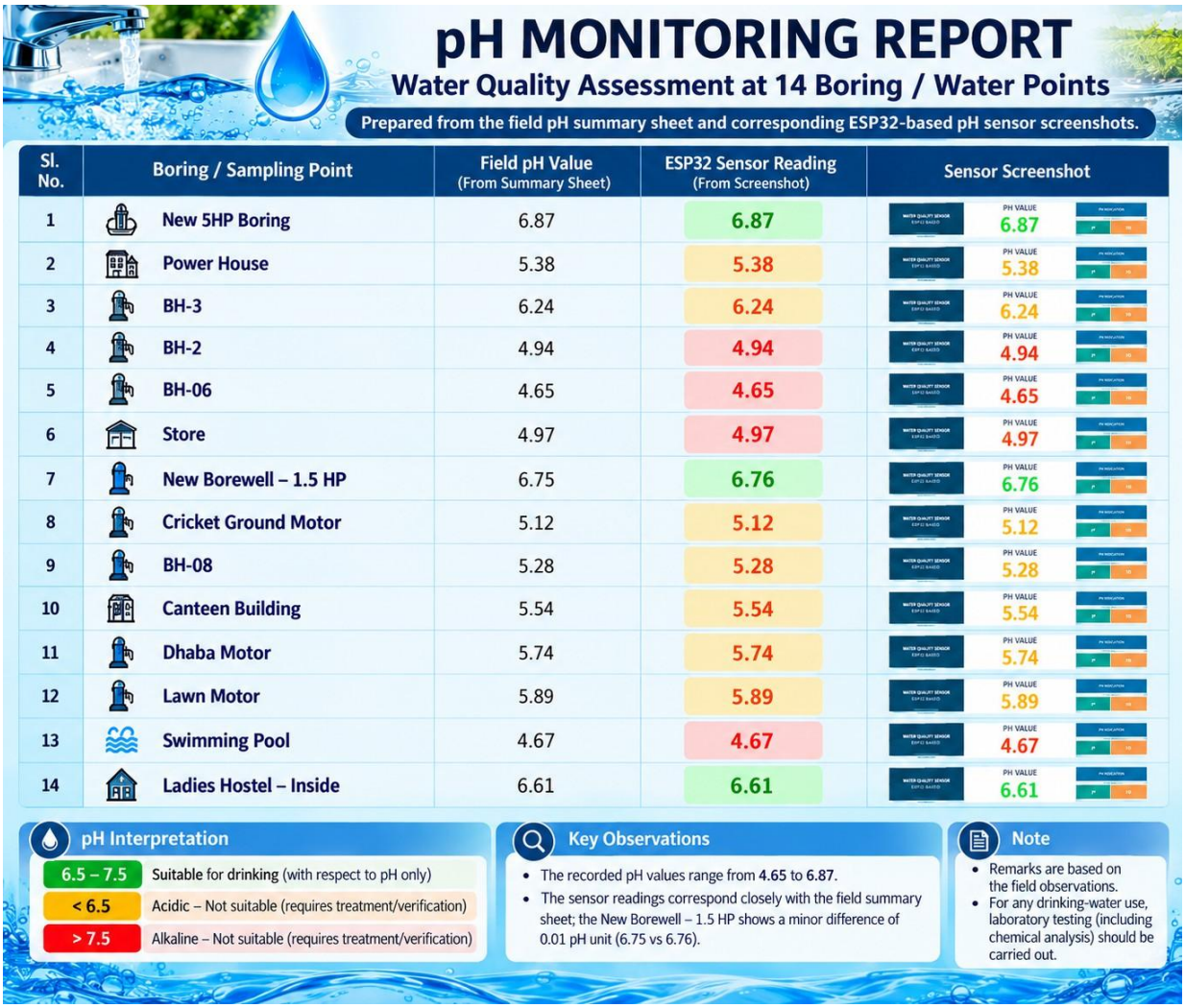


Fig. 20: pH Monitoring Report: Water-Quality Assessment at 14 Boring and Water Points (ESP32 Sensor Readings)

IS 10500:2012 specifies a drinking-water pH range of 6.5–8.5. Three of the 14 source measurements fall within this range and 11 are below it. These results show why water quality is assessed at individual source points rather than assumed to be uniform across the campus, and why source water passes through RO purification and post-treatment verification before it is supplied for drinking. The pH readings are retained as monitoring evidence and are not used on their own to declare any source or treated supply safe for consumption.

Purified water is analysed in the University's Environmental Assessment and Research Laboratory (EARL) for physical, chemical and microbiological parameters, including pH, conductivity, TDS, turbidity, chloride, total hardness and total alkalinity, using APHA methods and the limits of Bureau of Indian Standards IS 10500. Field sensors provide rapid, location-specific screening, while laboratory analysis confirms conformity with drinking-water standards.

8.3 Operation, Maintenance and Continuity of Supply

RO plants, storage tanks, pipelines and dispensers are operated and maintained to keep drinking water available throughout the day. Dispensing outlets, connections and storage vessels are cleaned regularly, and monitoring results guide maintenance of the purification system and identify sources that need

attention. Through purification, a separate distribution network, accessible dispensers and verified quality, the University provides free and safe drinking water across its campuses.

Relevant SDGs: SDG 6 — Clean Water and Sanitation; SDG 3 — Good Health and Well-Being; SDG 4 — Quality Education.

9. Water-Conscious Building Standards

The University integrates water conservation into the design, operation and upgrading of its buildings. Building water services are guided by recognised Indian standards, and water-efficient fixtures, automatic controls, leak monitoring, rainwater harvesting and efficient irrigation reduce demand across academic buildings, hostels, administrative blocks and dining facilities.

9.1 Applicable Building Standards

Standard or Technical Reference	Relevant Water-Management Provisions
National Building Code of India 2016 (NBC 2016), Part 9 – Plumbing Services, Section 1: Water Supply	Water-supply design, demand estimation, storage, distribution, fittings, inspection, testing and maintenance.
Energy Conservation and Sustainable Building Code 2024 (ECSBC 2024)	Water-use reduction, monitoring, rainwater harvesting and wastewater recycling and reuse in applicable buildings.
Eco-Niwas Samhita 2024 – Building Code for Residential Buildings	Water conservation in residential buildings, including hostels: efficient sanitary fittings, monitoring, rainwater harvesting and reuse.
IGBC and ECBC 2017 building design references	Resource-efficiency frameworks applied in the design of new facilities.

9.2 Water-Efficient Fixtures and Plumbing

Dual-flush water closets, low-flush or waterless urinals, water-saving aerators, flow restrictors, sensor-operated and automatic shut-off taps, and low-flow showerheads in hostels reduce water discharged at each point of use. The fixture inventory records complete deployment in toilets and urinals and progressive upgrading of wash basins and taps.



Fig. 21: Water-Efficient Water Closets, Urinals and Wash Basins Installed on Campus

Appliance Category	Total Fixtures	Water-Efficient Fixtures	Deployment
Water closets with dual-flush systems	544	544	100.00%
Urinals with low-flush or waterless systems	180	180	100.00%
Wash basins and taps with water-efficient technology	1,656	445	26.87%
Total across the three categories	**2,380**	**1,169**	**49.12%**

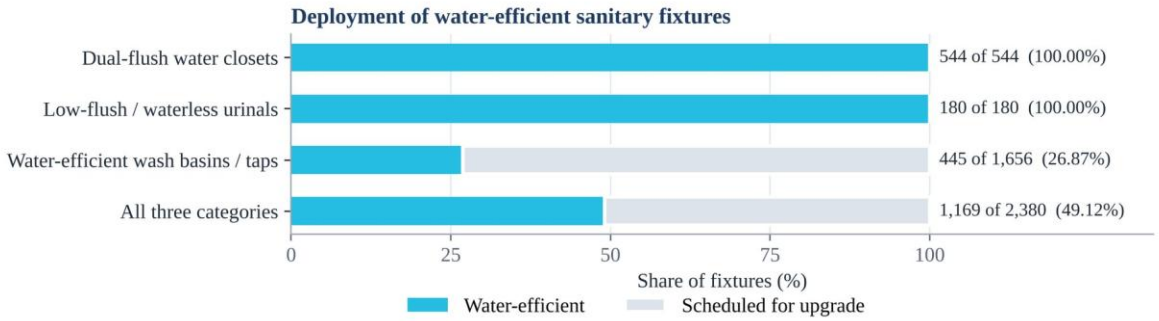


Fig. 22: Deployment of Water-Efficient Sanitary Fixtures (2025)

Dual-flush cisterns let users choose a lower or higher flush volume, while low-flush and waterless urinals reduce or eliminate flushing water in high-occupancy buildings. Aerators mix air into the water stream to maintain rinsing performance at lower flow, flow restrictors cap the volume delivered, and sensor-operated taps stop flow when not in use. The remaining conventional taps are being upgraded progressively.

9.3 Building Water Systems and Smart Controls

- Storage and level control: automatic shut-off mechanisms, float valves and level indicators on overhead and ground tanks prevent overflow.
- Digital leak monitoring: monitoring, inspection and maintenance of plumbing identify losses between the supply point and the fixture.
- Fixture inventory and tracking: category-wise records allow progress in upgrading conventional fittings to be measured.

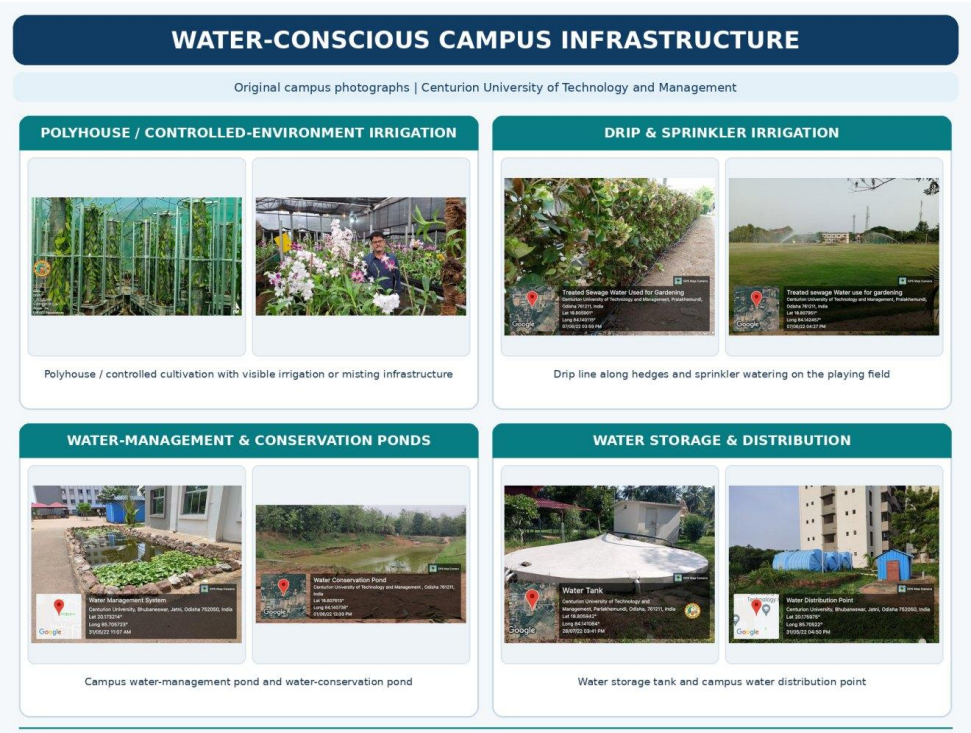


Fig. 23: Water-Conscious Campus Infrastructure: Polyhouse Irrigation, Drip and Sprinkler Systems, Conservation Ponds and Storage

9.4 Rainwater Harvesting, Reuse and Efficient Irrigation

Roof and surface runoff is collected and directed to harvesting structures, recharge pits and percolation facilities, while treated wastewater is reused for non-potable purposes. Outdoor water use is managed through drip irrigation for gardens and hedges, sprinkler irrigation for playing fields and smart irrigation in polyhouses, extending water-conscious design from indoor plumbing to the wider campus.



Fig. 24: Efficient Irrigation in Campus Landscapes: Drip, Lawn and Sprinkler Systems

Relevant SDGs: SDG 6 — Clean Water and Sanitation; SDG 7 — Affordable and Clean Energy; SDG 11 — Sustainable Cities and Communities.

10. Water-Conscious Planting and Campus Landscapes

The University designs and maintains its landscapes to minimise irrigation demand. Plants suited to local conditions are selected and grouped by water requirement, soils are enriched with organic matter and mulched, non-functional turf is reduced and water is delivered efficiently to the root zone. These practices keep campuses green while avoiding unnecessary watering.

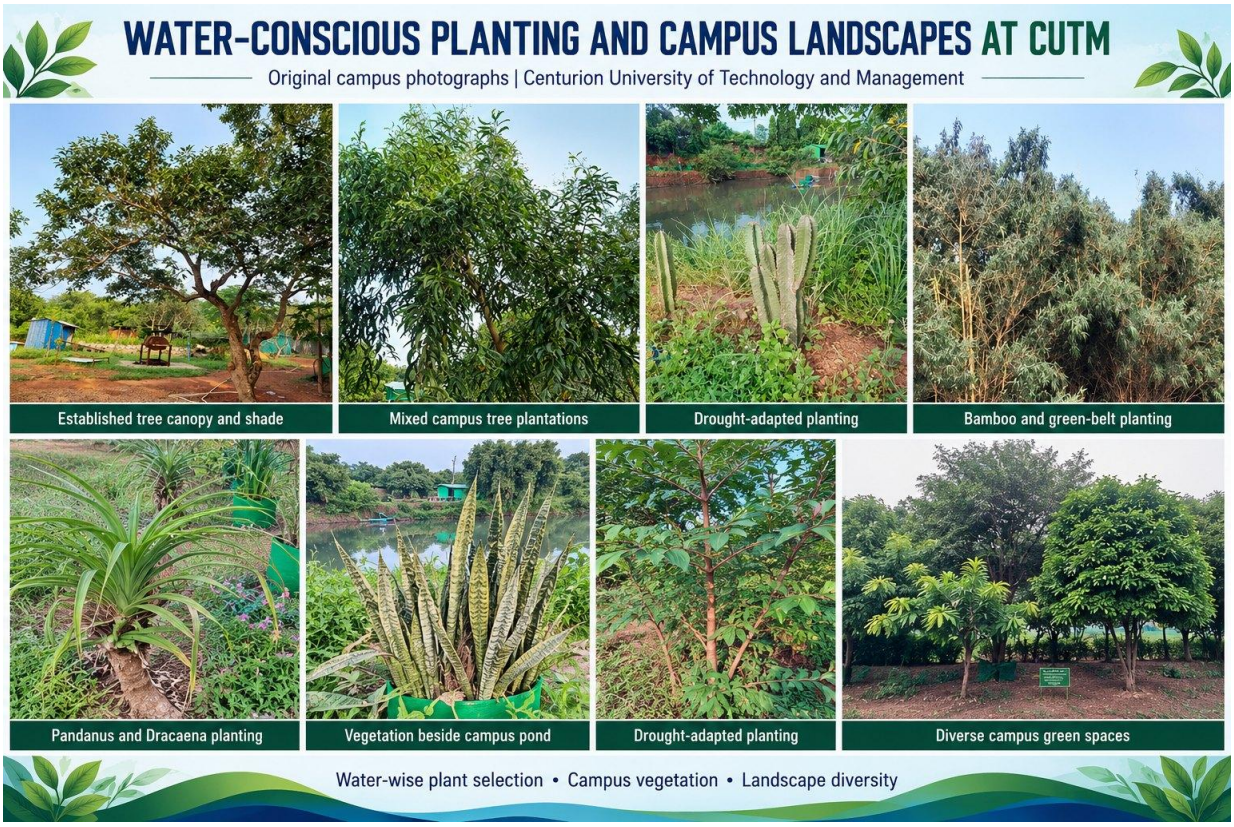


Fig. 25: Water-Conscious Planting and Campus Landscapes

10.1 Campus Vegetation and Landscape Diversity

Campus flora inventories record more than 31,000 plants, including a 2025 census of 4,195 trees from 80 species, an urban campus collection of 25,904 plants from 83 species spanning fruit and plantation trees, native trees, spice crops, climbers, ornamental shrubs and orchids, and further inventories of 438 plants (28 species) and 579 plants (26 species). A dense, multilayered native micro-forest of 425 plants from 68 species adds to this green cover.

10.2 Water-Wise Plant Species and Zoning

Plant Species	Water-Conscious Characteristics	Landscape Application
Euphorbia antiquorum (antique spurge)	Succulent stems store water; low water demand	Dry beds, sunny open areas and roadside planting
Callistemon citrinus (lemon bottlebrush)	Tolerates dry conditions once established	Borders, entrances, pathways and pollinator gardens
Acacia auriculiformis (earleaf acacia)	Adaptable to varied soils; tolerant of dry periods	Boundary plantations, green belts and windbreaks
Syzygium cumini (jamun)	Tolerant of dry periods after establishment; dense canopy	Avenue planting, shade and fruit-bearing spaces
Muntingia calabura (Jamaica cherry)	Drought-resistant once established	Shade plantations and biodiversity gardens
Bambusa vulgaris (common bamboo)	Tolerates some drought; prefers adequate moisture	Green screens, buffer strips and erosion control

Hydrozoning groups plants with similar water needs so that irrigation can be targeted: low-demand species such as Euphorbia, Callistemon and Acacia occupy sunny, well-drained zones, while bamboo is placed where moisture is available. The palette also includes Pandanus fascicularis, Dracaena trifasciata, Diospyros chloroxylon and Furcraea foetida.

10.3 Landscape Design Practices

- Site-specific selection and hydrozoning match each plant to its growing conditions and water requirement.
- Soil enrichment and mulching improve soil structure and moisture retention around roots.
- Reduction of non-functional turf limits the area requiring regular irrigation and mowing.
- Root-zone irrigation through drip lines delivers water directly where plants need it.

10.4 Smart Irrigation and Alternative Water Sources

IoT-based automation in polyhouses monitors temperature, humidity, CO_2 and soil conditions and controls overhead fogging and root-zone drip or flow-table irrigation. The Centre for Smart Agriculture operates an IoT irrigation system that responds to soil moisture, temperature and rainfall through automated drip and sprinkler controls. Treated sewage water irrigates hedges and landscaped areas, while five percolation tanks and a storage pond capture surface runoff for recharge and dry-season irrigation.



Fig. 26: IoT-Enabled Smart Irrigation and Water Control

10.5 Ecological Benefits

Water-wise landscapes lower irrigation and maintenance inputs, conserve soil, improve the campus microclimate and support biodiversity. Shade trees such as jamun, flowering plants such as bottlebrush and fruiting trees such as Jamaica cherry provide food and habitat for pollinators and birds, and root systems stabilise soils against erosion. Periodic plantation drives under the University's Sustainability Policy continue to extend this green cover.

Relevant SDGs: SDG 6 — Clean Water and Sanitation; SDG 13 — Climate Action; SDG 15 — Life on Land.

11. Water Management Education for Local Communities

Through its School of Fisheries and M.S. Swaminathan School of Agriculture, the University provides educational opportunities for farmers, fishers, Self-Help Groups (SHGs) and village communities in water management, water conservation, irrigation and sustainable aquaculture. Structured training, practical demonstrations and field engagement connect water-management principles with agricultural and fisheries livelihoods.



Fig. 27: Community Water-Management Education and Engagement Pathway

11.1 NABARD-Sponsored Watershed Management Training

Date	Training Activity	Farmers Trained
26 August 2025	Watershed-management training programme	20
23 November 2025	Three-day watershed-management training	15
Total	**Two training sessions**	**35**

The training addressed four freshwater environments in and around Gajapati district: rainfed ponds (seasonal water availability, stocking densities and drought-resilient species), hill streams (species ecology, water flow and riparian vegetation), village tanks and community ponds (traditional management combined with water-quality monitoring) and integrated farming and fish culture (water-use efficiency). Participants also learned about biosecurity, disease surveillance, runoff reduction, catchment conservation and stocking rates matched to pond area and carrying capacity.



Fig. 28: Farmers in a Community Water-Management Training Session

11.2 Hands-on Training in Water-Efficient Aquaculture

In July 2025, 20 farmers from Rasoor and surrounding villages received practical training in biofloc technology, shrimp culture and Recirculating Aquaculture Systems (RAS). On 3–4 September 2025, a two-day residential programme under NMAET–ATMA, implemented through the Department of Agriculture and Farmers' Empowerment, Government of Odisha, brought 25 farmers from Buguda block, Ganjam district, to the University for exposure to the RAS facility and the Black Soldier Fly (BSF) larvae unit, which converts organic waste into fish feed and organic manure.

Technology	Practical Learning Focus	Water-Management Relevance
Biofloc technology	System operation and culture-water quality	Beneficial microbes maintain water quality and reduce water replacement
Recirculating Aquaculture System (RAS)	Operation, filtration and water reuse	Culture water is treated and recirculated, reducing freshwater demand
Shrimp culture	Production practices and culture conditions	Water-quality management in intensive aquaculture



Fig. 29: Practical Aquaculture Training for Farmers at the University's Demonstration Facilities

11.3 Village-Level Learning and Freshwater Stewardship

Under the Rural Agricultural Work Experience Programme (RAWEP), 44 final-year B.F.Sc. students surveyed water bodies and irrigation infrastructure in 14 villages of Gajapati district – Gosani, B. Sitapur, R. Sitapur, Totagumuda, Rayada, R. Udaygiri, Burkhhat, Mahendragiri, Kashinagar, Seranga, Gumma, Palasa, Tikili and Barua – working with farmers and SHG members and engaging a group of 200 fish farmers. On 2 July 2025, 22 students and a faculty member led participatory freshwater-resource mapping at Hatibadigopinathpur village. Awareness sessions at Jamakhala Pond in Gopalpur explained the pond's value for clean water, fish stocks and cultural heritage.



Fig. 30: Village-Level Learning and Freshwater Stewardship

11.4 Demonstration Facilities

The University's RAS, biofloc, aquaponics, ornamental fish culture and freshwater pearl culture units serve as practical learning environments. The Ornamental Fish Culture and Health Programme maintained 30 demonstration aquaria, engaged about 70 farmers and SHG members and trained 41 students, and a two-day workshop from 25 November 2025 covered aquarium set-up, water-quality management and aquascaping. Three watershed ponds managed for intensive aquaculture, polyculture and community water conservation show how water bodies can be managed according to their purpose.

11.5 Community Participation



Fig. 31: Community Participation in Water-Management Learning Activities (2025)

Programme or Activity	Community Participation
NABARD-sponsored watershed-management training	35 farmers in two programmes
Biofloc, shrimp culture and RAS training, Rasoor	20 farmers
NMAET–ATMA training on BSF and RAS	25 farmers from Buguda block, Ganjam district
Freshwater aquaculture and resource-management training	50 fish farmers
Ornamental fisheries demonstration and engagement	About 70 farmers and SHG members
Utkal Krishi Mela	200 participants; aquaculture and water use among the topics
National Remote Sensing Day outreach	118 students and farmers; natural-resource and water-resource planning

Ten progressive farmers and two women's SHGs also came forward to demonstrate a floating cage integrated fish-and-aquaponics system, with continued handholding support from the University.

Relevant SDGs: SDG 6 — Clean Water and Sanitation; SDG 2 — Zero Hunger; SDG 4 — Quality Education; SDG 14 — Life Below Water.

12. Off-Campus Water Conservation Support

The University supports water conservation beyond its campuses through water-efficient irrigation, rainwater harvesting and the restoration of shared freshwater resources, improving water access for farming communities and protecting community water bodies.



Fig. 32: Integrated Water Resources Management (IWRM): Efficient Irrigation, Rainwater Harvesting and Pond Restoration

12.1 Solar-Powered Irrigation in Rural South Odisha

In collaboration with Harsha Trust, under the Minimum Energy Access and Productive Use of Energy initiative, the University has supported 730 solar-operated drip irrigation systems now in use across South Odisha, including Koraput and Nabarangpur districts. Solar pumping combined with drip lines delivers water directly to crops without dependence on grid electricity. A farmer in Boriguma, for example, was able to cultivate land that had been difficult to irrigate and move to higher-value crops.

A bicycle-mounted portable solar irrigation system – a solar panel, submersible pump, overhead tank and drip pipes – moves between fields. About 10 portable systems in Koraput and Nabarangpur serve around 200 small farmers through shared borewells and dug wells, and 11 defunct borewells have been revived for irrigation.



Fig. 33: Solar-Powered Pumping, Irrigation and Community Water Infrastructure

12.2 Rainwater Harvesting and Community Water Infrastructure

Through the LTIMindtree Foundation's Shelter to Habitat project, formalised through an MoU announced on 27 November 2024 and implemented through 2025, the University supports sustainable housing in the tribal villages of Alajhola and Gayaljuba (Rayagada block) and Rashika Rajpur (Gumma block), with an expected reach of about 3,000 beneficiaries. The project has delivered 82 climate-resilient homes with rainwater-harvesting systems, together with solar-powered borewells for community access to safe drinking water.



Fig. 34: Shelter to Habitat Project: Solar-Powered Community Infrastructure – Solar Lighting, Solar Panels and Elevated Water Storage

12.3 Restoration of Jamakhala Community Pond

Jamakhala Pond in Gopalpur, which predates 1950, once supplied drinking water to about 100 village families before pollution and urbanisation degraded it. Restoration began in October 2023 in collaboration with the Government, local residents, students and volunteers:

- Wastewater diversion to stop continued pollution of the pond.
- Aquatic plant restoration with water lilies as a natural means of improving water quality.
- Reintroduction of indigenous fish species, supported by conservation and breeding.

The pond now supports 30 indigenous aquatic species, including the great snakehead (Channa micropeltes), bronze featherback (Notopterus notopterus), clown featherback (Chitala chitala), freshwater shark (Wallago attu) and Asian stinging catfish (Heteropneustes fossilis). More than 50 students from the Schools of Agriculture and Fisheries carried out water-quality testing, habitat restoration and wildlife monitoring at the pond as part of their coursework, and their findings guide the conservation strategy.



Fig. 35: Jamakhala Pond – a Restored Freshwater Ecosystem and Its Native Biodiversity

Relevant SDGs: SDG 6 — Clean Water and Sanitation; SDG 2 — Zero Hunger; SDG 7 — Affordable and Clean Energy; SDG 14 — Life Below Water.

13. Sustainable Water Extraction on Campus

Groundwater from borewells supplies 523,525 litres a day (42.9%) of the University's water, with the balance of 698,000 litres a day (57.1%) drawn from municipal supply. The University manages extraction responsibly by measuring abstraction, reducing demand, reusing treated wastewater and returning rainfall to the aquifer.

The campus-wise water-source matrix in Section 4.1 shows each campus's groundwater contribution. These figures identify the campuses with the greatest groundwater dependence and guide the prioritisation of sustainable extraction measures, pumping efficiency and recharge.

Evidence item	Documented result
Campuses covered	Paralakhemundi, Bhubaneswar, Rayagada, Balangir, Balasore and Chatrapur
Groundwater source	Borewells
Reported groundwater contribution	523,525 L/day (42.9%)
Reported municipal / mains supply	698,000 L/day (57.1%)

Evidence item	Documented result
Consolidated reported water supply	1,221,525 L/day

13.1 Extraction, Storage and Distribution Infrastructure

- Groundwater extraction: borewells supply groundwater for campus operations.
- Flow measurement: inlet flow meters and borewell totalisers quantify water entering the supply system from opening and closing readings.
- Pumping and control: pump-control panels and pump-status signals manage transfer to storage.
- Storage: raw-water tanks with level sensors provide storage before distribution.
- Distribution: campus pipelines convey water to residential, academic, sanitation, landscaping and agricultural uses.
- Operational monitoring: IoT connectivity and a central dashboard bring flow, tank-level and pump data together for oversight and reporting.

13.2 Balancing Extraction with Recharge and Reuse

Rooftop rainwater harvesting, recharge pits and percolation structures replenish groundwater, while open-well and borewell recharge provisions return rainfall to the aquifer. The reuse of 375 KLD of treated wastewater for landscaping and irrigation reduces the volume that would otherwise be pumped from borewells, and water-efficient fixtures, overflow controls, sensor-operated taps and efficient irrigation reduce overall demand. Borewell maintenance, raw-water testing, rainwater-harvesting records and geo-tagged photographs document this infrastructure.

13.3 Renewable-Energy Water Extraction beyond the Campus

The University applies the same principles in rural communities. With Harsha Trust, 730 solar-operated drip systems and about 10 portable solar irrigation units draw water from borewells and dug wells using solar energy, and 11 defunct borewells have been revived. Solar-powered borewells under the Shelter to Habitat project provide decentralised community water access alongside rainwater harvesting in 82 homes.

Relevant SDGs: SDG 6 — Clean Water and Sanitation; SDG 7 — Affordable and Clean Energy; SDG 13 — Climate Action.

14. Cooperation on Water Security

The University cooperates with government agencies, national research and development institutions, international organisations and local communities to address water security, freshwater-resource management and aquatic-ecosystem conservation. These partnerships connect University expertise with community needs through training, technology transfer, ecosystem restoration, water-resource assessment, research and public awareness.



Fig. 36: Institutional and Community Cooperation Supporting Freshwater Management and Water Security

14.1 Local Cooperation

At Jamakhala Pond, the University works with government representatives, residents, students and volunteers to restore and maintain a shared freshwater resource, with the Cultural, Sports and Responsibility Cell supporting continued stewardship. In Gajapati district, RAWEP field surveys in 14 villages drew on the local knowledge of farmers and SHG members to build a village-level evidence base on water bodies and irrigation, and two NABARD-supported programmes trained 35 farmers in location-specific watershed management.

14.2 Government and District-Level Cooperation

The University cooperated with the District Fisheries Office, Rayagada, on the transfer of RAS technology. Letter No. 313 of 21 February 2025 requested a visit to the University's 200,000-litre RAS facility, commissioned in January 2025, so that a beneficiary of the Mukhyamantri Krushi Udyog Yojana (MKUY) could observe its installation and operation. Under the Government of Odisha's NMAET–ATMA framework, 25 farmers from Buguda block, Ganjam district, received residential training on RAS and BSF-based waste-to-feed systems on 3–4 September 2025.

14.3 National Institutions

Partner	Nature of Cooperation	Water-Security Focus
ICAR–Indian Institute of Soil and Water Conservation (ICAR–IISWC), Dehradun	MoU signed on 29 June 2025 for student exchange, joint research and resource sharing	Soil and water conservation, erosion and sediment control

Partner	Nature of Cooperation	Water-Security Focus
ICAR–Central Institute of Freshwater Aquaculture (ICAR–CIFA), Bhubaneswar	Agreement (July 2022 – July 2025) for training, internships and postgraduate research	Freshwater aquaculture systems and their management
National Bank for Agriculture and Rural Development (NABARD)	Sponsored watershed-management training for 35 farmers	Sustainable management of local water bodies

14.4 International Organisations

The University has collaborated with UNICEF and Youth4Water through World Water Day activities that promote water conservation, water, sanitation and hygiene (WASH) and awareness of climate-related water challenges, extending its water-security work to a wider public.

Relevant SDGs: SDG 6 — Clean Water and Sanitation; SDG 14 — Life Below Water; SDG 17 — Partnerships for the Goals.

15. Promoting Conscious Water Use on Campus

The University promotes responsible water use by combining awareness with infrastructure that makes saving water part of daily routine. Its Green Policy identifies water management as a component of campus sustainability, and the principles of "Reduce, Reuse, Recycle, Recover" frame its communication with students, faculty and staff.

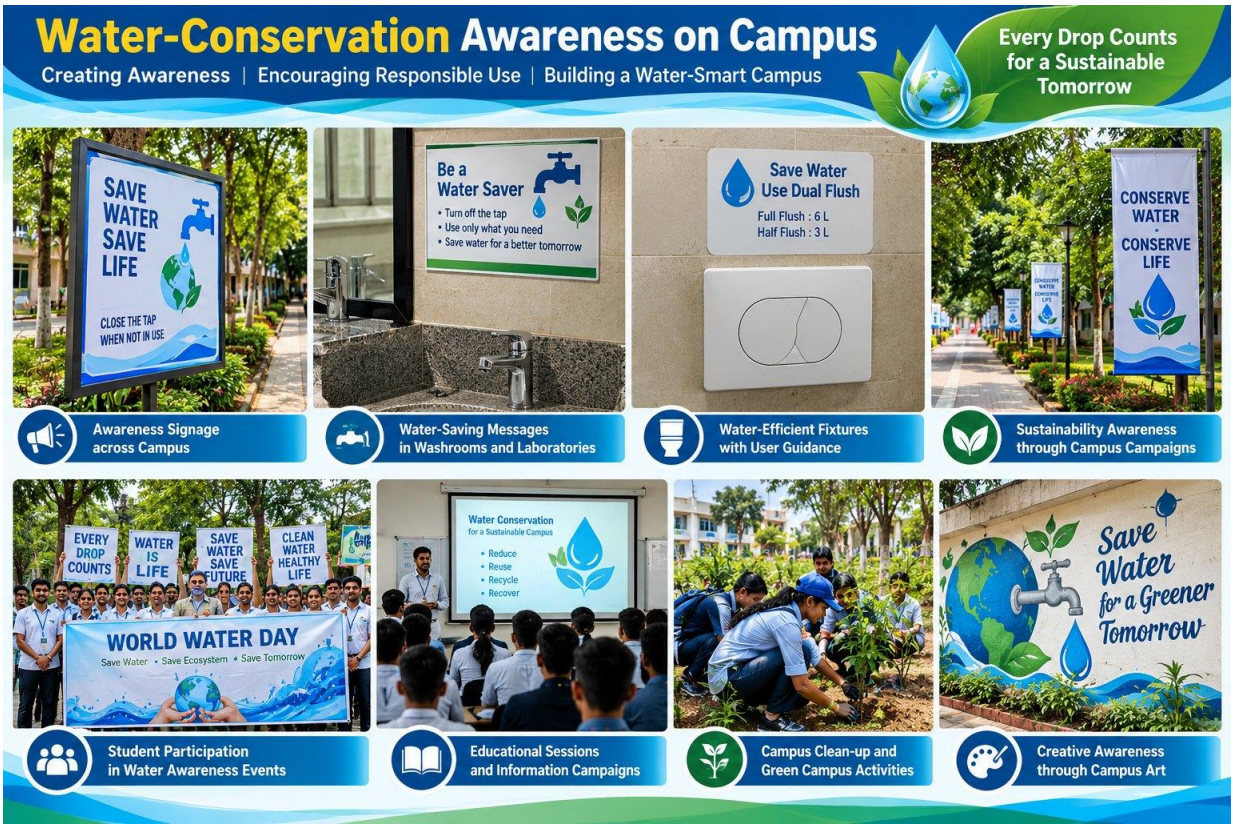


Fig. 37: Water-Conservation Awareness on Campus

15.1 Awareness and Communication

- Water-conservation signage in washrooms, laboratories and common areas reminds users to close taps and use only what they need.
- User guidance on fixtures, such as dual-flush instructions, links each water-saving device to the correct way to use it.
- Awareness events and World Water Day activities engage students and staff in water stewardship.
- Student innovation in water-saving solutions connects conservation with learning and research.

15.2 Participation of Students, Faculty and Staff

Students take part in sustainability activities, campaigns and innovation projects, while faculty and staff support responsible practice in academic and administrative facilities by avoiding unnecessary use and reporting leaks or faulty taps. This shared responsibility complements the University's investment in efficient systems.

15.3 Infrastructure that Supports Responsible Behaviour

Water-efficient fixtures – all water closets with dual flush, all urinals low-flush or waterless, aerators, flow restrictors, sensor-operated taps and low-flow showerheads in hostels – are installed across hostels, academic buildings, administrative blocks and dining facilities. Drip irrigation for gardens and hedges, sprinkler irrigation for playing fields, smart irrigation in polyhouses, real-time digital leak monitoring and the reuse of treated water extend responsible use from buildings to the whole campus.



Fig. 38: Integrated Campus Water-Management System: Efficient Fixtures, Smart Irrigation and Leak Prevention

Relevant SDGs: SDG 6 — Clean Water and Sanitation; SDG 4 — Quality Education; SDG 12 — Responsible Consumption and Production.

16. Promoting Conscious Water Use in the Wider Community

The University extends water awareness beyond its campuses through public engagement, stewardship of shared freshwater resources and practical demonstrations of water-efficient farming and aquaculture.

16.1 Community Freshwater Stewardship at Jamakhala Pond

Awareness activities at and around Jamakhala Pond in Gopalpur explained the importance of the pond for clean water, local fish stocks and cultural heritage, and encouraged residents to help maintain it and protect its aquatic life. Students shared knowledge gained through fieldwork, linking the restoration measures – wastewater diversion, water lilies and indigenous fish – with community responsibility for keeping the pond free of pollution.

16.2 Village-Level Water-Resource Awareness

Through RAWEP, 44 final-year B.F.Sc. students engaged farmers and SHG members across 14 villages in Gajapati district, documenting water bodies, irrigation infrastructure, availability and patterns of use and discussing their responsible management. Participatory freshwater-resource mapping at Hatibadigopinathpur on 2 July 2025, involving 22 students and one faculty member, helped the community understand its dependence on local water sources.



Fig. 39: Village-Level Freshwater Resource Mapping and Community Engagement

16.3 World Water Day Awareness with UNICEF and Youth4Water

World Water Day activities with UNICEF and Youth4Water raised public awareness of water conservation, WASH and climate-related water challenges, encouraging wider community engagement with water security.

16.4 Promoting Water-Efficient Practices in Rural Communities

Demonstrations of biofloc technology, RAS and responsible shrimp culture for 20 farmers from Rasoor (July 2025) and 25 farmers from Buguda block (3–4 September 2025) showed how filtration, recirculation and good water-quality management reduce the need for freshwater replacement. The demonstrations communicated five principles of responsible water use:

- Maintain water quality to keep freshwater resources usable.
- Reuse and recirculate water in aquaculture wherever technically appropriate.
- Reduce unnecessary water replacement through good management.
- Protect ponds and shared water bodies from wastewater and pollution.
- Manage local water resources according to seasonal availability.

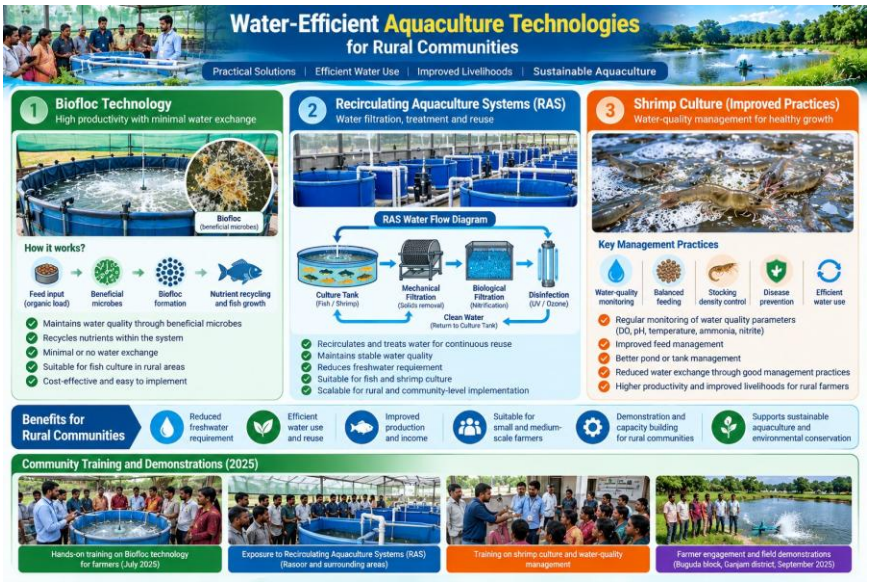


Fig. 40: Water-Efficient Aquaculture Technologies for Rural Communities

Activity	Participation or Coverage	Contribution to Conscious Water Use
Jamakhala Pond awareness activities, Gopalpur	Local residents and University students	Protection of a shared freshwater ecosystem
RAWEP village-level engagement	44 students across 14 villages; farmers and SHG members	Awareness of local water resources and their use
Participatory freshwater-resource mapping, Hatibadigopinathpur	22 students and one faculty member, 2 July 2025	Understanding of village water availability
Biofloc, shrimp culture and RAS training, Rasoor	20 farmers, July 2025	Water-quality management and reduced water exchange
RAS exposure programme, Buguda block	25 farmers, 3–4 September 2025	Water recirculation and reuse in aquaculture

Relevant SDGs: SDG 6 — Clean Water and Sanitation; SDG 2 — Zero Hunger; SDG 14 — Life Below Water; SDG 17 — Partnerships for the Goals.

17. Results Matrix – SDG 6 (2025)

Focus Area	2025 Value	Direction to 2030
Water supplied and tracked	1,221,525 L/day (445,856.6 m³/year)	Metering on every source
Water use per person	68.25 L/day; 24.91 m³/year	Progressive reduction
Installed wastewater treatment capacity	1,000 KLD	Sustained and expanded
Wastewater treated	975 KLD (87.8%)	100% of wastewater generated
Treated water reused	375 KLD	Higher share of reuse
Treated-water reuse rate	38.5% of treated wastewater (136,875 m³/year indicative)	Outlet-level, campus-wise reuse metering
Rainwater harvested	About 41 lakh litres a year	Expanded harvesting and recharge
Dual-flush water closets / efficient urinals	100% / 100%	Sustained
Water-efficient wash basins and taps	445 of 1,656 (26.87%)	All taps and basins
Free drinking water	RO-purified supply across all campuses	Sustained, with laboratory verification
Plants in campus flora inventories	31,116	Water-wise landscapes in all new plantings
Solar drip-irrigation systems supported	730	More villages reached
Rural homes with rainwater harvesting	82	Extended through housing partnerships
Indigenous aquatic species in Jamakhala Pond	30	Model replicated for other ponds
Villages surveyed for water resources	14	Wider district coverage

18. Interlinkage Wheel – SDG 6 and Connected Goals



Fig. 41: SDG 6 Interlinkage Wheel

Connections:

- SDG 6 ↔ SDG 2: solar drip irrigation, water-efficient aquaculture and treated-water reuse for farms.
- SDG 6 ↔ SDG 3: free RO-purified drinking water, sanitation and laboratory-verified water quality.
- SDG 6 ↔ SDG 4: farmer training, student fieldwork and water-management education.
- SDG 6 ↔ SDG 7: solar-powered pumping and irrigation in rural communities.
- SDG 6 ↔ SDG 13: rainwater harvesting, groundwater recharge and climate-resilient housing.
- SDG 6 ↔ SDG 14 and SDG 15: pond restoration, indigenous fish species and water-conscious planting.
- SDG 6 ↔ SDG 17: partnerships with NABARD, ICAR institutions, government agencies, UNICEF and Youth4Water.

The University's integrated approach ensures that every water intervention also contributes to food security, health, education, clean energy, climate resilience and healthy ecosystems.

19. Conclusion

Centurion University of Technology and Management demonstrates how a multi-campus university can manage water as a complete cycle. It measures 1,221,525 litres of daily supply by source and use, holds consumption at 68.25 litres per person per day, treats 975 KLD of wastewater through 1,000 KLD of installed capacity and reuses 375 KLD for landscapes and farms. Free RO-purified drinking water, water-efficient buildings, rainwater harvesting and water-wise landscapes make conservation part of everyday campus life, while policies on water discharge, hazardous waste and pollution prevention protect the water bodies that receive its effluent.

Beyond its boundaries, the University turns this experience into community capacity: farmers trained in watershed management and water-efficient aquaculture, 14 villages surveyed by students, 730 solar drip-irrigation systems, 82 homes harvesting rainwater and a restored community pond that again supports 30 indigenous species. Partnerships with NABARD, ICAR institutions, district and state agencies, UNICEF and Youth4Water extend this work into regional water security.

Building on this foundation, the University will extend water-efficient technology to all taps and basins, meter every source, treat and reuse a greater share of its wastewater and widen its community programmes. Its model – every drop measured, every drop treated, every drop valued – reflects a lasting institutional commitment to SDG 6 and to the communities it serves.

Supporting documents: CUTM Water Consumption Metrics (2025); Water Reuse Measurement report (2025); pH Monitoring Report – Water Quality Assessment at 14 Boring / Water Points; Policy on Water Discharge Guidelines and Standards, 2024; Policy on Hazardous Waste Disposal, 2024; Policy on Preventing Marine Pollution, 2024; Facilities for the Management of Degradable and Non-Degradable Waste; Water Sources, Quality and Usage (cutm.ac.in); Environment Audit Report and Drinking Water Quality Monitoring Report; Water-Conscious Building Supporting Sustainable Water Usage report; Water-Conscious Plantation Supporting Water Conservation in CUTM Campus; campus flora inventories (2025); School of Fisheries training and RAWEP records (2025); MoU with ICAR–IISWC (29 June 2025); District Fisheries Office, Rayagada, Letter No. 313 (21 February 2025).