



SDG 6: Clean water and sanitation

ENSURE AVAILABILITY AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION FOR ALL

We all deserve to live in a world where everyone has access to clean running water and sanitation and our freshwater ecosystems are safeguarded for the future. The IITGN campus has been designed with key sustainability features, such as water conservation, purification and recycling. IITGN also has dedicated courses and lab facilities working in the field of sustainable water resources and other water-related issues.

Research

A total of 14 projects were in the area of water, with a sanctioned amount of INR 8.2 crores. Students and faculty from IITGN are conducting research on a wide range of themes related to water, including water quality, wastewater treatment, water and wastewater management, desalination and sustainable river management. A wide range of projects related to various aspects of water and sanitation viz. Disease, treatment technique, detection, medicine etc. The research projects, along with the names of the funding agencies, are as follows:

- Micro-components quantification of end uses of water consumption in low-income settings- WIN Foundation.
- Pilot scale in-situ application for arsenic and fluoride removal from the groundwater: A safe drinking water production perspective-WIN Foundation
- Towards development of sustainable water cyber-physical systems: Implementation in Gujarat Water Network Systems-WIN Foundation
- Unravelling Submarine Groundwater Discharge (SGD) zones along the Indian Subcontinent and its Islands (Mission-SGD) Pilot study -NCESS
- Development of low-cost novel biomaterials for in-situ groundwater/soil remediation: A safe drinking water production perspective- SERB
- Low-Cost and Non-Electric Water Filter for Point-of-Use(POU) Water Disinfection- WIN Foundation
- Groundwater Quality Monitoring for Ambuja setup in Mehsana- Ambuja Intermediates Pvt. Ltd
- Groundwater Quality Monitoring for Gopinath Chem-Tech Ltd setup in Mehsana- Gopinath Chemtech

- Vulnerability Assessment and Sustainable Solutions for Water Quality Management in the Urban Environment-DST
- Electrochemical fabrication of sub-nm pores on mica and Si-nitride sheets for desalination applications-MoE
- Multi-effect membrane distillation for modular desalination and brine concentration-SERB.
- Sewage disposal and management at high altitude areas- Army Technology Board
- Development and application of a geomorphic tool for sustainable management of a Himalayan river system, India- MoE
- Development of a predictive geomorphic model as a tool for sustainable river management-Ministry of Earth Sciences (MoES)
- Towards development of sustainable water cyber-physical systems: Implementation in Gujarat Water Network Systems-WIN Foundation.
- Water for Change: Integrative and fit-for-purpose water-sensitive design framework for fast-growing livable cities-DST
- Brine splitting for energy-efficient textile dyeing effluent reuse-DST

Along with these, about 25 articles and review works have been published in reputed journals involving nearly 20 researchers of IITGN contributing as authors.

Education

Several graduate and undergraduate courses are offered on sustainability, as well as water-related topics. Through our immersive educational programs, students gain the knowledge and skills to contribute to the achievement of Sustainable Development Goal 6. By implementing sustainability modules in existing courses and advancing sustainability education nationally and internationally, the institute aims to develop a curriculum.

CE 202: Sustainability and Environment

CE 308A: Water Resource Engineering

CE 605: Remote Sensing of Land and Water Resources

CE 611: Advanced Engineering Hydrology

CE 625: Advanced Hydraulic Engineering

CE 633: Water Resource Systems: Planning and Management

HS 642: Structures and Hydrology in Ancient India

EH 601 N: Earth Surface Processes In The Anthropocene

EH 605: Modelling of Earth System & Sustainability

EH 602: River Morphology and Ecology

ES 635: Water Quality Engineering

Dedicated labs

- Water and climate Lab
- Water and environment technology Lab
- Water energetics Lab
- Water resource engineering Lab

Other labs

- Machine Intelligence and Resilience Lab

- Dry Process Technology (DryProTech) Lab
- DSIR-IITGN-CRTDH (Common Research & Technology Development Hub, CRDTH)
- State Climate Change Centre

Online short course under TEQIP-III, titled 'Frontiers in the Energy-Water Nexus' was delivered in 2021.

Invited lectures on water are as follows:

- Unsustainable Use of Groundwater Resources: Threat to Food and Drinking Water Security by Mr Dipankar Saha, former Member (Head Quarters) CGWB, and former Member Secretary, CGWA, September 28, 2020
- Sanitation in India - Exploring the Links between Waste, Caste and the Environment by Mr Kanthi Swaroop, PhD student, IIT Bombay, October 9, 2020.
- Groundwater Arsenic in the Himalayan Mega River Basin Aquifers Sources and Processes by Prof Abhijit Mukherjee, IIT Kharagpur, October 13, 2020.
- A Point-of-use, Non-electric, Affordable SEP-based Water Filter Designed via Surface Engineering of Silica Particles by Dr Deepa Dixit, Postdoctoral Fellow, IIT Delhi, October 22, 2020.
- Effectiveness of Water Adaptation Responses in Reducing Climate and Associated Risks: Early Findings from a Meta-Review by Dr Aditi Mukherji, International Water Management Institute, November 23, 2020.

Community Outreach

Several events in the field of water were conducted during the past year. The major events were Sustainability Fair, WIN-WATSAN Webinar Series, Indo-UK virtual conference on Water Vulnerability World Water Day, and Sustainability Seminar Series. These events were attended by a broad range of stakeholders, including industry professionals, NGO representatives, government officials, academicians and researchers.

Indo-UK Virtual Conference

The three-day "Indo-UK Virtual Conference on the 5C's of Water Vulnerability: Climate Change, Contaminants, Co-occurrence, Conflicts, and COVID-19", hosted by IITGN commenced yesterday evening with more than 200 participants from India and abroad.

Sustainability Fair 2021

The third annual Sustainability Fair was held online on March 26, 2021, on the theme of "Renewable Energy and Water Resources." The Fair was inaugurated by Shri Vijay Rupani, Chief Minister of Gujarat. The event featured keynote addresses on topics related to challenges and opportunities in the international water sector, sustainable energy for rural development and community decentralised water management, respectively. More than 600 participants attended the fair.

WIN WATSAN webinar series 2020: Innovations and empowerment for sustainable watsan solutions

The event was conducted as a six part series, from September 3 through October 8, 2020. It was organised in collaboration with WIN Foundation, Arid Communities & Technologies, Centre for Environmental Planning and Technology (CEPT), IIT Bombay, and IIT Kharagpur. Leading innovator-practitioners from

premier institutions, social organisations and startups, presented their actual innovations. The series also provided a platform to the Water and Sanitation community to interact with various leaders and experts in the domain, with opportunities to collaborate.

World Water Day 2021

The Dr Kiran C Patel Centre for Sustainable Development, in collaboration with the International Association of Hydrogeologists - Indian National Chapter, organised an event to celebrate World Water Day 2021, on 22 March 2021. The event included two keynote talks by domain experts. A total of 91 people attended the session.

Sustainability Seminar Series

Speakers from world-renowned organisations covered topics related to water, pollution, climate change, energy and natural resources, wildlife and ecosystems at the webinars. More than 1,000 people from India, as well as Australia, Austria, Brazil, Ecuador, France, Gambia, Germany, Hong Kong SAR, Indonesia, Italy, Japan, Kyrgyzstan, Saudi Arabia, Spain, Sri Lanka, Switzerland, UAE, UK, and USA, attended the series.

- CARE with MIRACLE: Climate Adaptation and Resilience Engineering (CARE) with Machine Intelligence for Regional Assessment of CLimate Extremes (MIRACLE) by Prof Auroop Ganguly, Professor of Civil and Environmental Engineering (CEE) at Northeastern University (NU) in Boston, MA, USA, and Director of the Sustainability and Data Sciences Laboratory (SDS Lab) on October 5, 2020
- Feedback from land processes to Indian monsoon by Prof Subimal Ghosh, Professor in Department of Civil Engineering, Centre for Urban Science & Engineering and Convener, Interdisciplinary Program in Climate Studies, Indian Institute of Technology Bombay on October 19, 2020
- Floods in a changing climate by Prof Pradeep Mujumdar, Professor in the Department of Civil Engineering and Chairman, Interdisciplinary Centre for Water Research, Indian Institute of Science Bangalore on October 26, 2020
- Programa Agua Doce (Fresh Water Program): Drinking water to semi-arid rural communities through desalination in Brazil by Mr Henrique Veiga, Brazilian Federal Govt officer and Mr Emilio Gabbrielli, Ex-President of International Desalination Association, and ex-head of sales for Latin America of Toray Membranes Ltd. on October 28, 2020
- Effectiveness of water adaptation responses in reducing climate and associated risks: Early findings from a meta review by Dr Aditi Mukherji, Principal Researcher at the International Water Management Institute on November 23, 2020
- Sustainable water availability by Dr Virendra Tiwari, Director, CSIR-National Geophysical Research Institute (CSIR-NGRI), Hyderabad on November 30, 2020
- Ensuring India's water security: The five R's by Amb Venkatesan Ashok, India's Ambassador to the Czech Republic and Zimbabwe and Former Secretary, Govt. of India on December 7, 2020
- Conservation at scale: What have we learnt? by Dr Sejal Worah, Programme Director, World Wide Fund for Nature-India (WWF-India), New Delhi on January 18, 2021

Sanitation policies are complex suggestions over competing straightforward mainstream solutions, community sanctions, traditional caste logics and their conception to humiliate and stigmatise sanitation

workers. A lecture on this topic was delivered by Kanthi Swaroop, PhD student, IIT Bombay on October 9, 2020.

Climate, environment and the Indus Civilization: Insights from the land, water and settlement and TwoRains Projects, organised by Archaeological Sciences Centre by Prof Cameron Petrie, Reader in South Asian and Iranian Archaeology, Department of Archaeology, University of Cambridge on March 27, 2021.

Young Researcher Seminar Series

- A point-of-use, non-electric, affordable SEP-based water filter designed via surface engineering of silican particles, Chemical Engineering Seminar Series By Dr Deepa Dixit, Postdoctoral Fellow, IIT Delhi on October 22, 2020.
- Geomorphic characterization of a seasonal river network in semi-arid western India, Senior Researchers Colloquium by Dr Sonam, Research Associate, Earth Sciences, IITGN on December 18, 2020.

Operations

Water Supply and sanitation facilities

- A water collection and distribution system which is environmentally responsible is operational on campus.
- The institute provides free drinking water for students, staff and visitors; water fountains and dispensers have been installed in the academic and hostel blocks.
- A flow metre is installed at the campus, measuring the total water volume extracted from the Narmada canal.
- The water quality parameters are checked daily by the Institute Works Department as a measure to prevent polluted water from entering the water system.
- During ongoing construction activities, the contractors are responsible for providing clean drinking water and a minimum level of safety and sanitation facilities for all workers.

Volume of water used at the Institute in 2020-21: Inbound (treated or extracted water): 3,02,068 cubic metres

Volume of wastewater recycled using STP: 48477 cubic metres

Percentage of recycled water: 16%

Wastewater disposal, treatment, reuse and reduce

- The housing for campus residents and hostels have the following features to minimise water use: low-flow faucet and showerheads, dual flush in toilets, waterless urinals, and efficient taps.
- Throughout the campus water-saving aerators are used in all the washbasins, sink taps and faucets. These dispense water at a controlled rate by mixing air with the stream of water.
- The institute has also established strategies to safely dispose of hazardous chemical waste on campus, and implements a programme to recycle electronic waste.
- The filling of overhead water tanks is automated, with 24x7 monitoring of water levels and pumps on/ off to prevent overflow of water.

- Surfaces such as open grid pavements and planting beds (shrubs) have been used throughout the campus to reduce the imperviousness factor.
- Thus, a system was developed to treat domestic sewage primarily through a biological process (natural wastewater system).
- The campus is a zero-discharge campus and supports full harvesting-recycling-reuse of water and wastewater, which also contributes to reducing the carbon and water footprints.
- It treats all its sewage in an environmentally friendly sewage treatment plant that uses anaerobic reactors to digest sewage solids and a root zone treatment system, which treats the effluent to be later used for horticultural operations.
- Capturing rooftop rainwater and using the topography for water recovery and root zone treatment and, once used, recycling all this water for irrigation purposes. The rooftop rainwater is captured in four underground Jal Mandaps of 50 lakh litres storage capacity, placed strategically across the campus.
- Surface runoff of rainwater is captured through a series of drainage pipes and sent to the seasonal ponds through intake wells. The overflow of the ponds goes to the Sabarmati River.