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SDG 6 | CLEAN WATER AND SANITATION

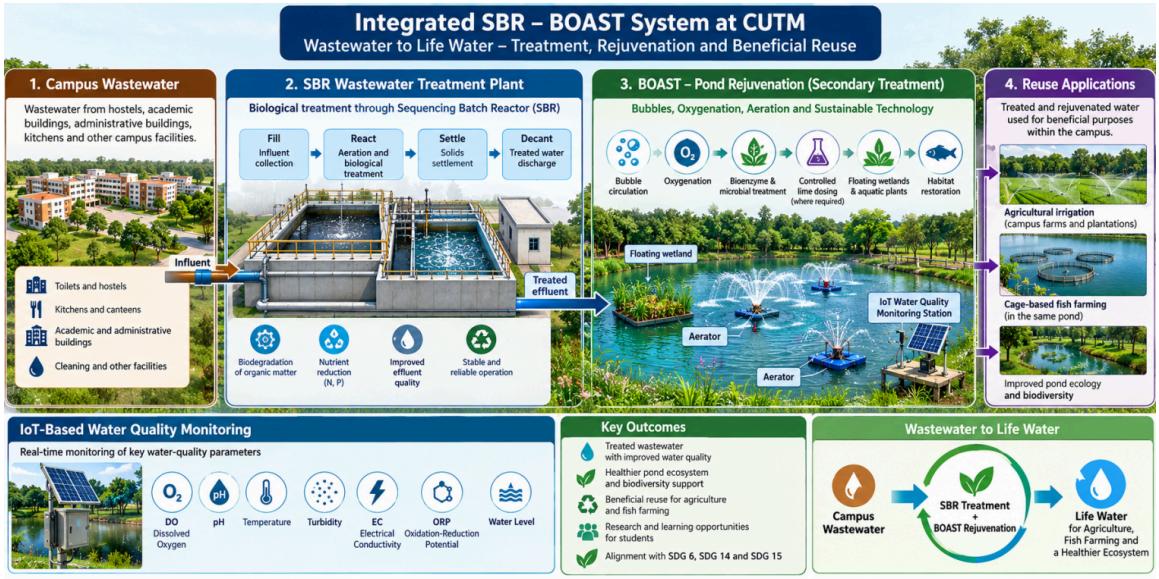
Water usage and care

Wastewater treatment: A process in place to treat wastewater

Wastewater to Life Water

Since 2022 Centurion University of Technology and Management (CUTM) has established wastewater treatment infrastructure across its six campuses to manage wastewater generated from institutional activities. The university-wide infrastructure has a combined reported installed treatment capacity of 1,000 kilolitres per day (KLD). At Paralakhemundi, four treatment units of 75 KLD each provide a combined capacity of 300 KLD, while the Bhubaneswar campus operates a 250 KLD Sequencing Batch Reactor (SBR)-based wastewater-treatment system. The remaining campuses of Rayagada, Balangir, Balasore and Chatrapur have a combined reported treatment capacity of 450 KLD.

At the Bhubaneswar campus, CUTM integrates biological wastewater treatment with ecological pond rejuvenation and beneficial water reuse. Following treatment through the SBR system, treated effluent is conveyed to a pond where the BOAST (Bubbles, Oxygenation, Aeration and Sustainable Technology) framework supports further water-quality improvement through aeration, oxygenation, biological processes and ecological interventions. This integrated pathway underpins CUTM's **"Wastewater to Life Water"** approach, connecting wastewater treatment with responsible water management, resource recovery and ecological restoration. Subject to water-quality verification and ecological suitability, treated water can support beneficial reuse, including agricultural irrigation and cage-based fish farming. Operational treatment volumes, effluent quality and reuse outcomes are assessed separately through treatment records, water-quality monitoring and laboratory evidence.



2. Wastewater Treatment Capacity and Operational Performance

Centurion University of Technology and Management (CUTM) has established wastewater-treatment infrastructure across its campuses to manage wastewater generated from institutional activities. The university-wide treatment infrastructure has a combined reported installed capacity of 1,000 kilolitres per day (KLD) across its six campuses. At the Paralakhemundi campus, wastewater treatment is supported by four treatment units, each with a capacity of 75 KLD, providing a combined capacity of 300 KLD. At the Bhubaneswar campus, a 250 KLD Sequencing Batch Reactor (SBR)-based wastewater-treatment system provides the primary biological treatment stage. The remaining four campuses—Rayagada, Balangir, Balasore and Chatrapur—have a combined reported treatment capacity of 450 KLD.

Table 1. Campus-Wise Wastewater Treatment Capacity

Campus / campus group	Treatment infrastructure	Installed capacity (KLD)	Annualised design capacity (m^3/year)
Paralakhemundi	Four treatment units × 75 KLD	300	109,500
Bhubaneswar	SBR-based wastewater-treatment system	250	91,250
Rayagada, Balangir, Balasore and Chatrapur	Combined treatment capacity	450	164,250
Total — CUTM	Six-campus treatment infrastructure	1,000	365,000

2.1 Wastewater Generation, Treatment and Reuse

The internal Water Consumption Metrics report wastewater generation, treatment, reuse and discharge across the university. These figures describe operational volumes and are presented separately from installed plant capacity.

Wastewater management parameter	Reported quantity

Estimated wastewater generated	1,110 KLD
Estimated wastewater treated	975 KLD
Treatment share of estimated generation	87.84%
Estimated treated wastewater reused for landscaping and agricultural irrigation	375 KLD
Estimated wastewater discharged	135 KLD

2.2 Integrated SBR Treatment and BOAST-Based Pond Rejuvenation

The SBR system provides the primary biological treatment stage. After treatment, the effluent is transferred to the campus pond, where the BOAST framework—Bubbles, Oxygenation, Aeration and Sustainable Technology—supports secondary pond management and ecological rejuvenation. The BOAST framework integrates bubble circulation, aeration and oxygenation, biological processes, controlled treatment interventions where required, and ecological components such as aquatic vegetation and floating wetlands. IoT-based water-quality monitoring supports the assessment of parameters including dissolved oxygen, pH, temperature, turbidity, electrical conductivity and water level.The BOAST framework integrates bubble circulation, aeration and oxygenation with bioenzyme and beneficial microbial processes, controlled lime dosing where required, aquatic vegetation and nature-based treatment components. This approach is intended to improve water circulation, support dissolved oxygen maintenance, facilitate the breakdown of residual organic matter and restore the ecological condition of the receiving pond. IoT-based water-quality monitoring supports the observation of parameters such as dissolved oxygen (DO), pH, temperature, turbidity, electrical conductivity (EC) and water level, with oxidation-reduction potential (ORP) monitored where appropriate. The integrated SBR–BOAST system connects wastewater treatment with beneficial water reuse and ecological restoration. The rejuvenated pond is intended to support agricultural irrigation and cage-based fish farming within the same waterbody, subject to appropriate water-quality verification and ecological suitability. This **“Wastewater to Life Water”** approach links engineering-based wastewater treatment with resource recovery, pond rehabilitation and sustainable agricultural applications. Under SDG 6, Indicator 6.3.1, CUTM’s primary institutional evidence is the wastewater treatment process and the associated secondary pond-treatment pathway through BOAST.

This integrated approach connects wastewater treatment with beneficial water reuse and ecological management. The rejuvenated pond is intended to support agricultural irrigation and cage-based fish farming, subject to appropriate water-quality verification, ecological suitability and relevant operational requirements. The installed treatment capacity, documented SBR process, treatment records and secondary pond-management pathway demonstrate CUTM’s wastewater-treatment framework



3. SBR-Based Wastewater Treatment at CUTM

CUTM also operates a Sequencing Batch Reactor (SBR)-based wastewater treatment system to treat wastewater generated from campus activities. The SBR process uses biological treatment under controlled operating cycles to reduce biodegradable organic matter and suspended solids before the treated effluent is transferred to the campus pond for further treatment and ecological rejuvenation through the BOAST framework. The SBR system forms the primary wastewater treatment stage in CUTM's integrated approach. Rather than treating the pond as a substitute for wastewater treatment, the University connects the treatment plant with a secondary, nature-integrated pond-management process. This creates a treatment pathway that combines engineered biological treatment with aeration, oxygenation, biological activity and ecological management.

3.1 Sequencing Batch Reactor Treatment Process

SBR is a fill-and-treat biological process in which wastewater treatment operations occur sequentially within a reactor. The operating cycle generally includes the following stages:

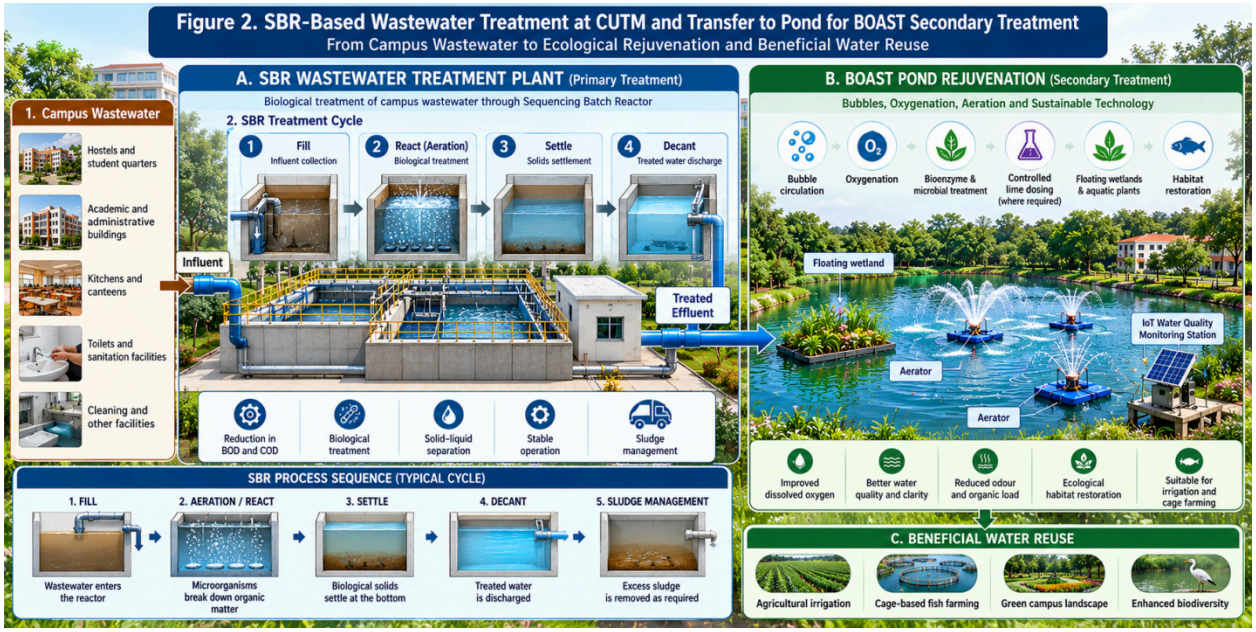
- Filling: Wastewater is introduced into the reactor for treatment.
- Aeration and biological reaction: Aeration supplies oxygen to support microorganisms that break down biodegradable organic matter. The reactor operating conditions support biological treatment of the wastewater.
- Settling: Aeration is stopped or adjusted as specified by the operating cycle, allowing biological solids to settle and separate from the treated liquid.
- Decanting: The clarified supernatant is withdrawn from the reactor for subsequent handling.
- Sludge management: Excess biological sludge is removed as required to maintain the treatment process and appropriate solids concentration.

The cycle duration, aeration settings, sludge-wasting schedule and operating parameters depend on the installed plant configuration and wastewater characteristics. The process stages described above represent the general SBR treatment sequence.

3.2 Transfer of Treated Effluent to the Pond

Following SBR treatment, the treated effluent is conveyed to the pond, where the water enters the secondary treatment and ecological-management stage. This integration links wastewater treatment with pond rejuvenation and beneficial water use. The pond is managed through the BOAST

framework—Bubbles, Oxygenation, Aeration and Sustainable Technology. The framework complements the engineered wastewater treatment stage by focusing on water circulation, oxygen availability, biological processes and the ecological condition of the receiving waterbody. The transfer of SBR-treated effluent to the pond establishes a sequential treatment arrangement: biological wastewater treatment first, followed by secondary pond management. The effectiveness of this combined system is assessed through appropriate water-quality monitoring rather than by visual appearance alone.

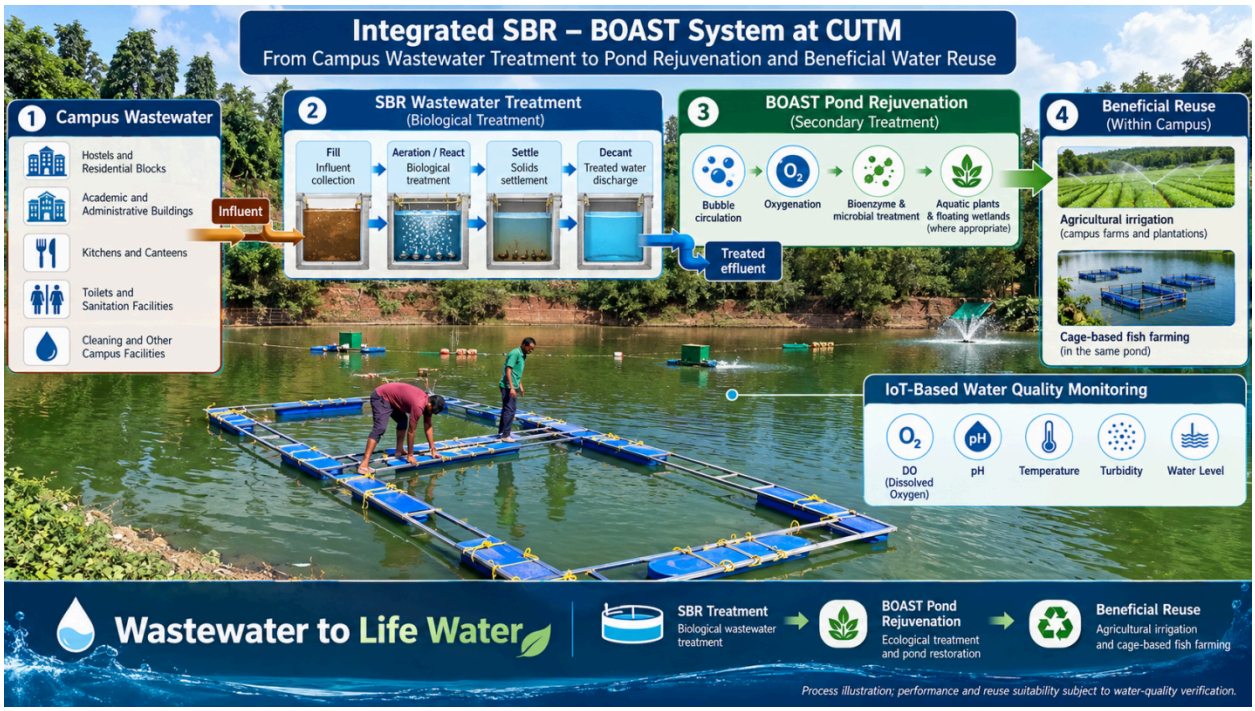


3.3 Treatment Verification and Operational Monitoring

The performance of the SBR process and the receiving pond needs to be assessed through documented operating records and water-quality testing. Relevant evidence includes treatment-plant operating logs, treatment cycle records, sludge-management records, sampling dates and laboratory results for the influent and treated effluent. For the pond stage, the BOAST monitoring framework covers parameters such as dissolved oxygen (DO), pH, temperature, turbidity, electrical conductivity (EC) and water level, with oxidation-reduction potential (ORP) included where appropriate. These parameters support operational monitoring and the assessment of changes in pond-water conditions.

The existence and operation of the SBR treatment process, together with the documented pathway to secondary pond treatment, demonstrate CUTM's wastewater-treatment approach. Quantitative treatment efficiency, compliance with applicable discharge requirements and suitability for specific reuse applications is reported in accordance with actual laboratory results and operational records.




Integrated SBR – BOAST System at CUTM
From Campus Wastewater Treatment to Pond Rejuvenation and Beneficial Water Reuse
1 Campus Wastewater
Hostels and Residential Blocks
Academic and Administrative Buildings
Kitchens and Canteens
Toilets and Sanitation Facilities
Cleaning and Other Campus Facilities
Influent
2 SBR Wastewater Treatment
(Biological Treatment)
Fill
Influent collection
Aeration / React
Biological treatment
Settle
Solids settlement
Decant
Treated water discharge
Treated effluent
3 BOAST Pond Rejuvenation
(Secondary Treatment)
Bubble circulation
Oxygenation
Bioenzyme & microbial treatment
Aquatic plants & floating wetlands (where appropriate)
4 Beneficial Reuse
(Within Campus)
Agricultural irrigation
(campus farms and plantations)
Cage-based fish farming
(in the same pond)
IoT-Based Water Quality Monitoring
DO (Dissolved Oxygen)
pH
Temperature
Turbidity
Water Level
Wastewater to Life Water
SBR Treatment
Biological wastewater treatment
BOAST Pond Rejuvenation
Ecological treatment and pond restoration
Beneficial Reuse
Agricultural irrigation and cage-based fish farming
Process illustration; performance and reuse suitability subject to water-quality verification.