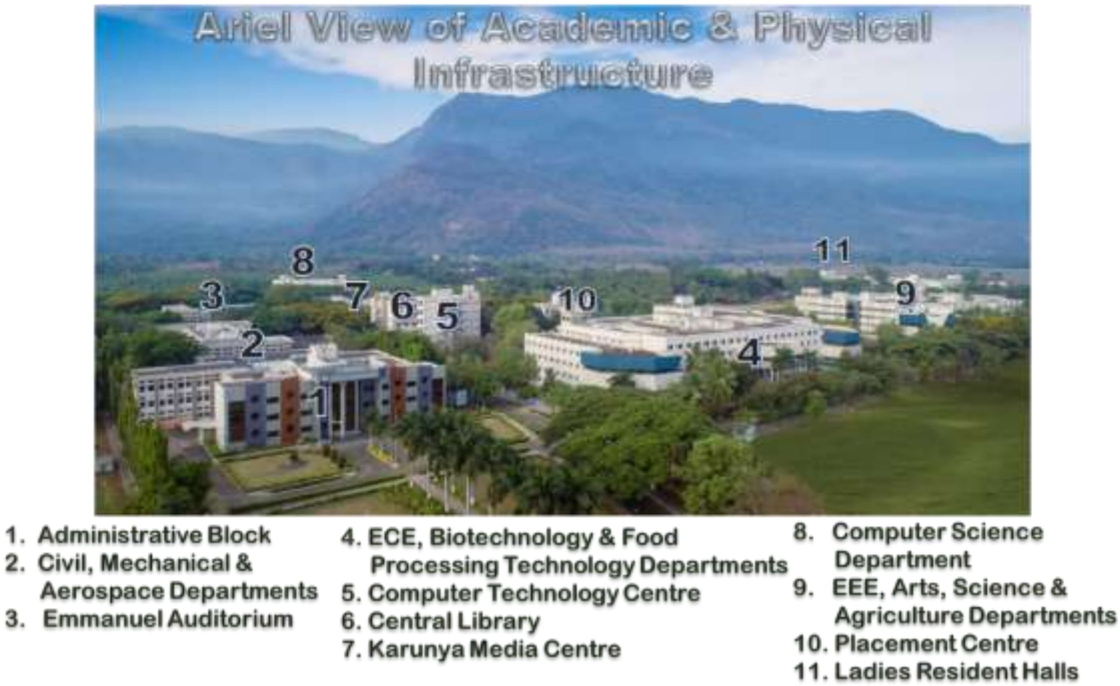
Karunya INSTITUTE OF TECHNOLOGY AND SCIENCES
(Declared as Deemed to be University under Sec.3 of the UGC Act, 1956)
MoE, UGC & AICTE Approved
NAAC A++ Accredited

SDG 6 CLEAN WATER AND SANITATION

6 CLEAN WATER AND SANITATION

REPORT

6.2.1 Total Volume of Water Used in the University



Location of Water Resources (wells

Sources of Water Supply:

There are 5 open wells and 23 bore wells on campus supplying water to 166 storage tanks which meet the water demand of the students, faculty and staff (Total of 8087).

- Groundwater: 95% of water supply from aquifers to meet the demand in the campus
- Potable water supply from Siruvani reservoir: Drinking water in the campus and hostels
- Desalinated Water using RO plants: For cooking and drinking.
- Ferrocement -based roof top water harvesting structure and recycled water from 4 STP units in the student's hostel: Water demand for gardening and irrigation.

Facility	Quantity / Capacity	Function	Coverage
RO Plants	2 Units (2000 LPH + 500 LPH)	Centralized purification for hostels and staff quarters	~60% of potable supply
Water Purifiers	86 Units	Secondary purification and cooling	37 buildings (academic, admin, hostels)
Self-Closing Taps	3,376 Nos.	Minimize wastage at outlets	56.4% water-efficient
IoT-Level Controllers	119	Overflow and refill management	All sumps & OHTs
Overhead Tanks	46	Water storage	Monitored 24×7
Sumps	8	Ground-level reservoirs	Smart sensor integrated

Stage	Infrastructure	Functional Capacity	Measurement System
Freshwater Input	Siruvani /TWAD + 23 Borewells + 5 Open Wells	1.4–1.6 MLD	Operational Time and capacity
Treatment	4 STPs	Domestic wastewater recycling	Flow meter
Potable Production	RO Plants (2000 & 500 LPH)	Drinking & cooking supply	Sensors and RO Logbook Registers
Storage & Distribution	Sumps + overhead tanks + Pumps	Internal distribution network	119 IoT Level Controllers
Reuse Network	113 Reuse Outlets	Irrigation	-

The volume of water consumed/used in the hostel and university - 291,132 m^3/year
Total Volume of water consumed per person – 36.0 m^3/year

Measurement of water consumption:

- Automatic water flow controllers have been installed in water tanks to measure the flow and avoid overflow. The water supply volume is determined based on motor power, pumping duration for each tank, and the building height, allowing calculation of the water flow into each tank.
- For hostels, the volume of water used by students was estimated through semi-structured interviews covering water use for bathing, washing, flushing, drinking, and minor uses.
- Similarly, interviews were conducted at the university campus to estimate water consumption in canteens, laboratories, and construction sites.

- Flow meters are installed at STP inlets and outlets to measure the inflow and reuse of treated water, as well as at RO plant intake and delivery points to track the volume of treated water used.

Automative waterflow controllers

The campus has established extensive **rainwater harvesting and groundwater recharge systems** to enhance sustainable water management. During the monsoon, rainwater collected from building terraces is quantified based on roof area and rainfall depth. A 25,000-litre ferrocement tank at the administrative block stores water from a 1,900 m² roof for washing use. Additionally, 33 soak pits—each 3 m deep and 1.8 m in diameter—are distributed near academic buildings and hostels to facilitate groundwater recharge. In total, 33 rainwater harvesting sites have been identified, with terrace areas ranging from 39 m² to 5,590 m² across key locations such as the administrative block, civil and mechanical departments, auditoriums, guest houses, and hostels, all contributing significantly to replenishing groundwater and promoting sustainable resource utilization.

Location of Rain Water Harvesting System in KITS Campus		
Sl.No	Location	Area of Terrace
1	Behind Administrative Block	1900 m^2
2	Adjacent to Administrative Block	
3	Adjacent to Aerospace Lab	278 m^2
4	Adjacent to Old Bio Tech Block	766 m^2
5	Adjacent to Ebenezer Auditorium	1,100 m^2
6	Adjacent to CST Department	1,247 m^2
7	Adjacent to Elohim Auditorium	450 m^2
8	Adjacent to Mechanical Lab	2960 m^2
9	Adjacent to Civil Department	2812 m^2
10	Adjacent to Civil Lab	
11	Adjacent to Mechanical Workshop	2,218 m^2
12	Adjacent to Food Processing Lab	4,277 m^2
13	Adjacent to Computer Centre	1,023 m^2
14	Adjacent to S & H Block	5,590 m^2
15	Adjacent to Visitor Waiting Hall - LH	150 m^2
16	Adjacent to Old DMR Dinning Hall	600 m^2

17	Adjacent to Sewage Treatment Plant - LH - EVR	2,814 m^2
18	Adjacent to Sewage Treatment Plant - LH - SRR Extn	1,502 m^2
19	Adjacent to Oprah Residence	1,800 m^2
20	Adjacent to Sundaraj Residence	1,600 m^2
21	Adjacent to Sevagapandian Residence	1,306 m^2
22	Adjacent to PRGR Residence	1,910 m^2
23	Adjacent to DMR Residence	1,609 m^2
24	Adjacent to Indoor Games - FDR	748 m^2
25	Adjacent to FDR Mess	1,841 m^2
26	Adjacent to FDR Residence	2,324 m^2
27	Adjacent to EGR Residence	1,484 m^2
28	Adjacent to Student Amenity Centre - AR/HR	147 m^2
29	Adjacent to Hepzibah Gents hostel	1,220 m^2
30	Adjacent to Post Office	39 m^2
31	Adjacent to Baburaj Residence	2,275 m^2
32	Adjacent to Guest House	1,892 m^2
33	Adjacent to JMR Mess	2,185 m^2

Recycled water from sewage treatment plants (STPs) forms a vital component of the water management system. The university operates four STPs: JMR (1000 KLD capacity), FDR (400 KLD), Ladies Hostel (450 KLD), and PR GARG (600 KLD).

STP Unit	Installed Capacity (KLD)	Annual Output (m^3/year)	End-Use Application	Measurement
JMR Hostel	1000	132,525	Irrigation, lawns etc.	Flow Meters
FDR Hostel	400	79,729	Hostel & garden irrigation	
Ladies Hostel STP	450	61,778	Mess cleaning	
PR GARG Campus STP	600	111,171	Farm Irrigation (329 acres)	

Total	2,450 KLD	385,204 m³/year	100% Recycled and Reused	


Desalination units also play an essential role in ensuring potable water availability. Two desalination units with a total capacity of 2000 litres per day for cooking and 500 litres per day for drinking are operated with flow meters installed to measure intake and delivery volumes. The treated water from RO plants is primarily used for drinking and cooking purposes. **RO Treated Drinking Supply: 2,618 m³/year.** Monitoring Tools: FREHNIG IoT Flow Transmitters + Database (LPS + cumulative flow).

Overall, the Karunya Institute of Technology and Sciences has developed an efficient and sustainable water management system by integrating groundwater, surface water, desalinated water, recycled wastewater, and harvested rainwater. Continuous monitoring through flow meters, automated controllers, and pumping records ensures optimal use and conservation of water resources. Through these measures, KITS effectively minimizes wastage, supports groundwater recharge, and promotes sustainability across its academic, residential, and agricultural zones.

Water Conservation Structures (Farm Ponds and Tanks) – Karunya Institute of Technology and Sciences

Water Resources Conservation and Management through

a. ponds and tanks
b. rainwater harvesting and recharge of wells (33 Nos)
c. use of recycled water
d. usage of water efficient appliances
e. rainwater utilization for crops
f. optimal water usage through drip irrigation
g. IoT based water level controller for reducing the wastage
h. Water Quality Monitoring
i. Capacity building and awareness creation

6.3.1 Process for Grey water and Black Water Treatment

Greywater Treatment Units

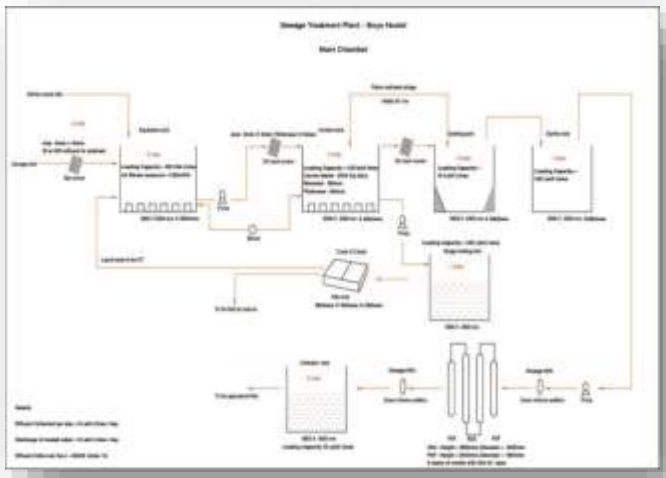
Karunya Institute of Technology and Sciences (KITS) is a fully residential campus with a total of 8087 faculty and staff members. The campus comprises 17 departments, 15 hostels for both boys and girls, and 17 apartment complexes housing approximately 500 faculty and staff. Additionally, the School of Agriculture and Biosciences utilizes 329 acres of agricultural land for academic, research, and community development purposes. The campus has 5 open wells and 23 bore wells that supply water to 177 storage tanks meeting the water demand of students, faculty, and staff.

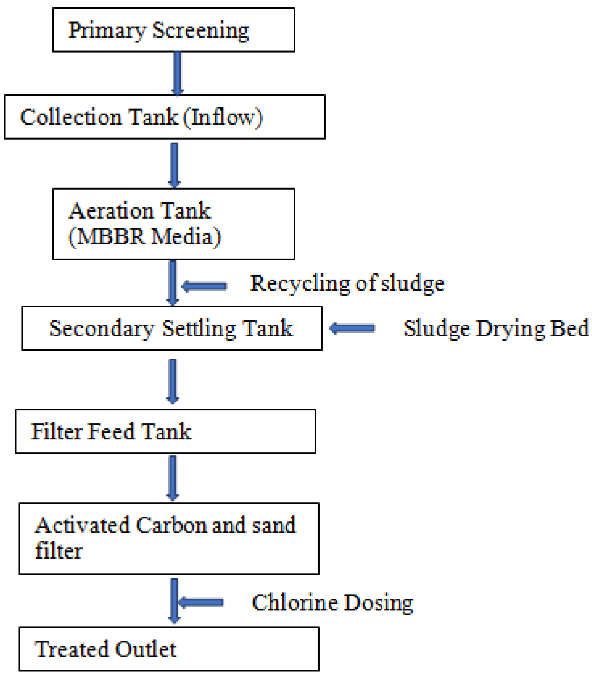
GREY WATER TREATMENT

STP Unit	Installed Capacity (KLD)	Annual Output (m^3/year)	End-Use Application
JMR Hostel	1000	132,525	Irrigation, lawns etc.
FDR Hostel	400	79,729	Hostel & garden irrigation
Ladies Hostel STP	450	61,778	Mess cleaning
PR GARG Campus STP	600	111,171	Farm Irrigation (329 acres)
Total	2,450 KLD	385,204 m^3/year	100% Recycled and Reused

To ensure sustainable water reuse, **five Sewage Treatment Plants (STPs)** have been established across student hostels. These treat greywater generated from bathrooms, kitchens, and laundry facilities. Additionally, **four biogas plants** are used to process blackwater from hostels, producing **biogas for cooking** and reducing the load on sewage treatment units. The treated wastewater is **reused for gardening and irrigation**, with **113 outlets** supplying treated water across the campus.

General Process and Functions of Treatment Plant:





Steps involved in treatment process

The treatment process is a **multi-stage system** comprising physical, biological, and chemical processes to remove solids, organic matter, and pathogens.

Steps Involved:

1. **Primary Screening:**

   Removes large non-biodegradable materials like plastics, rags, and paper through coarse screens.

2. **Fluidized Bed Bioreactor (FBBR):**

   Wastewater undergoes biological degradation in an aeration basin by bacteria. The process continues for ~24 hours, after which mixed, liquor is sent to a clarifier for sedimentation. The effluent is collected, and biomass is recycled back into the system.

3. **Settling Tank:**

   Sludge settles and is partially returned to the aeration tank to maintain microbial concentration.

4. **Filtration System:**

   Water passes through **pressure sand filters** and **activated carbon filters**, which remove fine particulates, algae, and microorganisms.

5. **Sludge Drying Beds:**

   The collected sludge is dried through natural evaporation. The duration varies with climate conditions.

6. **Reuse:**

   The treated water is reused for **gardening, irrigation**, and cleaning activities in the campus and agricultural areas.

Primary Screening Unit

Fluidized Bed Reactors

Aeration System

Filtration System

Sludge Drying Bed

Reuse of Treated Water: The treated water is reused for gardening and irrigation in the agricultural farm.

JMR – STP

JMR Collection Tank, Settling Tank (after filtration)

FDR Collection Tank, Settling Tank (after filtration)

LH Collection Tank (After Filtration)

PRG Collection Tank, Settling Tank

JMR and LH STP – Aeration Tanks

Storage Tanks for Treated Water (Before Reuse in the Garden)

Outlet for the recycled wastewater from STP

BIO-GAS PLANTS FOR TREATING BLACK WATER

Blackwater contains human waste and is treated through **biogas plants** that enable anaerobic digestion of organic matter.

i) Biogas Overview

- Biogas is produced through **anaerobic fermentation** of organic matter, generating **methane (CH_4)** and **carbon dioxide (CO_2)**.
- Methane, a combustible gas, is used as a **renewable fuel** for **cooking and lighting**.
- The leftover **digested slurry** serves as **organic manure** for agriculture.

ii) Bio-gas plants in Karunya Campus

Since being a residential campus, blackwater in the hostel zones (both ladies and gents) of Karunya Campus are treated by biogas plant installed in the following locations:

S.No.	Location	Capacity of the Bio-gas Plant	Year of Installation	Savings in terms of LPG Cylinders (19Kg) /Day
1	FDR Campus	100m^3	2017	2 Nos.
2	JMR Campus	80m^3 (Multifeed)	2010	2 Nos.
3	Ladies Hostel (PRG Campus)	100m^3	2017	2 Nos.
4	Ladies Hostel (EVR Campus)	80m^3	2017	1.5 Nos.

- The treated effluent from biogas plant is diverted to the STP for storage and utilized for irrigation/gardening. This will reduce the organic load coming to two STPs of capacity 6 and 4.5 lakh litres of sewage and their operational & maintenance cost.
- The biogas produced from the plant can be utilized for cooking, and the residual dung or the digested slurry left after generating biogas can be used as manure for agricultural purposes

Biogas Plant for Blackwater

Utilization of Biogas for Cooking

6.3.2 Prevention of Water Pollution

Karunya Institute of Technology and Sciences (KITS) is a **fully residential campus** located in an ecologically sensitive region near the Western Ghats, spanning **720 acres** (2.9 million m²).

Campus Population Considered for Calculation: 8087 persons. As part of its commitment to **SDG 6 – Clean Water and Sanitation**, KITS follows a **zero untreated discharge approach**, prioritizing wastewater treatment, recycling, and groundwater protection.

Policy and Governance

Parameter	Details
Policy Framework	Environmental Sustainability Policy – Section *5 (Water Conservation & Wastewater Reuse)*
Supervisory Authority	Registrar and Chief Engineer
Monitoring Frequency	Daily via IoT database + Green Audit verification
Regulatory Compliance	TNPCB norms + IS:10500 (2012) potable standard

Wastewater Management Infrastructure

Facility Type	Location / Units	Capacity (KLD)	Function	% Reuse / Efficiency
Sewage Treatment Plants (STPs)	JMR (1000), FDR (400), Ladies Hostel (450), PR GARG (600)	2,450 KLD total	Treat greywater from hostels, kitchens, washrooms	96–98% removal efficiency- BOD/COD
Biogas Plants	FDR (100 m³), JMR (80 m³), LH (100 m³), EVR (80 m³)	360 m³ total	Treat blackwater + organic waste; generate biogas	6–7 LPG cylinders/day replaced (~2,200/year)
Reuse Outlets	Campus-wide	113 nos.	STP-treated water used for irrigation	100%
IoT Water Control Systems	Sumps + OHTs	119 controllers	Regulate overflow, optimize pumping	10% water & energy savings
Total Recycled Wastewater	—	385,204 m³/year	Reused for irrigation and gardening	92.10% reuse rate

Quantitative Indicators (FY 2023–24)

Indicator	Value	Source
Wastewater Generated	385,204 m³/year (including wastewater from kitchen since it is fully residential)	Flow monitoring
Treated Wastewater Reused	385,204 m³/year	STP Records

Reuse Efficiency	100% Calculation	Calculation
STP Biochemical Efficiency	95–97% BOD reduction	Lab Reports
Biogas LPG Equivalent Saved		Hostel kitchen consumption logs
Overflow Reduction via IoT	~42,000 m³/year saved	Database IoT logs
Sludge Reuse	Converted to manure for campus cultivation	Compost yard records
Solid Waste Segregation Bins	3,000	Solid Waste Management Unit
Paper Recycling Plant Output	25–30 tons/year	Green Audit Records

KITS achieves near-zero discharge with 100% treated water reuse, minimizing pollution and protecting groundwater

Pollution Prevention Measures

Measure Category	Implementation	Outcome
Greywater–Blackwater Segregation	Differential pipeline networks	Higher treatment efficiency, prevents mixing contamination
Biological + Tertiary Treatment STPs	Aeration → Clarification → Sand Filtration	Treated water meets reuse norms
Sludge Handling	Sludge dried & reused as organic compost	Reduces landfill waste & fertilizer requirement
Stormwater Management	33 soak pits + 6 farm ponds (14,334 m³ capacity)	Recharges groundwater annually
IoT Water Level Systems	Automated pump cut-off controls	Prevents overflow + lowers operational wastage
Routine Water Quality Testing	PHED + internal testing every 6 months once	Environmental Lab- Civil Division

Awareness & Capacity Building

- Nature Club (3 Units): Organizes 10+ water conservation and clean-water drives annually.
- Workshops on wastewater management for students & community (2 per semester).
- Karunya Technology Missions: *Water and Desalination*, *Wetland Conservation*, *Smart Farming*.
- Public outreach: Students trained to test water quality in nearby villages using field kits.

Impact Summary

Impact Parameter	Status / Value	Description
Treated Water Reuse Rate	100%	Supports zero untreated discharge
Biogas Fuel Offset	~6–7 LPG cylinders/day	Reduced fossil fuel dependence
Overflow Loss Reduction	~10%	IoT-based automated control

Groundwater Recharge	Consistently improving	Due to soak pit + pond integration
Pollution Control Compliance	Achieved	Green Audit

Governance & Monitoring

- Monitoring Dashboard: IoT-based flow and level system logging real-time data.
- Verification: Green Audit Committee; annual report to IQAC.
- Calibration: Flow meters and TDS meters verified by PHED annually.

Evidences and Supporting Documents

1. STP and Biogas Log Registers (2023–24)
2. IoT Database
3. Water Quality Reports- Testing Record
4. Green Audit Summary Report 2024
5. Environmental Sustainability Policy (Section 5)

KITS has evolved into a zero-discharge, data-driven campus, demonstrating exemplary water pollution prevention through technology, infrastructure, and continuous governance. The integration of STPs, biogas plants, IoT monitoring, and community engagement ensures a resilient, replicable model aligned with SDG 6 (Clean Water and Sanitation) and SDG 12 (Responsible Consumption and Production).

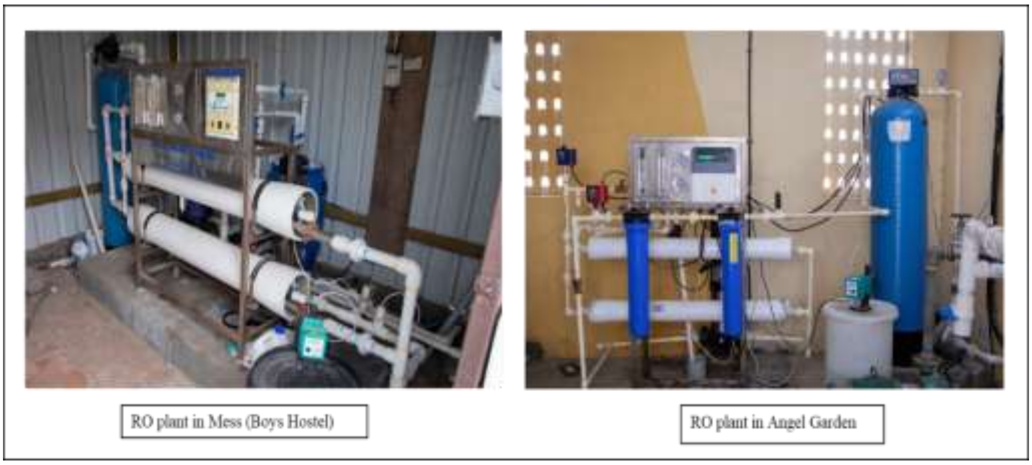
6.3.3 Free Drinking Water Provision

Karunya Institute of Technology and Sciences (KITS) is a fully residential green campus that ensures **free, safe and accessible drinking water** for all on-campus residents.

Campus Population Considered for Calculation: 8,087. The drinking water system integrates **central RO purification**, **secondary purification units**, and **IoT-based supply monitoring**, maintained in compliance with **IS:10500 (2012)** drinking water standards.

Infrastructure Overview

Facility	Quantity / Capacity	Function	Coverage
RO Plants	2 Units (2000 LPH + 500 LPH)	Centralized purification for hostels and staff quarters	~60% of potable supply
Water Purifiers	86 Units	Secondary purification and cooling	37 buildings (academic, admin, hostels)
Self-Closing Taps	3,376 Nos.	Minimize wastage at outlets	56.4% water-efficient
IoT-Level Controllers	119	Overflow and refill management	All sumps & OHTs
Overhead Tanks	46	Water storage	Monitored 24×7
Sumps	8	Ground-level reservoirs	Smart sensor integrated



RO setup across the campus

Measured RO Potable Water Supplied

Usage Category	Annual Quantity (m^3/year)
Drinking Supply	1,818
Cooking & Mess Use	800
Total RO Potable Supply	2,618 m^3/year

Water Quality Monitoring & Test Results

Parameter	Measured Range	IS:10500 Limit
pH	7.1–7.4	6.5–8.5
Total Dissolved Solids (TDS)	75–130 mg/L	<500 mg/L
Turbidity	0.8–1.0 NTU	<5 NTU
Total Hardness	90–120 mg/L	<200 mg/L
Total Coliform	Nil	0/100 mL

All samples met potable water standards as per IS:10500 (2012).

Distribution and Accessibility

Zone	Buildings / Units Covered	Water Points	Type of Supply
Academic Blocks	14	38	RO-fed purifiers
Hostels (Boys & Girls)	13	42	RO + Purifiers
Dining / Mess	6	8	RO + Direct line
Staff Quarters	15	16	RO + Purifiers
Common / Public Areas	10	12	Coolers + Push taps

Total Drinking Points = 116 (Purifiers + Coolers)

All are provided free of cost to students, staff, and visitors.

Maintenance and Monitoring

- AMC Vendor: *M/s Aqua Engineers Pvt. Ltd., Coimbatore*
    - Monthly filter replacement and TDS calibration

- Record maintained in AMC Log Register
- Monitoring Mechanism:
  - IoT water controllers prevent overfilling in sumps/tanks.
  - Daily visual inspection by the Environmental Lab and Water Institute of the Institute
  - Testing Frequency: Quarterly + annual third-party verification.

Figure represents: Sample of Water Purifiers across the Campus

Sample of Self closing taps; Location: Ladies Hostel

Wireless Automatic Water Flow Controllers

Wireless Automatic Water Flow Controllersat overhead tank

Sample pictures of Wireless automatic flow controllers in the campus

6.3.5 Plant landscapes to minimize water usage

Karunya Institute of Technology and Sciences (KITS), nestled amidst the rich biodiversity of the Western Ghats, demonstrates a strong commitment to environmental stewardship and sustainable landscaping. The campus has implemented a comprehensive water-efficient landscape design aimed at reducing water consumption, maintaining ecological balance, and supporting biodiversity. This initiative aligns with the institute's policy on Environmental Sustainability – Green Campus, Environment and Energy Conservation.

1. Native and Drought-Tolerant Species

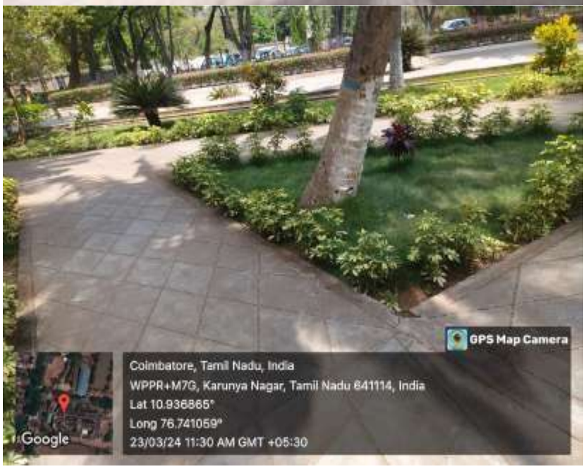
KITS has strategically planted native and drought-tolerant tree species that are well-adapted to the local semi-arid climate, requiring minimal irrigation and maintenance. These plant species not only enhance the green cover but also contribute to soil stabilization, carbon sequestration, and microclimate regulation within the campus. Some of the key species include Neem (*Azadirachta indica*), *Pongamia pinnata*, *Polyalthia longifolia*, *Dalbergia sissoo*, *Cassia fistula*, *Bahunia purpurea*, and Rain tree (*Samanea saman*).

KITS Gardens – An Overview

Medicinal Garden

Rose Garden

Butterfly Garden



In total, more than 1,000 trees and plants of over 65 varieties have been established across the campus landscape zones including the Academic Blocks, Student Residences, Administrative Complex, CTC, Media Centre, Parking Areas, and Staff Quarters.

2. Efficient Irrigation Systems

To optimize water use in the agricultural and landscape areas, IoT-based drip irrigation systems have been installed. These systems use soil moisture sensors to determine irrigation schedules, ensuring that plants receive only the required amount of water, thus reducing wastage and preventing nutrient leaching.

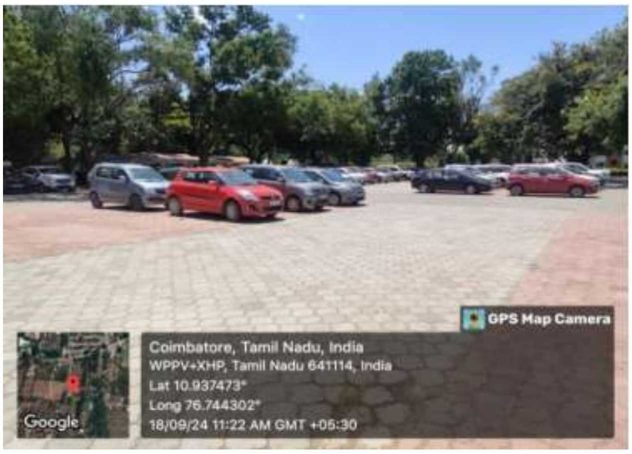
A maximum of 1800 plants/ season have been raised using grow bags in appropriate potting media with vermicompost. A maximum of four and a minimum of two to three types of vegetables from the same group have been raised per season and the entire space of the poly house was allotted accordingly as per the spacing requirement of vegetables. Besides vegetables, greens were also cultivated in polyhouse with organic inputs to cater the need of campus residents. Few exotic and endangered plants are maintained in polyhouse.

3. Rainwater Harvesting and Groundwater Recharge

KITS has constructed 33 soak pits across the campus for effective rainwater harvesting and groundwater recharge. Additionally, rooftop rainwater harvesting structures and well-designed stormwater drainage systems collect and divert runoff to recharge zones. These measures help sustain groundwater levels and minimize dependency on external water sources.

4. Permeable Surfaces and Green Infrastructure

Approximately 14% of the campus area comprises permeable pavements and open green spaces, allowing natural infiltration of rainwater into the soil. These permeable surfaces are integrated into major areas such as the Car Parking zones, Agri Block corridors, Girls Hostel yard, and the Agri Block atrium, thereby reducing surface runoff and improving groundwater recharge.



5. Landscape Maintenance and Water Conservation

Regular pruning, mulching, and weeding are carried out to ensure the health of the plants and improve water-use efficiency. The landscape maintenance team also adopts composting practices using organic waste to enrich the soil and further reduce water requirements. The agroforestry system further enhances effective water management by promoting efficient water use and improving soil moisture retention through integrated tree–crop interactions.

6. Educational and Community Engagement

Faculty and staff use the campus landscape as a living laboratory to educate students and the community about water-efficient landscaping practices and the importance of sustainability. Awareness programs, tree-planting drives, and environmental campaigns are conducted periodically under the Nature Club of KITS.

7. Impact and Sustainability

Through these initiatives, KITS has created a self-sustaining green ecosystem that conserves water, supports biodiversity, and promotes a culture of environmental responsibility. The integration of native species, smart irrigation, and recharge structures makes the campus a model for sustainable water management and eco-friendly landscaping in educational institutions.

S.No.	Name of the Tree/ Plant	Total
1.	*Acacia auriculiformis*	2
2.	*Albizzia*	5
3.	Almond	4
4.	*Araucaria cookie*	7
5.	Fase badam/ India Almond- *Terminalia catapa*	7
6.	*Bahunia purpurea*	168
7.	Banyan	3
8.	Bottle brush	5
9.	Blue gulmohar	2
10.	*Butea monosperma*	4
11.	*Caesalpinnia pulcherima*	3
12.	*Casine paniculata*	1
13.	*Cassia fistula*	4
14.	*Cassia javanica*	3
15.	Casuarina	32
16.	*Catha edulis*	3
17.	Coconut tree	86
18.	Copper pod tree/ Peltophorum ferruginium	62
19.	*Dalbergia sissoo*	13
20.	*Delonix regia*	3
21.	Devils tree – Alstonia scholaris	1
22.	Embelica	1
23.	False Ashoka *Polyalthia pendula*	49
24.	Fern Tree *Filicium decipiens*	15
25.	*Ficus benjamina*	2
26.	Fig	1
27.	Fish tail palm	1
28.	*Gmelia arborea*	5
29.	Golden Juniper	1
30.	Guava	3

31.	Jamun	21
32.	Jewel box tree/*Sterculia foetida*	2
33.	Mahogany	8
34.	Mango	12
35.	Manoranjitham	1
36.	*Melia doobia*	1
37.	*Michelia champaka*	2
38.	*Mimusops elengi*	1
39.	Moringa	1
40.	Nagalinga puspam	2
41.	Neem tree	59
42.	Oil palm	4
43.	Oliva europa	6
44.	*Polyalthia longifolia*	146
45.	Pomegranate	1
46.	*Pongamia pinnata*	61
47.	*Phoenix sp.*	1
48.	Rain tree	47
49.	Red gulmohar	14
50.	Royal palm	30
51.	Sandalwood	6
52.	Sapota	1
53.	Senna	15
54.	Singapore cherry	1
55.	*Spathodea campanulata*	12
56.	Tamarind	2
57.	Teak	1
58.	*Thespesia populnea*	9
59.	Unknown	8
60.	*Vitex negundo*	1
61.	X-1	1

62.	X-2	1
63.	X-3	1
64.	X-4	1
65.	X-5	1
66.	X-6	2
67.	Ylang ylang	1

Car Parking

Agri Block Corridor





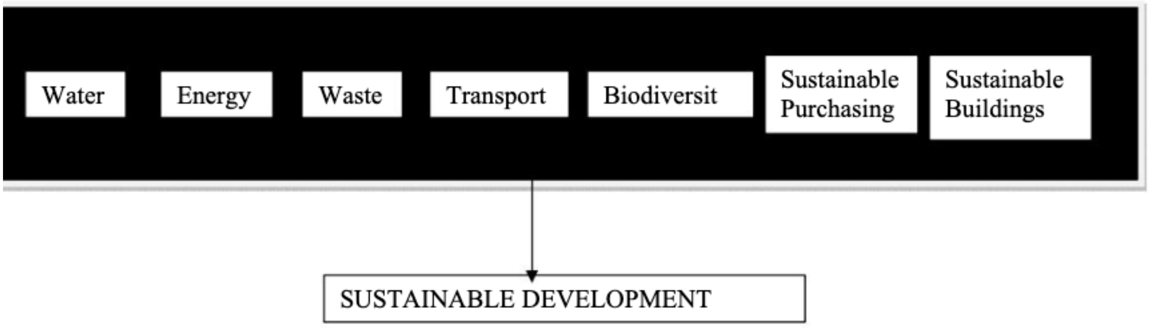




6.4.1 Policy for Reuse

In realization on the fundamental independence among environment and the physical, biological and social surroundings and their interactions that sustain life, KITS has a special responsibility to conduct its activities in an environmentally sound and sustainable manner. KITS also understands the legal framework within with it must operate. This prompted KITS to take initiatives to establish scientific treatment of sewage water and to produce biogas from the waste and to adopt solid waste management. The reuse of treated liquid waste for gardening and irrigating the plants in an experimental farm by using micro-irrigation technique has been introduced. Solid waste is converted into conventional and vemi-compost for the agricultural experimental stations. Rainwater harvesting and water conservation techniques are practised in the campus. Sustainable energy sources such as solar and biogas are harnessed, and wastage of energy is prevented. Regular energy, water and environmental auditing is conducted.

5. ENVIRONMENTAL POLICY STATEMENTS



https://karunya.edu/iqac/ranking/the-impact-ranking/policies

Karunya Institute of Technology and Sciences

WASTE AND RESOURCES MANAGEMENT POLICY

I. RELEVANCE AND SCOPE

1. Karunya Institute of Technology and Sciences (after this, KITS or Institute) understands its legal and ethical responsibilities to protect, conserve and work for a sustainable environment.
2. The Institute has highlighted its commitment to sound environmental management in other policy statements on different aspects of SDG. Some of the significant aims and deliverables for all aspects of sustainability, including waste management, are highlighted herein.
3. The Institute highlights socially relevant research in its Mission statement with water, food, healthcare and sustainable energy as its thrust areas. KITS is committed to making the Earth a better place to live in, a share of which can be achieved through the efforts of the Institute to work responsibly, ethically and morally in managing the campus and surrounding areas.
4. This Waste and Resource Management Policy ("the Policy") is intended to promote sound environmental management on the campus and surrounding areas through the participation of the entire KITS community. It outlines the Institute's commitments regarding sustainable waste management for the waste generated from its operations to reduce the negative impacts on the environment and avoid harm to human health.
5. This Policy highlights the Institute's determination to enhance waste and resource management from all perspectives, focusing on waste minimisation and working with the suppliers to introduce a circular economy.

6. This Policy demonstrates the determination of KITS to the Sustainable Development Goals, especially those on Sustainable Cities and Communities, Responsible Consumption and Production, Life Below Water, and Life on Land.
7. Waste and Resources Management Policy applies to all wastes, including hazardous waste, arising from the activities of the Institute on the campus. The partners of KITS shall follow the waste disposal procedures stipulated by the LSGs and the statutory bodies.
8. With its wastewater treatment and biogas plants, plastic waste to energy plant, and paper recycling plant, the KITS aims at a zero waste campus by 2040.

II. DEFINITIONS OF WASTE AND ADHERENCE TO ENACTMENTS

9. Waste may be defined as: "Any substance or object one discards, intends to discard or is required to discard".
10. The Institute is committed to compliance with waste legislation, statutory obligations, and codes of practice. It also manages all waste materials to minimise environmental impact and risk to public health by implementing and maintaining a standard environmental management system.
11. The Waste and Resources Management Policy of KITS has been drafted, considering the Ministry of Environment, Forests and Climate Change guidelines of the Government of India and the Central and State Pollution Control Boards. The National Environment Policy - 2006 highlighted waste disposal and the significance of recycling and treating waste.
12. The KITS Policy takes into cognisance the relevant and significant Enactments of the Government of India, such as The Solid Waste Management Rules – 2016, The Draft Liquid Waste Management Rules – 2024, The Hazardous Wastes (Management, Handling and Transformity Movement) Rules – 2008, The Plastic

Waste (Management and Handling) Rules – 2011, The Bio-Medical Waste (Management and Handling) Rules – 1998, The Batteries (Management and Handling) Rules – 2001, and The E-Waste (Management and Handling) Rules – 2011, and other stipulations of LSGs, UGC and statutory bodies.

13. In line with the principles of the waste hierarchy, the community in KITS shall work towards: Prevent – avoid creating waste; Reduce – minimising the amount of waste produced; Reuse – repair, refurbish or relocate items; Recycle – promote segregation of waste to increase the quantity of waste recycled; Recovery – send non-recyclable waste to energy recovery; and Dispose of – this will only be used as a last resort if all other options are exhausted.
14. The community shall also focus on Eliminating disposable items, including single-use plastic, where there is a clear case and a viable alternative exists; Collecting and analysing data (amount of waste generated by site and disposal method); setting waste improvement targets and monitoring and report annual data and progress against waste targets;
15. The KITS community shall also work with the suppliers, contractors, and partners to ensure this Policy's fulfilment and implementation on the campus and the surrounding areas
16. The entire community, with the cooperation of Controlling Officers, shall work towards:
    - Integrating the principles of the circular economy into operations and procurement decisions to minimise waste generated,
    - Providing suitable training to staff involved in waste management to effectively implement the Policy,

- Engaging with academic departments to promote and support teaching and research on sustainable waste and resource management,
- Developing a Waste and Resources Strategy and Action Plan to support the implementation of this Policy,
- Ensuring that the relevant SDGs in the area are addressed.

III. ROLES AND RESPONSIBILITIES

17. The Chief Engineer (Construction and Maintenance)) is primarily responsible for managing compliance with the Policy in the entire campus/estate and ensuring adequate resources are available to deliver on its implementation.
18. The Deans of Schools shall ensure the implementation of policy on their premises, including laboratories and other units.
19. The Sustainability Team, the Deans of Schools, and the Chief Engineer shall review the progress made in implementing this Policy.
20. All stakeholders, including staff, students, contractors, suppliers, business partners and visitors, are responsible for adhering to this Policy.
21. Suggestions or complaints should be submitted to the Registrar, who, together with the University Coordination Committee, shall address all suggestions and complaints.
22. Regarding the complaints, the Vice Chancellor will be the final appealing authority.

THIS POLICY WILL BE REVISED FROM TIME TO TIME AS DEEMED NECESSARY

Water Reuse and Measurement

Karunya Institute of Technology and Sciences (KITS) is a **720-acre, fully residential campus** operating a **closed-loop water circulation system**, ensuring efficient consumption, continuous monitoring, and **zero untreated wastewater discharge**.

Campus Population Considered for Calculation: 8087. The institutional approach prioritizes **reuse-first water management**, reducing dependence on freshwater withdrawals and ensuring long-term aquifer sustainability.

Water Supply, Treatment, and Reuse Network

Stage	Infrastructure	Functional Capacity	Measurement System
Freshwater Input	Siruvani /TWAD + 19 Borewells + 5 Open Wells	1.4–1.6 MLD	Operational Time and capacity
Treatment	4 STPs (Total: 2,450 KLD)	Domestic wastewater recycling	Flow meter
Potable Production	RO Plants (2000 & 500 LPH)	Drinking & cooking supply	Sensors and RO Logbook Registers
Storage & Distribution	8 Sumps + 46 OHTs + 14 Pumps	Internal distribution network	119 IoT Level Controllers
Reuse Network	113 Reuse Outlets	Irrigation	-

KITS reuses 91.5% of total water demand — demonstrating near-zero discharge performance.

STP and Reuse Output Distribution

STP Unit	Installed Capacity (KLD)	Annual Output (m^3/year)	End-Use Application
JMR Hostel	1000	132,525	Irrigation, lawns etc.
FDR Hostel	400	79,729	Hostel & garden irrigation
Ladies Hostel STP	450	61,778	Mess cleaning
PR GARG Campus STP	600	111,171	Farm Irrigation (329 acres)
Total	2,450 KLD	385,204 m^3/year	100% Recycled and Reused

RO Treated Drinking Supply: 2,618 m^3/year

Monitoring Tools: FREHNIG IoT Flow Transmitters + Database (LPS + cumulative flow).



Reuse Water Quality and Standards

Treated water is tested once in 6 months for compliance with TNPCB reuse standards:

Parameter	Range (mg/L)	TNPCB Standard
pH	7.0–7.6	6.5–8.5
BOD	8–12	≤ 20
COD	35–45	≤ 100
TSS	12–18	≤ 50
Total Coliform	Nil	<100 MPN/100ml

All STP-treated water is safe for irrigation and gardening purposes.

Water Management Educational Opportunities at Karunya Institute of Technology and Sciences (KITS)

Karunya Institute of Technology and Sciences (KITS) identified four thrust areas of societal importance - Water, Food, Healthcare, and Sustainable Energy to align with national priorities and Sustainable Development Goals (SDGs). Among these, Water remains a major focus area, reflecting KITS's long-standing commitment to sustainable water management, conservation, and community education.

The Water Institute (WI)

Established in 2008, the Water Institute (WI) serves as a flagship interdisciplinary centre dedicated to advancing scientific water management and ensuring water security, particularly in semi-arid regions. The Institute draws inspiration from international milestones such as the Dublin (1992), Rio (1992), and Johannesburg (2012) Conferences, and national programs like the National Drinking Water Mission and WAR for Water. The WI brings together faculty and students from engineering, agriculture, science, and management disciplines to collaborate on research, technology development, and societal outreach.

Infrastructure for Research and Consultancy

To strengthen education and research in water management, Karunya Institute of Technology and Sciences (KITS) has established four specialized laboratories focusing on Hydrology, Water Quality Testing, Central Instrumentation, and Computational and Simulation Studies. These state-of-the-art facilities are designed to promote interdisciplinary research and practical learning in sustainable water resource management.

The laboratories are equipped with advanced analytical instruments such as Atomic Absorption Spectrophotometer (AAS), Total Organic Carbon (TOC) Analyzer, UV Spectrophotometer, Ion Chromatography, and BET Surface Area Analyzer for precise water quality assessment. Field and monitoring equipment such as Automatic Weather Stations, Electrical Resistivity Meters, and Hydrometeorological Sensors support data collection for hydrological and groundwater studies.

In addition, the iGIS and FEFLOW software platforms are utilized for groundwater flow and contaminant transport modeling, enabling simulation-based decision-making in water management. The Central Instrumentation Facility further enhances research through shared access to high-end instruments including NMR, FTIR, SEM, AFM, XRD, HPLC, and GC, supporting advanced characterization and interdisciplinary collaboration in water and environmental research.

Academic Programs and Research Opportunities

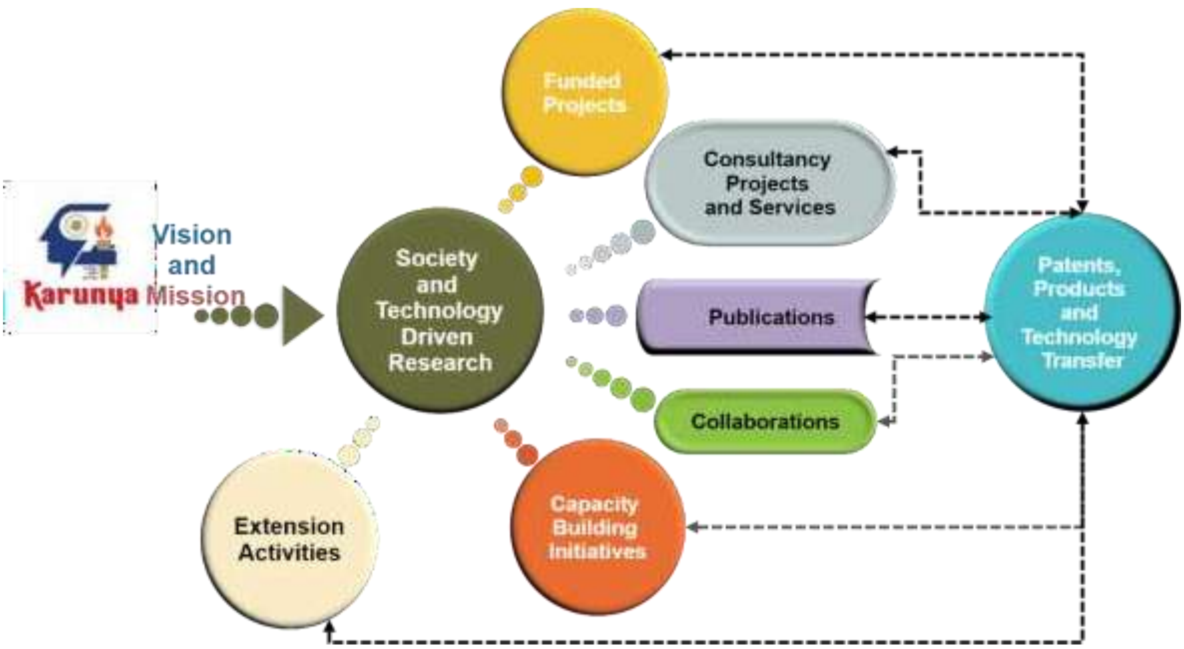
KITS provides diverse educational pathways from Undergraduate to Doctoral programs, focusing on water resources, treatment, and sustainability.

- The M.Tech. in Integrated Water Resources Management (IWRM), introduced in 2009 and later revamped as M.Tech. Environmental and Water Resources Engineering (2017), was framed using UNESCO-IHE and SaeiWATERs guidelines.
- The Ph.D. program under WI has produced over 20 doctoral theses addressing topics such as:
    - Land cover–land use impacts on hydrology
    - Groundwater recharge using isotope applications
    - Nano-membrane and electrocoagulation techniques for water treatment
    - Bioremediation and decentralized wastewater management models

Mission and Focus Areas

The Water Institute pursues a clear mission supported by six key strategies:

1. Participation in policy formulation
2. Academic intervention through curriculum integration
3. Research and consultancy for real-world solutions
4. National and international collaborations
5. Capacity building through workshops and training
6. Extension and outreach activities for community awareness



Curriculum Aligned with SDG 6: Clean Water and Sanitation

KITS offers 46 courses directly linked to SDG 6 across engineering, agriculture, and applied sciences. These include:

- Water and Wastewater Engineering
- Irrigation Water Management
- Hydrology and Water Resources Engineering

- Nanotechnology for Water and Wastewater Treatment
- Rainfed Agriculture and Watershed Management

Each course integrates sustainable water use, treatment technologies, and pollution prevention principles. Mapping exercises show alignment with Clean Water and Sanitation goals up to 100% for certain programs.

S.No.	Course code	Course Name
1	14CE2005	Applied Hydraulics and Hydraulic Machinery
2	14CE2008	Water and Waste water Engineering
3	14CE2011	Water Resources Engineering
4	15CE2001	Irrigation Engineering
5	14CE3036	Hydrology practicals
6	14CE3040	Water and Wastewater treatment
7	16CE3004	Elements of hydrology
8	16CE3005	Design of hydraulic and conveyance structures
9	16CE3006	Water resources planning and systems engineering
10	16CE3014	Nanotechnology for water and wastewater treatment
11	17CE2005	Applied Hydraulics and Hydraulic Machinery
12	17CE2008	Water Supply and Wastewater Engineering
13	17CE2028	Design and Drawing (Irrigation and Environmental)
14	17CE3054	Water and Wastewater treatment
15	17CE3058	Elements of hydrology
16	17CE3059	Design of hydraulic and conveyance structures
17	17CE3060	Water resources planning and systems engineering
18	17CE3061	Principles of integrated water resources management
19	17CE3062	Hydrology laboratory
20	17CE3077	Forest, Urban and Agricultural Watershed management
21	17AG1005	Irrigation Water Management
22	18CE2019	Hydraulic Engineering
23	18CE2025	Hydrology and Water Resources Engineering
24	18ME2082	Introduction to Water Technologies
25	18AT2001	Fluid Mechanics and Open Channel Hydraulics
26	18AT2009	Soil and Water Conservation Engineering
27	18AT2015	Ground water, Wells and Pumps
28	18AT2016	Water Harvesting and Soil Conservation Structures
29	18AT2018	Irrigation and Drainage Water Engineering

30	18AT2019	Micro Irrigation
31	18AT2044	Water Quality and Management Measures
32	18CE3036	Surface flow hydrology
33	18CE3038	Water resources planning and systems engineering
34	18CE3039	Water and Wastewater treatment technology
35	18CE3040	Hydrology laboratory
36	18CE3054	Principles of integrated water resources management
37	18CE3059	Impact of climate change on water resources
38	18ME2028	Hydraulics and Pneumatics
39	18ME2029	Hydraulics and Pneumatics Laboratory
40	18AG1007	Irrigation Water management
41	18AG2027	Rainfed Agriculture and Watershed Management
42	18HO1006	Irrigation and Weed Management in Horticultural Crops
43	20CE2039	Irrigation Engineering and Hydraulic Structures
44	19BT2010	Fluid Mechanics
45	19BT2011	Fluid Mechanics and Heat Transfer Lab
46	19BT2030	Environmental Pollution Control Engineering

Courses Aligned with Sustainable Development Goal 6: Water (Odd semester)

S. No	Course Code	Course Title (Odd Semester)	Mapping with SDG 6: Clean Water and Sanitation in %
1	17NT2002	Synthesis of Nanomaterials	5
2	17PH3017	Renewable Energy Sources	5
3	17PH3021	Material Characterization	20
4	18AG2015	Environmental Studies and Disaster Management	40
5	18AG2019	Crop Improvement I (Kharif crops)	70
6	18AG2020	Manures, Fertilizers and Soil Fertility Management	25
7	18AG2024	Precision Farming	50
8	18AG2029	Principles of Organic Farming	50
9	18AT2009	Soil and Water Conservation Engineering	50
10	18AT2018	Irrigation and Drainage Water Engineering	50
11	18CE2025	Hydrology and Water Resources Engineering	50

12	18CE3035	Atmospheric Environmental Pollution And Control	20
13	18CE3036	Surface Flow Hydrology	50
14	18CE3037	Environmental Chemistry and Microbiology	30
15	18CE3052	Groundwater Hydrology	30
16	18CE3057	Forest, Urban and Agricultural Watershed Management	40
17	18CE3058	Wetland Hydrology	30
18	18CE3061	Remote Sensing and Geographical Information System	10
19	18CH2001	Environmental Studies	30
20	18ME2028	Hydraulics and Pneumatics	30
21	18ME2047	Power Plant Engineering	10
22	18RO2010	Programmable Logic Controllers	10
23	18RO2011	Automation System Design	20
24	19CH3002	Waste to Energy	20
25	19ME2025	Thermodynamics	30
26	20AG2001	Rural Agricultural Work Experience (RAWE)	25
27	20AG2008	Fundamentals of Plant Breeding	50
28	20BT3031	Advanced Environmental Biotechnology	75
29	20FP3021	Green Technology in Food Processing	20
30	20ME1007	3D Printing Technology	10
31	20ME1009	Engineering Drawing and Graphics-2021 B.Tech BME A	20
32	20ME2016	Fluid Mechanics and Fluid Machines	20
33	20NT3018	Commercialization of Nanotechnology Products	10
34	20NT3020	Nanomaterial-Based Energy Devices	80
35	20RO2007	Smart Sensors for IoT Applications	10
36	20RO3017	Image Processing and Machine Vision	10
37	21AG1301	Fundamentals of Soil Science-2021 B.Sc Agri	50
38	21AG3001	Modern Concepts in Crop Production	30
39	21AG3005	Agro-Meteorology and Crop Weather Forecasting	45
40	21AG3006	Cropping Systems and Sustainable Agriculture	50
41	21AG3027	Principles of Plant Breeding	50

42	21AG3216	Soil Fertility and Fertilizer Use	25
43	21HO3127	Growth and Development of Horticultural Crops	50
44	21HO3131	Subtropical and Temperate Fruit Production	45
45	21MS3061	Spatial Data Analytics	10

Courses Aligned with Sustainable Development Goal 6: Water (Even semester)

S. No	Course Code	Course Title (Even Semester)	Mapping with SDG 6: Clean Water and Sanitation in %
1	17CH1004	Environmental Studies-2021 BBA	30
2	17EI2028	SCADA Systems Design	25
3	18AG2012	Problematic Soils and their Management	25
4	18AG2027	Rainfed Agriculture and Watershed Management	100
5	18AG2028	Practical Crop Production (Rabi crops)	30
6	18AG2032	Crop Improvement - II (Rabi crops)	70
7	18AG2034	Farm Management, Production and Resource Economics	100
8	18AG2035	Principles of Food Sciences and Nutrition	100
9	18AT2015	Groundwater, wells and Pumps	50
10	18AT2016	Water Harvesting and Soil Conservation Structures	50
11	18AT2019	Micro Irrigation	100
12	18BT2051	Role of Biotechnology in Environment	75
13	18CE3038	Water Resources Planning and Systems Engineering	40
14	18CE3039	Water and Wastewater Treatment Technology	40
15	18CH2001	Environmental Studies	30
16	18EI2005	Measurement and Instrumentation	30
17	18FP2020	Bakery, Beverages and Confectionery Technology	20
18	18HO2003	Precision Farming and Protected Cultivation	50
19	18HO2013	Principles of Ornamental Horticulture and Landscape Architecture	20
20	18ME2027	Fundamentals of Thermal Sciences and Fluid Mechanics	10

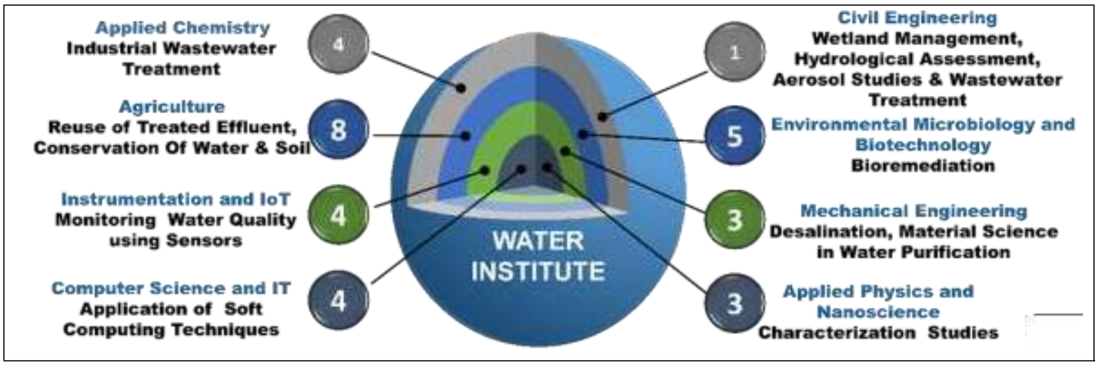
21	18ME2055	Computer Aided Design	10
22	18ME2058	Mechatronics systems	10
23	18RO2011	Automation System Design	20
24	19MA3030	Mathematical Modeling	10
25	19ME2020	Drone Technology-(Combined Class)	5
26	19RO1002	Engineering Practices	10
27	20AG1002	Introductory Agro-Meteorology & Climate Change	40
28	20AG2013	Principles of Seed Technology	60
29	20BC2019	Disaster Management	20
30	20BT3066	Algae Biotechnology	25
31	20CE2014	Water Resources Systems	20
32	20CH3040	Water Treatment Technologies	10
33	20RO2003	Sensors and Protocols for Instrumentation	30
34	20RO2007	Smart Sensors for IoT Applications	10
35	20RO3017	Image Processing and Machine Vision	10
36	21AG1201	Fundamentals of Genetics	20
37	21AG1302	Introductory Agro-meteorology & Climate Change	40
38	21AG1303	Agricultural Microbiology	20
39	21AG1451	Introductory Soil and Water Conservation Engineering-2021 B.Sc Agri A	50
40	21AG1503	Fundamentals of Crop Physiology	15
41	21AG3004	Principles and Practices of Water Management	100
42	21AG3007	Dryland Farming and Watershed Management	50
43	21AG3010	Agronomy of Fodder and Forage Crops	20
44	21AG3218	Remote Sensing and GIS Techniques for Soil, Water and Crop Studies	75
45	21AG3226	Agricultural Research, Research Ethics and Rural Development Programs	25
46	21ME3004	Manufacturing System and Simulation	10

Interdisciplinary Research and Collaborations

An interdisciplinary team of 75 faculty and numerous students actively participate in water-related research, resulting in:

- 100+ Scopus/WoS-indexed publications

- 12 patents, including collaborations with Ben-Gurion University (Israel) and Cape Breton University (Canada)
- Participation in funded research projects on electro-dialysis, capacitive deionization, and biochar-based purification



Publications

S.No.	Title	Authors	Scopus Source title
1.	Sustainable Solutions: Reviewing the Future of Textile Dye Contaminant Removal with Emerging Biological Treatments	Kusumlata| Ambade, B.| Kumar, A.| Gautam, S.	Limnological Review
2.	A sustainable and eco-friendly approach for environmental and energy management using biopolymers chitosan, lignin and cellulose — A review	Christina, K.| Subbiah, K.| Arulraj, P.| Krishnan, S.K.| Sathishkumar, P.	International Journal of Biological Macromolecules
3.	Rational construction of MOF derived α-Fe2O3/g-C3N4 composite	Kumaravel, S.| Avula, B.| Chandrasatheesh,	Spectrochimica Acta - Part A:

	for effective photocatalytic degradation of organic pollutants and electrocatalytic oxygen evolution reaction	C.| Niyitanga, T.| Saranya, R.| Hasan, I.| Abisheik, T.| Rai, R.S.| Pandiyan, V.| Balu, K.	Molecular and Biomolecular Spectroscopy
4.	Influence of nickel doping and cotton stalk activated carbon loading on structural, optical, and photocatalytic properties of zinc oxide nanoparticles	Thirumoolan, D.| Ragupathy, S.| Renukadevi, S.| Rajkumar, P.| Rai, R.S.| Saravana Kumar, R.M.| Hasan, I.| Durai, M.| Ahn, Y.-H.	Journal of Photochemistry and Photobiology A: Chemistry
5.	Sustainable management of tea wastes: resource recovery and conversion techniques	Duarah, P.| Haldar, D.| Singhania, R.R.| Dong, C.-D.| Patel, A.K.| Purkait, M.K.	Critical Reviews in Biotechnology
6.	IoT-Based Automatic Water Quality Monitoring System with Optimized Neural Network	Bamini, A.A.M.| Chitra, R.| Agarwal, S.| Kim, H.| Stephan, P.| Stephan, T.	KSII Transactions on Internet and Information Systems
7.	A coastal band spectral combination for water body extraction using Landsat 8 images	Aroma, R.J.| Raimond, K.| Estrela, V.V.| de Jesus, M.A.	International Journal of Environmental Science and Technology
8.	Assessing variability and hydrochemical characteristics of groundwater fluoride contamination and its associated health risks in East Singhbhum district of Jharkhand, India	Ambade, B.| Sethi, S.S.| Patidar, K.| Gautam, S.| Alshehri, M.	Journal of Hazardous Materials
9.	Application of artificial intelligence tools in wastewater and waste gas treatment systems: Recent advances and prospects	Behera, S.K.| Karthika, S.| Mahanty, B.| Meher, S.K.| Zafar, M.| Baskaran, D.| Rajamanickam, R.| Das, R.| Pakshirajan, K.| Bilyaminu, A.M.| Rene, E.R.	Journal of Environmental Management
10.	Comprehensive assessment of microalgal-based treatment processes for dairy wastewater	Singh, P.| Mohanty, S.S.| Mohanty, K.	Frontiers in Bioengineering and Biotechnology
11.	IoT and ML-based automatic irrigation system for smart agriculture system	Anoop, E.G.| Bala, G.J.	Agronomy Journal
12.	Optimized phenol degradation and lipid production by Rhodosporidium toruloides using response surface methodology and genetic algorithm-optimized artificial neural network	Singh, S.| Mahanty, B.| Gujjala, L.K.S.| Dutta, K.	Chemosphere

13.	Multi-model exploration of groundwater quality and potential health risk assessment in Jajpur district, Eastern India	Sabinaya, S.| Mahanty, B.| Rout, P.R.| Raut, S.| Sahoo, S.K.| Jha, V.| Sahoo, N.K.	Environmental Geochemistry and Health
14.	Dynamic change analysis of water spread region and its impact assessment using spectral indices of remotely sensed data	Anand, B.| Rekha, R.S.| Remitha, K.R.| Maniyammai, V.| Ramaswamy, K.| Gautam, S.	Environment, Development and Sustainability
15.	Nanozymes as Catalytic Marvels for Biomedical and Environmental Concerns: A Chemical Engineering Approach	T, S.K.| BS, M.N.D.| Babu, L.R.| Paul, A.E.| Murugan, S.| Periakaruppan, R.	Journal of Cluster Science
16.	Farm-era: Precision Farming with GIS, AI Pest Management, Smart Irrigation, Data Analytics, and Optimized Crop Planning	Reddy, K.P.| Roshni Thanka, M.| Edwin, E.B.| Ebenezer, V.| Stewart Kirubakaran, S.| Joy, P.	7th International Conference on Inventive Computation Technologies, ICICT 2024
17.	Utilizing banana peduncle as an affordable bio-adsorbent for efficient removal of lead ions from water and industrial effluents	Muthusamy, P.| Murugan, S.| Mandal, S.K.| Mishra, B.| Mohanta, Y.K.| Sarma, H.| Narayan, M.	Sustainable Chemistry for the Environment
18.	Plant-based biopolymers for wastewater pollutants mitigation	Harshan, K.| Rajan, A.P.| Kingsley, D.| Sheikh, R.A.| Aashmi, J.| Rajan, A.P.	Physical Sciences Reviews
19.	Crop water management using machine learning-based evapotranspiration estimation	Meenal, R.| Jala, P.K.| Samundeswari, R.| Rajasekaran, E.	Journal of Applied Biology and Biotechnology
20.	Smart Waste Bins using DCNN and Internet of Things	Ande, A.| Sundar, G.N.| Thomas, R.| Nair, V.| Narmadha	2nd International Conference on Emerging Trends in Information Technology and Engineering, ic-ETITE 2024
21.	Development of biopolymers from microbes and their environmental applications	Nambiar, K.| Kumari, S.P.| Devaraj, D.| Sevanan, M.	Physical Sciences Reviews
22.	Spatial analysis and assessment of soil erosion in the southern Western Ghats region in India	B, A.| K.R, R.| R, S.R.| M, M.D.| K, R.	Environmental Monitoring and Assessment
23.	Advanced Weather Monitoring and Disaster Mitigation System	Paul, D.J.| Janani, S.P.| Ancy Jenifer, J.	2024 International Conference on Cognitive Robotics and Intelligent Systems, ICC - ROBINS 2024

24.	A reversible fluorescent chemosensor based on a naphthalene dyad for Pb(II) ions: Applications in food, water, and bio-imaging	David, C.I.| Prabakaran, G.| Narmatha, G.| Luther, J.M.| Manigandan, S.| Muthusamy, A.| Kayalvizhi, R.| Kannan, V.R.| Kumar, R.S.| Nandhakumar, R.	Journal of Food Composition and Analysis
25.	Modelling selenite and chemical oxygen demand removal in an inverse fluidized bed bioreactor using genetic algorithm optimized artificial neural network	Sinharoy, A.| Mahanty, B.| Behera, S.K.| Mehta, M.| Mantri, S.| Das, R.| Saikia, S.| Rene, E.R.| Pakshirajan, K.	Journal of Chemical Technology and Biotechnology
26.	Production of biochar from Keppaphycus alvarezii (macroalgae) for the removal of eosin yellow: desorption, kinetic, and isotherm studies	Elayappan, T.| Jayanarayanan, B.| Daniel, A.P.	Biomass Conversion and Biorefinery
27.	Reuse and Recovery of Water from Industrial Textile Dyeing Effluent Using High-Performance Electrodes Continuous Flow Electrocoagulation Reactor	Jegathambal, P.| Brunoc| Shobina| Mayilswamy, C.| Parameswari, K.	Nature Environment and Pollution Technology
28.	Adsorption isotherms and kinetic studies for the defluoridation from aqueous solution using eco-friendly natural adsorbent like Terminalia Chebula	Sumathi, J.| Benedict, B.A.| Sheela, L.S.| Bhagavathsingh, J.| Manickam, V.	Sustainable Chemistry for Climate Action
29.	Facile synthesis of 3D graphite incorporated double doped ZnO nanocomposite material with enhanced photocatalytic properties: Evaluation of ecotoxicity and phytotoxicity	Kuruvilla, E.| Samson Nesaraj, A.| Jose, V.| Jose, V.| Dhanasekaran, P.| Arunkumar, M.	Inorganic Chemistry Communications
30.	Fundamentals and applications of carbon nanotube-based carbocatalysts for water treatment	Kadarkarai, G.| Arumugam, A.| Subramanian, U.M.| Mohan, R.	Woodhead Publishing Series in Composites Science and Engineering: Nanocomposites for Environmental, Energy, and Agricultural Applications
31.	Creating and analyzing Sb–TiO2 photocatalysts for effective UV-A light degradation of RR 120 and MO dyes	Balu, K.| Abisheik, T.| Michele Gomez, L.A.| Durai, M.| Tiffany, M.| R, V.| Afzal, M.| Yadav, A.K.| Pandiyan, V.| Ahn, Y.-H.	Journal of the Indian Chemical Society

32.	A captivating approach to elevate the detection of Al3+ ions incorporates the utilization of a tripodal receptor intricately embellishing the surface of zinc oxide	Tamil Selvan, G.| Samson, J.| Rajasingh, P.| Li, X.| Ravi Kumar, A.| Zhu, N.| Kuldeep, S.A.| Mosae Selvakumar, P.| Jun Tang, P.| Zhang, Z.	Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy
33.	Production of power and fresh water using renewable energy with thermal energy storage based on fire hawk optimization	Rajesh, P.| Gandla, P.K.| Robinson Smart, D.S.| Prayagi, S.V.	Intelligent Decision Technologies
34.	Assessing titanium vs. aluminium electrodes for wastewater remediation in the small-scale industries (SSI) textile sector	Sebastian, S.L.| Kalivel, P.| Subbiah, K.| Murphy, M.S.A.| David, J.J.| Palanichamy, J.	Environmental Nanotechnology, Monitoring and Management
35.	Sustainable groundwater development using semi-supervised learning and community-led total forestry and pasture approach	S, U.M.| Alphy, A.| Deivasikamani, G.| Prakash, U.| Shadrach, F.D.| Kumar, M.A.| Manoj, S.	Groundwater for Sustainable Development
36.	Precision Cultivation for Bonsai through IoT Implemented Smart Irrigation	Daniel, V.| Ramalakshmi, K.| Venkatesan, R.| Sundar, G.N.| Nancy, G.| Shirly, S.	Proceedings of the 3rd International Conference on Applied Artificial Intelligence and Computing, ICAAIC 2024
37.	Simultaneous Assessment of the Nitrates and Nitrites in the Ground Water Samples using Optical Spectrophotometry and Validating the Appropriate Wavelength of Measurement	Suguna Devakumari, M.| Shahbazi, K.	Agricultural Science Digest
38.	Adaptive Water Quality Potability Prediction and Analysis Through GEM Continual Learning Algorithm for Sustainable Resource Management	Jeremy David, C.| Shibin, D.	10th International Conference on Advanced Computing and Communication Systems, ICACCS 2024
39.	Investigating the efficiency of electrocoagulation using similar/dissimilar electrodes for the detoxification of Coralene Rubine dye: a cost effective approach	David, J.J.| Stephen, A.M.M.| Kavitha, S.| Krishnan, S.K.| Mariappan, S.| Sebastian, S.L.| Palanichamy, J.| Kalivel, P.| Sathishkumar, P.	Environmental Geochemistry and Health

40.	Evaluation of toxicity in real-time textile effluents post-treatment using Sorghum bicolor and Danio rerio-Potential for reuse	David, J.J.| Maria Stephen, A.M.| Sebastian, S.L.| Krishnan, S.K.| Kavitha, S.| Kalivel, P.| Palanichamy, J.	Desalination and Water Treatment
41.	Combined tactic of seasonal changes and ionic processes of groundwater in Tamirabarani river basin, India	Chellaiah, G.| Ayyamperumal, R.| Rengaraj, B.| Gopalakrishnan, G.| Senapathi, V.| Chengjun, Z.| Huang, X.	Environmental Science and Pollution Research
42.	Electrocoagulation using Ti/Ti for the remediation and reuse of aqueous Dispersive Blue-79	Sebastian, S.L.| Kalivel, P.| Subbiah, K.| David, J.J.| Stephen, A.M.M.| Palanichamy, J.	Environmental Monitoring and Assessment
43.	Exploring chitosan nanocomposites for wastewater treatment via solid phase extraction biorefinery	Gowri Lakshmi, S.| Gomez, L.A.| Shepherd, R.| Chandrapragasam, V.| Vijay, V.| Thathapudi, J.J.	Bio Refinery of Wastewater Treatment: Way to Generate Waste to Value
44.	Avenues and opportunities of detoxification of micropollutants from industrial effluent using advanced biological treatment techniques	Kandasamy, S.| Babu, S.A.| Dwaraka, S.J.B.| Naveenkumar, M.| Nandakumar, N.P.| Subbiah, K.	Emerging Innovative Trends in the Application of Biological Processes for Industrial Wastewater Treatment
45.	Fate of Micro/Nano Plastic Pollutants in the Marine Ecosystem	Thathapudi, J.J.| Gomez, L.A.| Vijay, V.| Chandrapragasam, V.| Shepherd, R.| Paul, S.| Lee, M.-J.| Somu, P.	Remediation of Plastic and Microplastic Waste
46.	Desalination Performance of Multi-Walled Carbon Nanotubes Added Polymeric Nanocomposite Membrane	Megha, M.| Elangovan, Y.| Pramada, S.K.| Jegathambal, P.| Nidheesh, P.V.	Water, Air, and Soil Pollution
47.	Treatment of acidic electroplating effluent from small scale industries using batch and continuous flow adsorption reactor	Anand, A.M.| Jegathambal, P.| Jannet, S.| Mayilswami, C.	Engineering Research Express
48.	Impact of Indoor Environment and Biological Processes on Bioaerosol Levels in a University Wastewater Treatment Lab	Upadhyay, R.| Przystaś, W.| Gautam, S.	Water, Air, and Soil Pollution
49.	Securing and Preserving the Support of the Community for the	Jayaseelan, D.| Chellaiah, G.| Neogi, A.| Bockhoff, N.| Sivan,	Water Resources Development and Management

	Implementation of the Continuous Water Supply System in India	P.P.| Sunilkumar, A.| Thankachan, A.	
50.	Rainfall Prediction using Machine Learning Algorithms	Sai, P.S.| Thiyagu, T.M.| Soumya, P.G.	Proceedings of the 3rd International Conference on Applied Artificial Intelligence and Computing, ICAAIC 2024
51.	An Investigation on the Treatment of Wastewater Disperse Dye by Electrocoagulation and Examine the Use of the Treated Dye for Flora and Fauna	Asath Murphy, M.S.| Jovitha, J.D.| Robin, R.S.| Sahaya, L.S.| Palanichamy, J.| Parameswari, K.	Iranian Journal of Chemistry and Chemical Engineering
52.	Ecology and diversity of microbial communities involved in the removal of priority contaminants and micropollutants in wastewater treatment systems	Shepherd, R.| Vijay, V.| Nair, A.| Rai, R.S.| Chandrapragasam, V.| Gomez, L.A.| Thathapudi, J.J.	Trends in Biological Processes in Industrial Wastewater Treatment
53.	Monsoon Shifts and Their Impact on Air Quality and Weather: A Case Study of the Amaravathi River Basin, India	Kumar, R.P.| Brema, J.| Gautam, S.| Catherina, G.	Aerosol Optical Depth and Precipitation: Measuring Particle Concentration, Health Risks and Environmental Impacts
54.	Variability of ground water quality in quaternary aquifers of the cauvery and vennar sub-basins within the Cauvery Delta, Southern India	Kokkat, A.| Mondal, N.C.| SajilKumar, P.J.| James, E.J.	Sustainability of Natural Resources: Planning, Development, and Management
55.	IoT Based Water body & Canal Management system using Cloud Technology	Shyaam Sankar, M.| Janani, S.P.| Ancy Jenifer, J.| Stewart Kirubakaran, S.	Proceedings - 2024 4th International Conference on Pervasive Computing and Social Networking, ICPCSN 2024
56.	Microbial immobilization as an adept bioremediation tool for dye degradation	Krishnan, S.K.| Subbiah, K.| Subramanian, K.| Kandasamy, S.	Emerging Innovative Trends in the Application of Biological Processes for Industrial Wastewater Treatment
57.	A study on the assessment of pollution and strategies for	Anto, C.A.| Verghese, V.| Kurian, P.K.|	International Journal of Water

	rejuvenation of Bharathapuzha river in Kerala, India	Cyriac, M.G.| Archana, S.	
58.	Optimizing Pyramid Solar Still Performance using Response Surface Methodology and Artificial Neural Networks	Immanuel, D.G.| Isaac, S.| Kaur, A.| Pearlin, E.| Bohidar, S.K.| Manikandan, R.	Journal of Environmental Nanotechnology
59.	Identifying Drought-Tolerant Rice Genotypes using Drought Response Indices and Machine Learning	Daniels, D.A.| Binodh, A.K.| Raimond, K.| Thankappan, S.	2024 International Conference on Cognitive Robotics and Intelligent Systems, ICC - ROBINS 2024

Extension and Community Outreach
KITS extends its water management knowledge beyond campus through:

- Awareness programs on water conservation and pollution control for local communities.
- Demonstrations on rainwater harvesting, greywater reuse, and precision irrigation at the university farm.
- Student-led initiatives such as clean-up drives in nearby streams and check dams under the Nature Club and NSS.
- Capacity-building workshops under the Karunya Technology Mission on Water and Desalination, promoting community participation in sustainable water use.

Off-campus Water Conservation Support

As part of its commitment to environmental stewardship and social responsibility, Karunya Institute of Technology and Sciences (KITS) has undertaken several off-campus initiatives to promote water conservation, sustainable agriculture, and community development. The institution actively engages with local communities through collaborative research, educational outreach, technology transfer, consultancy, and capacity-building programs.

KITS has developed an Integrated and Sustainable Village Development Model in Pachinampathy Village, Coimbatore District, which serves as a demonstration site for environmentally responsible and resource-efficient rural practices. The initiative emphasizes water security, food security, and livelihood sustainability through community-based projects and participatory development.

Karunya Community Outreach and Student Sensitization Integrated and Sustainable Village Development
Pachinampathi, Coimbatore District

Key Interventions and Technologies Demonstrated

- **Drip Irrigation for Kitchen Gardens** – Efficient irrigation systems were established to minimize water use and reduce nutrient leaching.

- **Vermicompost Units** – A vermicomposting facility using *Eisenia foetida* (tiger worms) was set up to produce organic manure for kitchen gardens.
- **Organic Kitchen Garden** – A 5-cent organic kitchen garden was developed using vermicompost to promote household-level vegetable production.
- **Rural Water Supply System** – Demonstration of a cost-effective ferrocement storage tank for safe drinking water in rural areas.
- **Household Biogas Plant** – Installed to demonstrate solid waste treatment and clean energy generation for cooking.
- **Solid Waste Management Systems** – Tools and gadgets introduced to improve waste segregation and recycling at the community level.
- **Construction of Sanitation Blocks** – Built using bamboo-reinforced geopolymer precast units and fly ash toilets, representing low-cost, eco-friendly sanitation technology.
- **Solar Lamps Installation** – Provided for community meetings to encourage renewable energy use in villages.
- **Tree Plantation and Nutritional Gardens** – Encouraged environmental awareness and improved household nutrition.

Community Engagement and Educational Activities

KITS faculty and students conducted various training sessions, awareness campaigns, and demonstrations on low-cost and sustainable farming practices, including:

- Preparation of Neem Seed Kernel Extract (NSKE) and Panchakavya.
- Techniques such as banana pralinage, stem injection, root feeding in coconut, and bee keeping.
- Use of yellow sticky traps and bucket traps for eco-friendly pest management.
- Tree banding and azolla cultivation demonstrations.

Additionally, health and environmental awareness campaigns were organized to educate villagers on sanitation, water purification, and personal hygiene. The outreach program also focused on livelihood improvement through the cultivation of coconut, moringa, and other useful plants.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A Farmers' Meeting was conducted in Mullassery, Kerala, on 09 September 2023, focusing on sustainable water management and adaptation strategies in wetland-based farming systems. Following this, a National Farmers' Meeting was held in Pullazhi, Kerala, on 11 September 2023, emphasizing the *management of Kol wetlands* in relation to climate change impacts and anthropogenic pressures. On the same day (11 September 2023), a consultation meeting was organized with officials from the Irrigation and Agriculture Departments and academicians. The meeting facilitated discussions on methodologies, best practices, and challenges faced in the sustainable management of the Kol wetlands under changing climatic conditions.

In addition, an international research initiative titled *"Evaluation of Ecosystem Services in the Context of Climate Change – Kol Wetlands, India"* was supported by the Ramsar Regional Center – East Asia (RRC-EA), South Korea, with a funding support of USD 9,722. The Kol wetlands, located in Thrissur district of Kerala, are Ramsar-listed ecosystems that play a vital role in supporting local livelihoods, maintaining biodiversity, and regulating hydrological cycles. The outcomes of this project revealed the increasing vulnerability of the Kol wetlands





to climate change, highlighting the urgent need for sustainable interventions and collaborative efforts to conserve and restore these critical water ecosystems.

Impact and Outcome

These collaborative interventions have strengthened the link between academia and community, creating a living laboratory for students and researchers while directly benefiting local populations. The Pachinampathy Model Village stands as a successful example of how integrated approaches - combining water conservation, renewable energy, waste management, and sustainable agriculture can lead to holistic rural development.

6.5.4 Sustainable Water Extraction on Campus

KITS has implemented sustainable water extraction practices on the campus essential for conserving water and reducing the environmental impact of campus operations. The strategies that KITS has considered to achieve sustainable water extraction are:

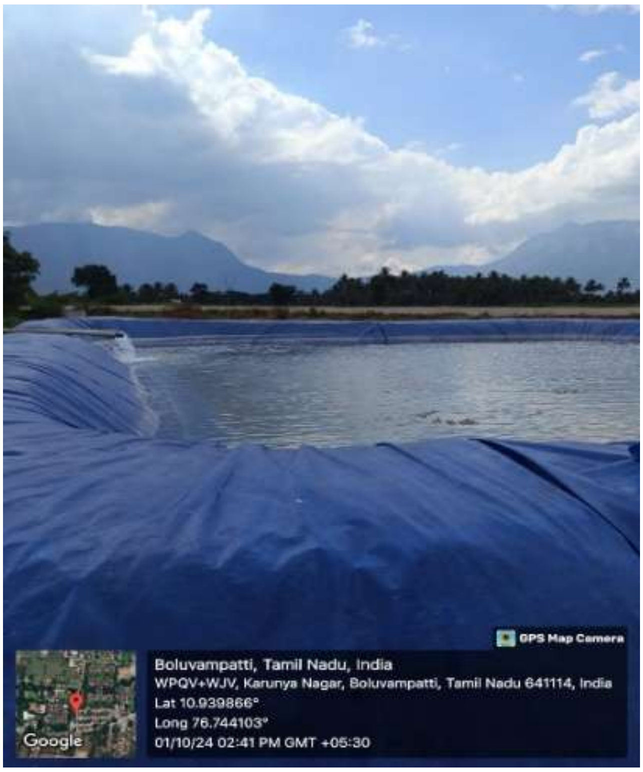
- IoT based Smart Irrigation
- Recycling and Reuse of Greywater generated in the campus.
- Sustainable building design with rainwater harvesting
- Water metering and monitoring
- Water efficient appliances such as self-closing taps, semi-automatic flushing tap, *Push*
- tap in wash basin, Hand shower, Push tap in water purifier,
- Research and innovation
- Water audits to identify the supply and demand.
- Policy

a. Water Structures in the campus (Ponds, tanks, small reservoirs and open wells)

S.No.	Lattitude	Longitude	Elevation (mts.)	Name	Location
1	10.943585	76.745736		Open well	Near West gate, Periya Thoppu
2	10.958098	76.753671	482	Open well	Near Farm Office, Seeba Well
3	10.942536	76.75331	460	Open well	Opposite to Farm Office
4	10.950613	76.747587	470	Open well	Near Orchard
5	10.940869	76.746818	478	Open well	Near Store Room
6	10.942536	76.75331	474	Open well	Opposite to Farm Pond
7	10.942536	76.75331	483	Open well	Near Dgs Ground
8	10.943751	76.74859	482	Open well	Near East Gate
9	10.942536	76.75331	482	Open well	**Block B1, Near Old banana area**
10	10.943585	76.745736	473	Open well	West side of North Land, Gokulam Theatre
11	10.958098	76.753671	483	Borewell	Four Corner
12	10.958098	76.753671	479	Borewell	Near shade net
13	10.943316	78.745222	475	Borewell	Borewell Thoppu
14	10.938314	76.750319	482	Borewell	EMS Opp.land (6.5 ac)
15	10.93893	76.750098	484	Borewell	EMS Opp.land (6.5 ac)
16	10.939587	76.752978	480	Borewell	EMS back side-1
17	10.935921	76.743564	473	Borewell	EMS back side-2
18	10.931493	76.748582	472	Borewell	Road side, EMS Back side-3

19	10.931548	76.74851	480	Borewell	EMS Back side-4
20	10.929945	76.757638	472	Borewell	EMS Back side-5
21	10.929945	76.757638	479	Borewell	EMS Back side-6
22	10.934145	76.751591	460	Open well	EMS Back side

Water Conservation Structures (Farm Ponds and Tanks) – Karunya Institute of Technology and Sciences



b. **Rainwater Harvesting:** During monsoon season, the volume of water collected from terrace of each building is calculated using the terrace area and the depth of rainfall over the area. The water collected over the terrace is directed to augment the groundwater through soak pits located in each of the building.
Ferrocement Storage Tank (Partially underground)

In the campus, a roof top rainwater structure (with capacity of 25,000 m3) made of ferrocement has been installed to collect the storm water from the roof of administrative block with an area of 1900 sq. m. The rain water that is being collected in the tank is supplied for washing purposes in the same block

Soak Pit (Groundwater Recharge)

Around 33 soak pits (3 m depth with 1.8 m diameter) are used to harvest roof top water, which are located in front / behind the academic departments and student hostels. These structures improve the groundwater recharge in the campus and augment the groundwater potential.


c. **Efficient Irrigation System:** Karunya model is a unique drip irrigation system where every line of plantation can be irrigated separately. The gate valves have been divided into blocks and independent rows as well leading to have multiple crop in one area. Based on the water requirement of each crop, the watering done in a controlled manner not only in block level but every row. In addition to the drip irrigation on land, overhead drip is practised in head which is a permanent fixture. Also drought resistant plants in landscaping reduce the water requirement.





d. **Greywater Recycling and Reuse:** For effective recycling and reuse of greywater from sinks, showers, washing of utensils in the kitchen and washing machines, five Sewage Treatment Plants (STP) have been constructed in the Student Hostels. In addition to that, to treat the black water from all the student hostels, four Biogas Plants have been installed to treat black water and for production of biogas to replace two to three commercial cylinders for cooking every day. The treated or recycled wastewater is reused for gardening (from 113 STP treated water outlets). The details on the capacity of each STP and the inflow rate with the quantity of treated effluent are given in the table below.

Average Treated water Output from STP's in KITS Campuses

Sl.No	Location	Capacity of STP	Average Wastewater Inflow Flow Rate in STP
1	JMR STP	1000 m^3 /day	650 -700 m^3 /day
2	FDR STP	400 m^3 /day	250 -300 m^3 /day
3	Ladies Hostel STP	450 m^3 /day	300 – 350 m^3 /day
4	PR GARG STP	600 m^3 /day	350 -400 m^3 /day
5	Bethesda STP	8 m^3 /day	4 m^3 /day

Reuse of Greywater for irrigation and gardening (Outlet Points)

Location	No. of Outlet Points
Student Hostel	88
Campus	25

e. Sustainable Building Design with Water-Efficient Appliances: KITS initiated a program to promote water efficiency by installing self-closing taps in various areas, including the hostel and college campuses. These taps are designed to minimize water wastage by automatically shutting off after use. The total number of self- closing taps installed at KITS is 3,376. To assess the effectiveness of this initiative, we calculate the percentage of water-efficient appliances installed compared to the total potential. KITS has achieved full installation of these water-efficient appliances. This depicts a thorough commitment to water conservation and sustainability

f. **Water Metering and Monitoring:** Flow Meters (FM) have been installed to track water usage in various campus facilities and monitor consumption patterns.

- FMs have been installed at the inlet of the sewage treatment plant to measure inflow into the collection tank and at the outlet to measure the reuse water for gardening and irrigation.

- FMs have been installed in both intake and delivery points of RO plants to measure the volume of treated water being used drinking and cooking.

Flow Meters at the Filter Unit of Treatment Plant to measure the Treated Water

g. **Education and Outreach:** KITS regularly organises awareness creating webinars, club and outreach activities on importance of water conservation among students, faculty, and staff. Use posters, flyers, and digital communication channels to share information about the university's water usage and the need for conservation.

h. Conservation of Water Bodies: Water bodies play a crucial role in sustaining life and ecosystems. To raise awareness about the importance of conserving these invaluable natural resources, 135 NCC Cadets of Karunya Institute of Technology and Sciences organized an online event on January 02, 2022. This event aimed to educate, engage, and inspire individuals to take active steps towards the preservation of water bodies. One of the standout features of this event was the creation and presentation of vlogs and poem recitation by NCC cadets, providing unique insights into water conservation.

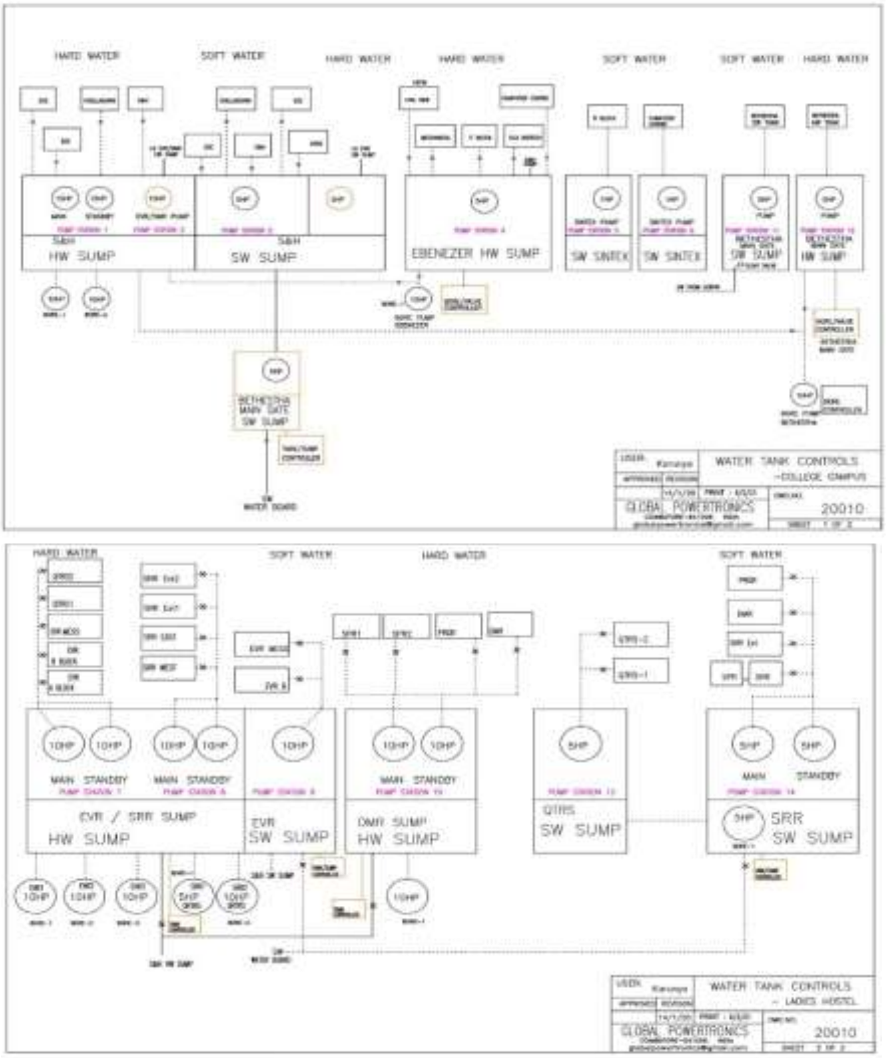
i. Research and Innovation:

j. Water Efficiency Audits: KITS conduct r water efficiency audits to identify opportunities for improvement and assess the effectiveness of conservation measures.

k. Water Quality Monitoring: As per policy, KITS regularly monitors the water quality on the campus, including regular testing of raw water sources for pollutants. TDS value and filters of RO units are checked on a routine basis to monitor the quality of water as per the IS_10500 and revised module IS 10500:2012 - Drinking Water Quality Monitoring Protocol and for regular maintenance of the plant.

l. Quantity of Water saved by Implementing Water Conservation and Management Activities (Other Than Roof-Top RTWH): Since 2019, in University campus, the wireless water level controller operating through modbus communication system has been installed for automatic valve control at the inlet of the sump and over head storage tanks. This helps in avoiding overflow of water and power consumption of the motor there by wastage of water and energy is prevented

The wastage of water due to overflow in storage tanks and sumps is prevented by using sensor-based pump operating system. The sumps in the campus and student hostels are connected to ensure water supply at all times in case of any reduction in groundwater level or mechanical failure of pumps. Three IoT based automated water controllers have been installed in the overhead tanks and sumps by which 10% of water and energy is conserved.



Layout of IoT based Centralized Water Level Control System

6.5.5 Cooperate with local, regional, national or global governments on water security

KITS has cooperation between universities and governments at different levels (local, regional, national, and global) on water security and in supporting policy level in addressing the challenges related to water availability, quality, and management. Such collaborations can lead to research advancements, policy development, and practical solutions for sustainable water resource management. KITS has MoU with following national and international level academic and industry partners. Here are ways in KITS cooperates with governments and universities on water security:

a. Research Partnership with SUEZ, India:

- KITS is an academic partner for SUEZ in India for implementation of 24 x7 water supply scheme. Research studies on chlorine decay studies have been carried out. Students have undergone B. Tech and M. Tech internship at SUEZ. Training programs on Smart Water Meter

System, Water GEM and Computational Optimization of water distribution system have been organized for students.

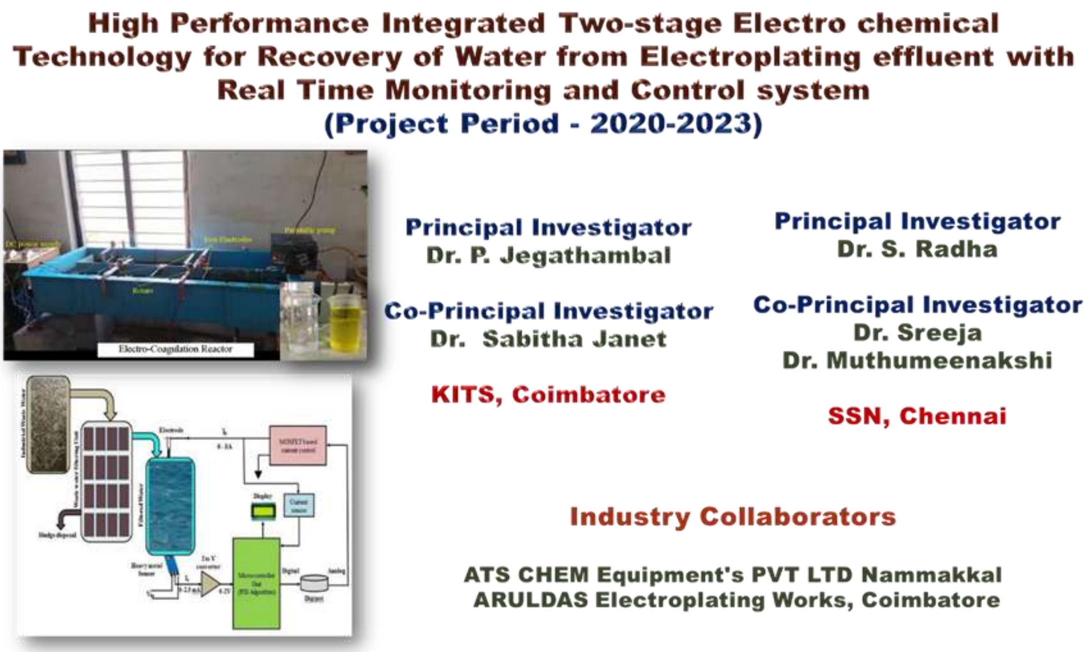
b. KITS is in collaboration with

- National Institute of Hydrology, Roorkee (MoWR)
- TamilNadu Agriculture University
- Centre for Water Resources Development and Management
- National Environmental Engineering Research Institute , for joint research projects, publications, students internship, capacity building activities

c. **Demonstration projects in the industries (Recovery of Water from electroplating effluent):**

KITS in industrial partnership with ATM Chem Equipment Pvt Ltd, Hosur and Aruldas Electroplating Works, Coimbatore:

KITS has **research partnership with academic institution SSN, Chenni** in executing DST project under Technology Stream for the Demonstration to lab-scale project entitled "High Performance Integrated Two-Stage Electrochemical Technology for Recovery of Water from Electroplating effluent with Real Time Monitoring & Control System". ATM Chem Equipment Pvt Ltd and Aruldas Electroplating work are the industrial collaborators in the DST project under Technology Stream for the Demonstration to lab-scale project entitled "High Performance Integrated Two-Stage Electrochemical Technology for Recovery of Water from Electroplating effluent with Real Time

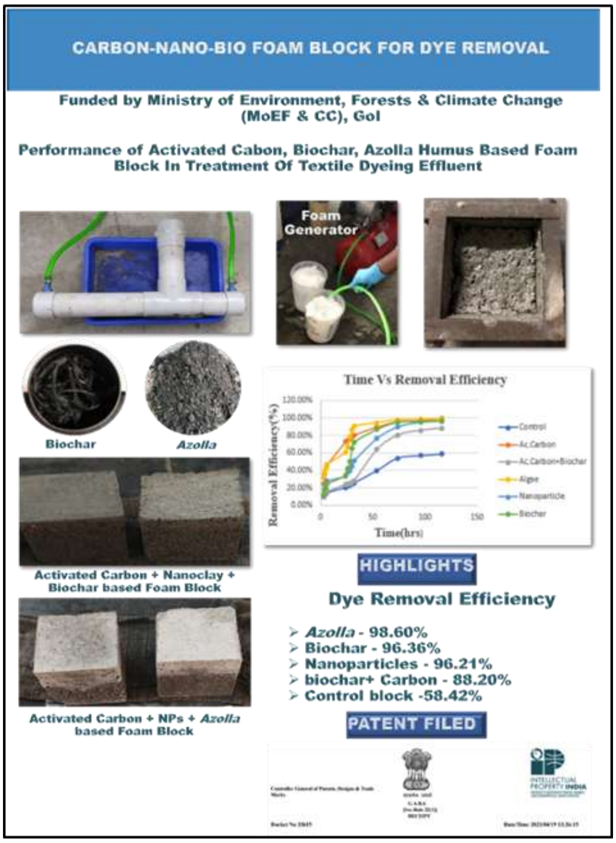


Monitoring & Control System". The ATM Chem Equipment is involved in the fabrication of the Modeland the performance evaluation of the model in treating electroplating effluent. Karunya has linked up with them in joint investigations.

d. Collaborative research is in progress with **Devi Threads PVT Ltd** to evaluate the performance of multichannel baffle type electrocoagulation using TiO_2 /Al electrodes in treatment of textile dyeing effluent. A prototype model has been installed in the industry

and the performance of the reactor in removing dye has been evaluated for the effluent directly coming out of the process unit.

- The CEO of Ray Construction Company is one of the inventors of the patent on 'A Novel Foam Block for Treating Textile Effluent' which is one of the outcomes of the ongoing funded project of the Ministry of Environment, Forest & Climate Change. To transfer the technology to product form, Fellowships for two scholars are provided at KITS.



e. International Collaboration

6.5.6 Promoting Conscious Water Usage

Water is one of the most essential natural resources that sustains life, ecosystems, and development. Recognizing its significance, Karunya Institute of Technology and Sciences (KITS) has taken significant steps toward promoting conscious water usage within the campus. The institute is deeply committed to sustainable water management through education, infrastructure, awareness, and research. These initiatives aim not only to conserve water but also to ensure its efficient and responsible use across all campus activities.
Through various educational programs, infrastructural improvements, and community collaborations, KITS promotes a culture of sustainability and environmental stewardship. The institute's water conservation initiatives are closely aligned with the United Nations Sustainable Development Goal 6 (SDG 6) – *Clean Water and Sanitation*. By integrating technology, research, and community participation, KITS continues to lead by example in responsible water resource management.

Educational Activities (Conferences / Workshops / Seminars / Consultations)

A two-day event on "Climate Change and Sustainable Agriculture" was organized on May 10–11, 2023, by the Karunya Technology Business Incubation Park (KTBIP) and the School of Agricultural Sciences, commemorating India's G20 Presidency under the theme *"Vasudhaiva Kutumbakam – One Earth, One Family, One Future."* The event aimed to promote awareness and innovation in sustainable agriculture and water management practices among students and researchers.

During the event, students showcased innovative models, blogs, vlogs, and exhibits focusing on climate-resilient agriculture, water-efficient cropping systems, and eco-friendly technologies designed to promote sustainable resource use in farming. These exhibits reflected the creativity and research potential of students in addressing contemporary environmental and agricultural challenges.

Ms. Liza Goldberg (USA) conducted a hands-on training session on Google Earth Engine, focusing on *water and vegetation mapping techniques*. This session significantly enhanced the research capacity of both students and faculty, encouraging the integration of geospatial technology in sustainable water and land management studies.

Academic events

KITS organized a series of academic events promoting sustainable water management and research. The Integration of Earth Observations with Isotopes in Water Resources Management workshop held on December 8, 2023, engaged 56 participants and focused on sustainable water resource assessment. On October 17, 2023, World Food Day was celebrated with the theme *"Water is life, water is food. Leave no one behind,"* highlighting the food-water nexus and involving 250 participants. A seminar on Salt Water Intrusion: Challenges and Opportunities in Coastal Agricultural Ecosystems was conducted on October 31, 2023, with 147 participants, addressing issues of water quality in coastal regions. Additionally, a technical session on Thermal Imaging for Infield Crop Water Mapping and Precision Irrigation took place on

February 6, 2024, benefiting 294 participants through insights into precision irrigation technologies.

Awareness Creation and Outreach

KITS regularly organizes awareness programs, webinars, and outreach campaigns to foster conscious water use among students, faculty, and staff. Posters, flyers, and digital communication tools are used to disseminate key conservation messages across the campus. Student organizations at KITS, including the Rotaract Club, Nature Club, and NSS units, actively organize sustainability and water-related programs such as: National Pollution Control Day was observed on December 2, 2023, to raise awareness about the importance of preventing water, air, and soil pollution through sustainable practices. Similarly, World Wetlands Day was celebrated on February 7, 2024, emphasizing the conservation and restoration of wetlands as vital ecosystems for maintaining water quality and biodiversity.

Webinar on Enhanced Water Productivity

A As part of the knowledge exchange activities, international webinars were also conducted to strengthen research and technical skills. Dr. Yafit Cohen (Israel) delivered an insightful session on *remote sensing and precision irrigation*, which benefited 319 participants by introducing advanced tools for optimizing water use in agriculture.

Infrastructure and Water Efficiency Measures

KITS continuously upgrades its infrastructure to reduce water wastage and improve efficiency.
Key measures include:

- Installation of sensor-based faucets and low-flow fixtures in hostels and academic blocks.
- Adoption of dual-flush toilets and automatic shut-off taps.
- Implementation of rainwater harvesting systems, stormwater drainage, and percolation pits to enhance groundwater recharge.
- Development of farm ponds and check dams for water storage and agricultural use.
- Reuse of treated wastewater for landscaping and horticulture, minimizing dependence on freshwater resources.

Collaboration and Partnerships

KITS actively collaborates with government agencies, NGOs, and research organizations for water-related studies and capacity-building programs. These partnerships help in implementing innovative water management practices and community outreach programs aimed at the sustainable use of water resources in the region.

Water Audits and Monitoring

The institute periodically conducts water audits to assess consumption patterns, detect leakages, and identify opportunities for conservation. These audits form the basis for implementing targeted interventions and optimizing campus-wide water management systems.

Water Efficient Appliances Usage

The university has installed a wide range of water-efficient appliances, including self-closing push taps, hand showers, flush valves, and automatic water level controllers in hostels, academic buildings, and common areas.

These initiatives are aimed at minimizing water wastage, promoting judicious use, and ensuring the long-term sustainability of water resources within the institution. The systematic use of automatic and self-closing taps, along with wireless water level controllers for overhead tanks, sumps, and borewell pumps, significantly reduces unnecessary water flow and prevents overflow losses.

Details of Water-Efficient Appliances Installed

Sl. No	Description of item	Location	Qty (Nos)
1	Self-closing Taps (Taps (Push tap in wash basin, Hand shower, Push tap in water purifier, Flush valve)	Hostel Campus	2736
2	Manual Operated Taps	Hostel Campus	2150
3	Self-closing Tap (Taps (Push tap in wash basin, Hand shower, Push tap in water purifier, Flush valve)	College Campus	700

4	Manual Operated Taps	College Campus	500
5	Water level controllers (overhead water tanks, Water sumps, Bore well pumps)	College & Hostel Campus	177
6	Toilets	Hostel Campus	880
	Total		8073

Metric Calculation

Appliance	Total Number	Total number water Efficient appliances	Percentage
Taps	6086	3436	56.4
Water level controllers	177	177	100
Toilets	930	880	94.6
		Average Percentage	83.6

KITS has achieved more than 80% implementation of water-efficient appliances. This extensive adoption highlights the university's proactive approach to water sustainability, ensuring that every drop is used efficiently while fostering environmental awareness among students and staff.

Water Efficient appliances

Wireless automatic water flow controllers

Reuse of the recycled/treated/new water from STP for gardening