Indian Institute of Technology Kanpur

Sustainability Report 2023

Foreword from the Director

With immense pleasure, I present the IIT Kanpur Sustainability Report, a testament to our institution's steadfast dedication to fostering a sustainable future. At IIT Kanpur, we recognize the urgent challenges posed by climate change and environmental degradation, and we firmly believe that universities must take a leading role in addressing these pressing issues.

This report exemplifies the collective efforts of our faculty, researchers, students, and staff, who have tirelessly pursued pioneering research and innovative solutions in various sustainability-related domains. From developing cutting-edge sustainable technologies to advocating for responsible waste management practices, these endeavors showcase our unwavering commitment to positively impacting society and the planet. We are committing all our resources to making our IITK Campus a "**Carbon neutral**" campus by 2030.

Central to IIT Kanpur's ethos is the belief that knowledge and expertise must be leveraged to address real-world challenges. As we strive for academic excellence, we remain equally dedicated to contributing meaningfully to global efforts toward achieving sustainable development goals.

I commend the entire IITK community for their exceptional contributions and extend my heartfelt gratitude to all stakeholders who have supported and collaborated with us on this transformative journey. We will continue working to create a greener, more equitable, and sustainable world.

Prof. Manindra Agrawal
Indian Institute of Technology Kanpur

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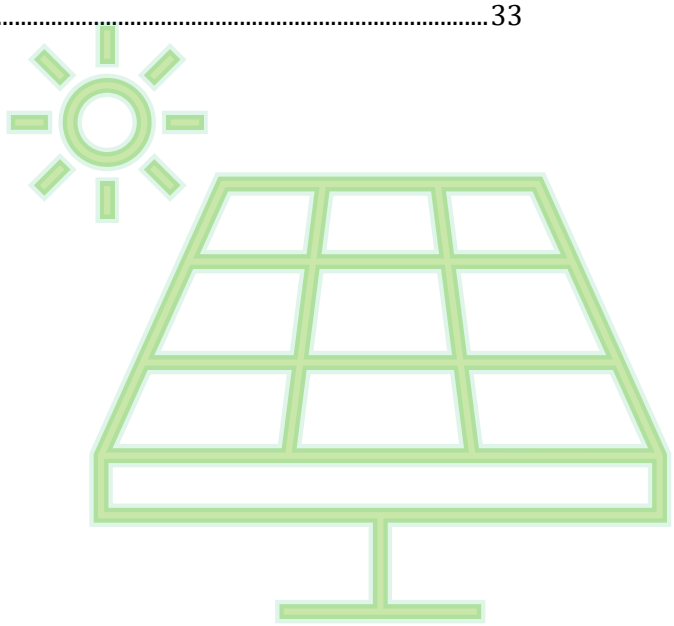


Preamble

In our commitment to environmental stewardship and a sustainable future, the Indian Institute of Technology Kanpur (IITK) proudly presents this comprehensive Sustainability Report. Recognizing the significant impact of carbon emissions, water management, waste reduction, and energy efficiency, we endeavor to pave the way for a greener and more resilient tomorrow.

This report highlights IITK's efforts to assess and manage carbon emissions across its operations and activities, encompassing three crucial scopes: Scope 1, comprising direct emissions from sources like PNG usage, fuel consumption, and refrigerant leakages; Scope 2, covering indirect emissions from purchased electricity; and Scope 3, addressing indirect emissions related to procurement, travel, and waste management.

We acknowledge the role of academic institutions in contributing to global carbon emissions and affirm our dedication to driving positive change. By disseminating information on our current carbon footprint, we aim to raise awareness and foster a culture of sustainability within our institution.

Furthermore, this report delves into our initiatives to optimize energy consumption, harness renewable energy, and promote sustainable transportation. Our commitment to waste management is evident in various practices, including recycling, composting, and proper hazardous waste disposal. Moreover, we outline strategies to achieve water sustainability through conservation, recycling, and rainwater harvesting.

As an academic community, we recognize the significance of education and research in shaping a sustainable world. This report showcases our wide range of educational programs and research initiatives focusing on renewable energy, climate solutions, environmental engineering, and more.

We would like to acknowledge the support of the Chandrakanta Kesavan Centre for Energy Policies and Climate Solutions (CKCEPCS). Additionally, the active involvement of student bodies and startups underscores the dedication of the IITK community to promoting sustainable practices and innovative solutions.

Through this report, we reaffirm our dedication to continuous improvement and accountability in our sustainability journey. IIT Kanpur strives to inspire and collaborate with other institutions, government agencies, and stakeholders to collectively drive positive change for a greener and more sustainable planet.

Current Carbon Emissions

IIT Kanpur is spread over an area of about 4.45 km^2 and like most of the lowland northern India, Kanpur has a monsoon-influenced hot semi-arid climate . The campus community consists of around 20,000 residents which includes current students, staff and their family members. Carbon emissions due to our institute come from various sources, including, but not limited to, energy procurement, lab equipment & teaching aids, travel, waste management, and construction activities.

These are the emissions we, the campus community, generate through our activities:

- **Scope 1 (Direct Emissions):** Includes the direct emissions from sources owned or controlled by the institute. These emissions result from burning fuels on-site, operating institute-owned vehicles, and refrigerant leakages.

- **Scope 2:** Includes indirect emissions associated with the generation, transmission and distribution of the purchased electricity consumed by the institute.

- **Scope 3 (Indirect):** Includes all other indirect emissions due to the institute's activities not classified under Scope 1 or 2. These emissions can be attributed to activities such as the extraction, production, and transportation of purchased goods or services, business travel, employee commuting, construction and maintenance work undertaken on the campus, and waste disposal.

Type	Data		Amount	Unit	Emissions (tonnes of CO_2eq.)
Scope 1	PNG		579,380	cu m	**1170.35**
	Fuel for Institute Vehicles & Diesel Generators	Petrol	3,170	L	**7.41**
		Diesel	23,960	L	**64.69**
		CNG	2,290	kg	**5.81**
	Refrigerant Leakage (Excluding CPs)	R22	450	kg	**2,102.80**
		R32	25	kg	
		R410	50	kg	
		R134	5	kg	
Scope 2	Electricity Purchased		57,861,000	kWh	**52,075**
	On-site Solar Production		2,453,537	kWh	**-**
Scope 3	Procurement	Computers & Peripherals	**Collecting Data and calculating associated Carbon Emissions**		
		UPS Batteries			
		LAN Cables			
		Scientific Goods			
		Washer & Washing Machines			
		Laboratory Equipments			
		Laboratory Furniture			
		Chemicals			
		Consumables			
		Sports Items			
	Construction Work on the Campus				
	Travel	Land Travel			
		Air Travel			
	Waste	Solid/ Cooked Food	4,229,940	kg	**3,900.36**
		Kitchen	4,25,746	kg	
		Horticulture	3,470,400	kg	
		Construction & Demolition	**Collecting Data and calculating associated Carbon Emissions**		
		Hazardous			
		Chemical			

Table 1: Carbon Emissions of the Institute for 2022

We adhere to the GHG protocol to calculate the institute's carbon emissions. Total carbon emissions for Scope 1 & 2 are estimated at **3,351 tonnes & 52,075 tonnes**, respectively; Scope 3 emissions are still being assessed. A significant source of carbon emission for the institute is the electricity purchased.

Green Campus

To boost clean and green environment of IIT Kanpur, every year thousands of trees of various varieties are planted on the campus. Our community enjoys a green cover of approximately 85,000 trees including the 12,000 thick Miyawaki style plantations.

Initiatives

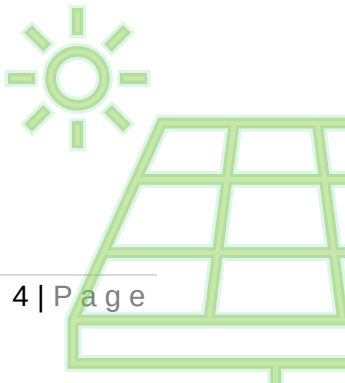
Energy

Energy consumption is the most significant contributor to carbon emissions from IIT Kanpur. Transitioning to renewable energy sources and improving energy efficiency are essential in reducing carbon emissions and mitigating climate change.

Renewable energy sources, such as solar, wind, hydroelectric, geothermal, and biomass, offer significant advantages over fossil fuels. We can significantly decrease carbon emissions by shifting away from fossil fuels and increasing the share of renewable energy in our energy mix. Also, we must reduce energy demand and carbon emissions by implementing energy-efficient measures in buildings, transportation, and appliances.

For the said purpose, IIT Kanpur has been actively promoting renewable energy and improving energy efficiency on its campus. The institute has undertaken various initiatives to reduce its carbon footprint and promote sustainable practices.

Current Initiatives



The **Energy Audit Committee** was constituted in 2024. The committee will prepare energy audit report and monitor the sustainability status of the campus. The Committee will also develop a roadmap for achieving net zero campus.

Environmental Advisory Committee (EAC) is a policymaking body on environmental issues and was constituted at IIT Kanpur in 2013.

Centralized Air Conditioning in Academic Area

The buildings in academic area are cooled through the centralized air conditioning. It saves energy by optimizing cooling distribution, reducing redundant cooling units, and improving temperature control. It allows for efficient energy use by using advanced technology and proper maintenance, resulting in a **40%** reduction in energy consumption and reduced greenhouse gas emissions.

Solar Water Heaters

Many Residential halls have installed solar water heaters. This renewable and sustainable technology reduces reliance on fossil fuels and significantly lowers energy consumption and associated carbon emissions.

Rooftop Solar

The campus presently has a Solar generation installation of capacity of 1 MW under CAPEX mode and 1.21 MW under RESCO Mode through Renew Power. Furthermore, a 0.4 MW PV system is being installed.


Solar Panel installation at the roof tops

Promoting bicycles for daily commute

The well-marked cycle paths run parallel to the roads and help in easy commute. Also, to commute within the campus the residents can avail a low-cost E-Rickshaw service.

Outside Lecture Hall

Low-cost E-Rickshaw service for campus residents

IITK has introduced 12 electric golf carts. These eco-friendly vehicles are used to transport students/staff/visitors around the campus, reflecting the institute's commitment to green initiatives. The service operates daily from 6:30 AM to 10:30 PM.

Planned Initiatives

Replacing CFL tube lights

Many Lighting fixtures, especially in residential halls, use CFL tube lights. Recently the "Maintenance department" has decided on replacing the old CFLs, with new LED tube lights, on a maintenance priority basis. The replacement will help achieve about a **30-40%** reduction in lighting energy consumption across the campus.

Expanding Rooftop Solar

The installed Solar PV capacity is expected to increase significantly (**about 2-3 MW more**) as PV systems are planned to be installed in many rooftop spaces and other locations across the campus.

NetZero Energy Building

We plan to convert one of our existing buildings on campus to Net zero energy; this building will be off-grid and will be able to produce enough energy to complete its regular operation.

Waste

A sustainable and healthy environment requires effective waste management. It encourages the wise use of resources, reduces the negative environmental impact, and promotes responsible consumption and production patterns. The objectives of IIT Kanpur's waste management techniques are to effectively manage waste, minimise waste generation, promote recycling and reuse, and ensure proper waste disposal.

Current Initiatives

Waste Segregation: Solid waste, food waste, horticulture & kitchen waste, chemical waste, and E-waste are segregated across the campus.

Solid Waste/Cooked Waste: As per the recent statistical data for 2022, this mode of waste collected from households, hostels, and the rest of campus is about **4,200 tonnes**. The solid waste is given off to ***M/s. JTM Services Pvt. Ltd***, a government-approved vendor.

Kitchen Waste: This mode of waste is about **100 tonnes** from households and **325 tonnes** from hostels, as per the 2022 data. ***Agnys Waste Management***, an IIT Kanpur incubated startup**,** composts the kitchen waste using **t**he drum composting method. Each drum has a capacity of 200 kg, and it takes 20-22 days to complete

one cycle. The compost thus generated is distributed free of cost among the campus residents.

Horticulture Waste: This mode of waste is about **3,470 tonnes** per year. IIT Kanpur produces vermin compost and leaf manure by collecting dry leaves, roots, grass, stems, kitchen waste, etc. The compost and manure are used in the nursery to nurture the soil. The tree woods are collected, segregated by the nursery, and auctioned by the State Office.

IIT Kanpur nursery

Agnys Waste Management Plant

E-Waste and hazardous waste: Various departments and halls collect and auction e-waste from academic areas and hostels, respectively. For residential areas, collection drives are held on every second Saturday of the month, in which residents can come and submit their hazardous waste items - like bulbs, batteries, electronics, broken glass, blades, scissors, mobiles, etc. - to the counters at a designated place which is then accumulated together and given to an authorised recycler once it reaches 2 tonnes.

Chemical Waste: Chemical waste is divided into three categories: *Chlorinated, Non-Chlorinated, and Solid*. Chlorinated and non-chlorinated liquid waste is collected in canes and later transferred to Master Bins kept at a Chemical Shed on the campus. Solid waste is also collected and dumped there. Later this waste is outsourced to ***Ranky Enviro Engineers Ltd.***, which works under the UP-Waste Management Project.

Project Bhoomi: In a significant development towards efficient waste management, Agnys Waste Management Private Limited, a SIIC (Startup Incubation and Innovation Centre) IIT Kanpur-incubated company, developed an automatic composting machine known as 'BHOOMI,' in collaboration with Imagineering Lab, IIT-Kanpur.

BHOOMI stands for Bio-composting of Horticulture and Organic waste into Manure Indigenously. Engineers India Limited supported the Research & Development of the device. The device has advanced features like carbon filters, shredders, air pumps, and solar panels, which systematically convert waste into manure in just 10-20 days. The process is more convenient and rapid than the conventional technologies.

Planned Initiatives

Zero Landfill campus: This initiative aims to convert our campus into a zero-landfill campus through a comprehensive and sustainable waste management initiative.

Key components of the plan include:

1. Waste Segregation and Collection: While segregating most wet and dry waste across the campus, we plan to further segregate plastics, glass, metals, and other materials at the source. This measure will lead to proper waste management and reduce human efforts.

2. Waste-to-Energy Technologies: We plan to set up a BIOGAS Plant on a zonal or central level on the campus to deal with all kinds of organic waste effectively. Until now, organic waste goes to composting, and the cooked food waste is handled in an unorganized and inefficient way. Installed effectively at various levels

in IITK, we can use the biogas released from the BIOGAS plant as an energy resource and by-products of the treatment can be used as compost or manure.

3. Collaborations and Partnerships: We look forward to potential collaborations with NGOs that can help us recycle and reuse our dry waste to the maximum extent, such as discarded shoes, cardboard, tin boxes, etc., that usually go into the waste stream.

Waste management at the institute level is essential for environmental preservation, health and hygiene, resource conservation, sustainability education, cost-effectiveness, regulatory compliance, and social responsibility. Through the successful implementation of this project, the IIT Kanpur campus may serve as a model for other educational institutions and communities.

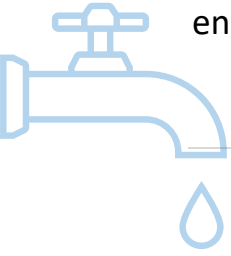
Water

Water sustainability on campus is a vital aspect of environmental stewardship. It involves reducing water consumption, promoting conservation, and safeguarding management, including availability, quality, and distribution. These challenges are interconnected within the circular economy, emphasizing sustainability, and addressing fundamental water security issues.

To achieve water sustainability, it is essential to focus on water conservation. This involves practicing responsible water consumption, implementing water recycling and reuse practices, and adopting strategies that minimize water waste.

Current Initiatives

The water requirement for our campus is solely fulfilled by groundwater. We have ten tube wells, each approximately 1000 feet deep. The water is pumped from a depth of around 100 feet, as the groundwater level is reasonably good due to the amount of rainfall in Kanpur and the influence of the nearby River Ganges. This ensures a sufficient water supply for the campus. Considering the large population



of our campus, the water demand is high. The estimated consumption is **4 million liters per day (MLD)**.

Wastewater management: IIT Kanpur has a network of Sewage Treatment Plants (STPs) having a total treatment capacity of **1.35 MLD**. These plants play a crucial role in reducing the discharge of untreated water from the main campus. However, at present, we do not segregate greywater for recycling. The treated wastewater from the STP is currently utilized for horticultural purposes, such as irrigation & gardening.

Oxidation Pond is a great place to spot birds.

While our campus treats wastewater and reuses it for non-potable purposes, there is room for further improvement. Implementing a system for the segregation and treatment of greywater and blackwater can enhance water sustainability and reduce the strain on freshwater resources. This segregation method would involve treating different types of wastewater separately, allowing for better resource management and potentially expanding the reuse of treated water in various applications.

Rainwater Harvesting: The existing rainwater harvesting infrastructure on campus has a capacity of 52 million Liters.

Planned Initiatives

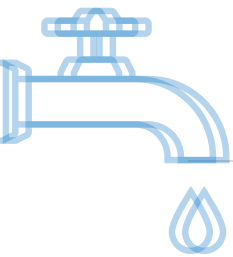
The existing water supply network at IITK is being analyzed to identify areas where improvements must be made. This analysis involves assessing the efficiency of the network, identifying any bottlenecks or areas of water loss, and exploring ways to optimize the system. The institute must ensure a more reliable and sustainable water supply by identifying and addressing inefficiencies.

Measuring and Monitoring Equipment: We plan to install measuring and monitoring equipment to enable regular checks on the water parameters, ensuring that the water supplied to the campus meets the required quality standards. Tracking the water quantity will also help identify potential issues, such as leaks or excessive consumption.

Greywater Segregation: The institute plans to implement the greywater segregation method from wastewater to promote water sustainability. Greywater refers to domestic wastewater generated from laundry, showers, and handwashing. This type of wastewater can be treated and reused for various purposes, including irrigating gardens and flushing toilets. Greywater typically makes up **50% to 80% of the total wastewater** produced by a building. Greywater is generally safer and easier to treat for non-potable uses than blackwater.

Common greywater sources include sinks, showers, baths, and washing machines. Since greywater is mostly free from pathogenic contamination, it can be repurposed effectively for toilet flushing and other non-potable applications.

Post-treatment, using greywater for toilet flushing is a practice that helps conserve freshwater resources. By repurposing greywater, the institute can reduce its dependence on potable water for non-potable uses, contributing to water conservation efforts and promoting a more environmentally friendly approach to wastewater management.



Rainwater Harvesting: The institute plans to expand the existing rainwater harvesting infrastructure on campus. Rainwater harvesting effectively collects and stores rainwater for various uses rather than allowing it to run into the wastewater stream. The process involves collecting rainwater from surfaces such as rooftops and directing it to a storage tank or reservoir for later use.

Aerators and Self-resetting taps: Implementing aerators and self-resetting fixtures can significantly contribute to water conservation efforts at IIT Kanpur. A faucet aerator, which mixes air with water, reduces water flow and pressure while maintaining a positive user experience. The institute can achieve substantial water savings without compromising functionality by installing aerators in all the new and old taps and incorporating self-resetting taps in upcoming buildings.

Waterless Urinals: The institute plans to study the feasibility of water-less urinals and implement them. Traditional urinals contribute significantly to water wastage, causing environmental, social, and economic problems. These urinals operate without water and utilise a special liquid or cartridge as a sealant to trap urine and prevent odours. Waterless urinals would help conserve water and offer several other benefits, such as reduced maintenance costs, improved restroom hygiene, and a positive environmental impact.

These planned initiatives demonstrate IITK's commitment to water sustainability. By monitoring water quality and quantity, analysing and optimising the water supply network, implementing greywater segregation, and adopting rainwater harvesting techniques, the institute aims to promote efficient water use, conserve resources, and contribute to a more sustainable campus environment.

Academics

Along with becoming a more sustainable and carbon-neutral campus, IIT Kanpur also aims to educate its students, staff, and the community about the social,

environmental, and governance aspects of sustainable development. Many of the institute's departments and centres are collaboratively working towards this aim.

Department of Sustainable Energy Engineering

The department aims to contribute to the national vision of energy sustainability of meeting a large proportion of the nation's energy needs through new and renewable energy technologies in the future for better health of its citizens and energy security. It has partnered with Mehta Family Foundation (USA) and Rice University (USA) to achieve excellence in energy sustainability education, research, and technology development. Cutting-edge research is being done on various topics like Solar Photovoltaics, Solar Thermal, Wind Energy, Batteries and Supercapacitors, Fuel Cells, Electric Vehicles, Hydrogen and Alternative Fuels, Carbon Capture and Utilization, Smart Grids and Renewables Integration, Energy Policy, and Regulation, etc.

Chandrakanta Kesavan Centre for Energy Policies and Climate Solutions (CKCEPCS)

This centre was established to assist policymakers with practical solutions to the problems of climate change. As a signatory to the Paris Climate Agreement, India must develop, adapt, and implement technologies to reduce emissions and grow sustainably. The centre aims to spearhead the development of technology and policy solutions to help India and the world combat climate change.

The Kotak School of Sustainability

The school opened in partnership with Kotak Mahindra Bank in December 2023 aims to excel in sustainability education, research and innovation, technology development, entrepreneurship, and outreach. The school will spearhead the development of holistic end-to-end technology solutions for sustainable development for a healthy planet and species.

Centre for Environmental Science and Engineering

The mission of this centre is to carry out high-quality, interdisciplinary research, leading to technology development and competency building in various areas related to environmental problems, thereby providing solutions to the Indian industry, medical professionals, and policymakers. Broad research areas include Water and Wastewater Treatment, Aerosol Properties and Regional Climate Change, Air Quality Modelling, and Management.

National Aerosol Facility

The National Aerosol Facility is a multi-purpose facility for studying aerosol behavior under simulated conditions. IIT Kanpur successfully conducted its first artificial rain test under the supervision of this facility.

AI Centre of Excellence on Sustainable Cities

The AI Centre of Excellence on Sustainable Cities, led by IIT Kanpur, will leverage artificial intelligence for smart city planning, traffic management, and efficient resource distribution. By integrating data from sensors, GIS maps, and satellite feeds, it will predict resource needs and enhance public space design. With shared infrastructure across Agriculture, Health, and Sustainable Cities the CoE will further optimize costs and resources.

Just Transition Research Centre (JTRC)

Just Transition Research Centre (JTRC) leverages high quality academic environment to conduct cutting edge research to address the academic and policy requirements of the national and sub-national levels. The centre's aim is aligned primarily with the seventh sustainable development goal of the United Nations: affordable and clean energy.

https://www.iitk.ac.in/JTRC/index.php

Academic Programs which lead to a degree in Sustainable Development

1. Master of Technology (M.Tech.) in Sustainable Energy Engineering
2. Master of Science by Research (M.S.R) in Sustainable Energy Engineering
3. Ph.D. in Sustainable Energy Engineering
4. eMasters in Climate Finance & Sustainability
5. eMasters in Sustainable Construction Practices & Project Management
6. eMasters in Renewable Energy & e-Mobility

Academic Courses covering various topics related to sustainable growth

#	Topic of the course	Department	Level (UG/ PG)	Code	SDGs aligned
1	ENVIRONMENT AND SUSTAINABILITY	Civil Engineering	UG	CE212	12, 13, 15
2	ENVIRONMENTAL QUALITY AND POLLUTION	Civil Engineering	UG	CE311	13, 15
3	QUALITY AND SAFETY IN CONSTRUCTION	Civil Engineering	UG/ PG	CE645M	9
4	AIR POLLUTION AND ITS CONTROL	Civil Engineering	UG/ PG	CE666	13, 15
5	SURFACE WATER QUALITY MODELING	Civil Engineering	UG/ PG	CE760M	6, 15
6	ENVIRONMENTAL QUALITY AND PROCESSES	Civil Engineering	UG/ PG	CE214	9, 12, 13
7	WATER SUPPLY AND WASTEWATER DISPOSAL SYSTEMS	Civil Engineering	UG	CE412A	6, 15
8	ENVIRONMENTAL FLUID MECHANICS	Civil Engineering	UG/ PG	CE656	6, 15

9	HUMANS, ENVIRONMENT AND SUSTAINABLE DEVELOPMENT	Civil Engineering	UG/ PG	CE663	9, 12, 15
10	ENVIRONMENTAL QUALITY & POLLUTION MONITORING TECHNIQUES	Civil Engineering	UG/ PG	CE668	9, 12, 13, 15
11	SURFACE WATER QUALITY MODELING	Civil Engineering	UG/ PG	CE760	6, 15
12	SUBSURFACE CONTAMINANT FATE AND TRANSPORT	Civil Engineering	UG/ PG	CE761M	6, 15
13	ENVIRONMENT TOXICOLOGY AND RISK ASSESSMENT	Civil Engineering	UG/ PG	CE764M	13, 15
14	INDUSTRIAL WASTE MANAGEMENT	Civil Engineering	UG/ PG	CE765M	7, 9, 17
15	TOWARDS SUSTAINABLE MANAGEMENT OF PLASTIC POLLUTION	Civil Engineering	UG/ PG	CE768M	12
16	PRACTICAL ETHICS	All Departments	UG	ETH111	5, 12, 16
17	INTRODUCTION TO CLIMATE CHANGE ECONOMICS AND POLICY	Management Science	UG/ PG	MBA667	13, 17
18	INTRODUCTION TO POLICY MAKING	Management Science	UG/ PG	MBA669	17
19	RENEWABLE ENERGY - ECONOMICS POLICY AND REGULATION	Management Science	UG/ PG	MBA782M	7, 9 ,11
20	SOCIO-POLITICAL AND ETHICAL ASPECTS OF BUSINESS	Management Science	UG/ PG	MBA617	1, 5, 8, 16
21	INTRODUCTION TO UNIVERSAL HUMAN VALUES AND ETHICS	Management Science	UG/ PG	MBA618	5, 16
22	SUSTAINABLE DEVELOPMENT FOR BUSINESSES	Management Science	UG/ PG	MBA725M	9
23	DERIVATIVES & RISK MANAGEMENT FOR THE	Management Science	UG/ PG	MBA784M	7, 13

	ENERGY AND ENVIRONMENTAL MARKETS				
24	ECONOMIC GROWTH AND GEOPOLITICS	Economics	UG/ PG	ECO715	1, 2, 17
25	EMPIRICAL METHODS IN HEALTH ECONOMICS AND PUBLIC POLICY	Economics	UG/ PG	ECO717	3, 17
26	ENVIRONMENTAL ECONOMICS: POLICY AND TRADE	Economics	UG/ PG	ECO725	13, 17
27	LABOUR ECONOMICS	Economics	UG/ PG	ECO753	1, 2, 3, 5, 8
28	SOLAR PHOTOVOLTAIC TECHNOLOGIES	Electrical Engineering	UG/ PG	EE615	7
29	SMART GRID TECHNOLOGIES	Electrical Engineering	UG/ PG	EE679A	11
30	ENVIRONMENTAL GEOLOGY	Earth Sciences	UG/ PG	ES451A	13
31	ENVIRONMENTAL SOCIOLOGY	Humanities & Social Sciences	UG/ PG	SOC475	8, 13
32	SOCIOLOGY OF ENVIRONMENT	Humanities & Social Sciences	UG/ PG	SOC742	8, 13
33	PSYCHOLOGY OF WELLBEING	Humanities & Social Sciences	UG	PSY470	1, 2, 3
34	CONTEMPORARY APPLICATIONS OF SOCIAL DEMOGRAPHY	Humanities & Social Sciences	UG	SOC476	5, 8, 10
35	SOLAR ENERGY TECHNOLOGY	Mechanical Engineering	UG/ PG	ME645	7
36	ELECTRONIC AND METALLURGICAL WASTE RECYCLING	Material Science & Engineering	UG/ PG	MSE662	12, 13
37	INTRODUCTION OF BIOMATERIALS	Material Science & Engineering	UG	MSE204A	7
38	PHYSICS OF ENERGY MATERIALS	Sustainable Energy Engineering	UG/ PG	SEE602	7

39	INTRODUCTION TO BIOENERGY AND BIOFUELS	Sustainable Energy Engineering	UG/ PG	SEE608	7
40	SUSTAINABLE ENERGY AND ENABLING NET ZERO EMISSIONS	Sustainable Energy Engineering	UG/ PG	SEE622	13, 15
41	DESIGN STRATEGIES FOR NET-ZERO ENERGY BUILDINGS	Sustainable Energy Engineering	UG/ PG	SEE624	11, 13, 15
42	ELECTRIC VEHICLES	Sustainable Energy Engineering	UG/ PG	SEE627	7
43	ECOLOGY, EQUITY AND THE ECONOMY	Sustainable Energy Engineering	UG/ PG	SEE629 M	8, 13
44	ENERGY, CLIMATE CHANGE & SUSTAINABILITY	Sustainable Energy Engineering	UG	SEE211	7, 13
45	AN INTRODUCTION TO SUSTAINABLE ENERGY TECHNOLOGIES	Sustainable Energy Engineering	UG/ PG	SEE605	7, 13
46	HYDROGEN ENERGY: PRODUCTION STORAGE AND UTILIZATION	Sustainable Energy Engineering	UG/ PG	SEE607	7, 13
47	SOLAR PHOTOVOLTAICS	Sustainable Energy Engineering	UG/ PG	SEE613	7, 13
48	WIND ENERGY	Sustainable Energy Engineering	UG/ PG	SEE614	7, 13
49	SOLAR THERMAL ENGINEERING	Sustainable Energy Engineering	UG/ PG	SEE615	7, 13
50	RENEWABLES INTEGRATED SMART POWER SYSTEMS	Sustainable Energy Engineering	UG/ PG	SEE616	7, 11, 13

51	POLICY PROCESSES AND ANALYTICAL METHODS: APPLICATION TO CLIMATE POLICIES	Sustainable Energy Engineering	UG/ PG	SEE628	11, 12, 13
52	INTRODUCTION TO SUSTAINABLE ENERGY POLICY	Sustainable Energy Engineering	UG/ PG	SEE617	11, 12, 13
53	POWER ELECTRONICS FOR ELECTRIC VEHICLES	Sustainable Energy Engineering	UG/ PG	SEE633	7, 13

Workshops/ conferences/ FDPs on topics related to sustainable development in Academic year 2023-24 and 2024-25

#	Topic of the workshop/ conference	Time period	SDGs aligned
1	Fundamentals of Energy Transition for Achieving Net-zero	01.06.2023 - 20.06.2023	7, 11, 12, 13
2	Training on Net-zero Campuses	04.07.2023 - 05.07.2023	7, 11, 12, 13
3	Managing Energy, Economic, and Environmental Transition: A Subnational Exchange	27.07.2023	7, 9, 11, 12, 17
4	International Workshop on Sustainable Materials Development Energy & Environmental Applications	30.10.2023 - 02.11.2023	7, 11, 12, 13
5	Sustainable Management of Tailings Storage Facilities	14.11.2023 - 16.11.2023	7, 11, 12, 13
6	Carbon Neutrality & related Certifications	04.12.2023 - 05.12.2023	7, 11, 17
7	Sustainable Scale and Storable E-Fuels for Decarbonising Transport sector	07.12.2023 - 10.12.2023	7, 11, 12, 13
8	Annual Day of the institute's Cell for Differently Abled Persons (CDAP)	13.01.2024	3, 10
9	International Workshop on Sustainable Energy, Power, and Propulsion	19.01.2024- 21.01.2024	7, 11, 13
10	3rd Regulatory Certification Program on Renewable Energy: Economics, Policy, and Regulation	09.03.2024 - 24.03.2024	7, 17

11	International Workshop on Social Research Methodologies in Just Transition: Capacitating Sectoral Leaders	27.03.2024 - 28.03.2024	1, 2, 3, 5, 8, 10
12	Delegation from University of Melbourne (discussions on Renewable Energy sources, Climate Change, Water Quality Monitoring, Remote Sensing)	08.04.2023- 12.04.2023	6, 7, 12
13	India Green Summit & Expo 2024	22.04.2024	13
14	Transition of Indian Metros: Automated, Intelligent and Sustainable Solutions for Energy Savings	03.07.2024 - 05.07.2024	11
15	Smart Transportation for Reducing Emissions and Congestion in Indian Cities (STREC)	20.07.2024	11
16	ASIAN CONFERENCE ON GAS TURBINES 2024	21.08.2024 - 23.08.2024	7
17	Design and Implementation of Smart Water Systems	30.08.2024 - 31.08.2024	11
18	Sustainable Production of Green Steel	16.09.2024 - 19.09.2024	12
19	India Just Transition Summit Navigating a People-Centred Low-Carbon Transition for India	16.10.2024 - 17.10.2024	1, 2, 7, 8, 10
20	H_2O & Climate: Hydraulics, Hydrology & Climate Conference	26.10.2024 - 27.10.2024	6, 13
21	ESG and Business Sustainability	30.10.2024 - 09.05.2027	8, 12, 17
22	ESG and Business Sustainability	02.11.2024 - 12.01.2025	8, 12, 17
23	International Conference on Energy Technologies	05.11.2024 - 07.11.2024	7, 12
24	Agriculture Practice Using Drones: Plan, Design, Build, and Fly	13.11.2024 – 23.11.2024	8, 9
25	Evonik Sustainability Challenge 2025	15.01.2025	13
26	The Geospatial Technologies and Smart Cities Workshop	20.01.2025	11
27	Annual Day of Cell for Differently Abled Persons (CDAP)	13.01.2025	10
28	Universal Human Values (UHV) Workshop	27.01.2025- 03.02.2025	5, 10
29	National Conference on AI Solutions for Sustainable Cities	03.02.2025 - 04.02.2025	11

30	Climate Justice and Climate Policy	05.02.2025 - 07.02.2025	13
31	Transforming Indian Army with new construction technologies, green initiative & climate resilient infrastructure	10.02.2025	9, 13
32	Civil Societies and Climate Change: An India-Australia Dialogue.	17.02.2025 – 19.02.2025	12, 13
33	Resource Adequacy Framework for Distribution Utilities: Methodological and Implementation Issues	19.02.2025	11, 12
34	Communicators' Workshop on Renewable Energy in India	20.02.2025 – 22.02.2025	7
35	Building Climate Resilient Coal Communities: Youth-Centric Economic Diversification and Sustainable Development in the Coal Belt of Uttar Pradesh	27.02.2025	1, 2, 3, 5, 8, 10
36	ITEC course on Industrial and Electronic Waste Recycling Management	10.03.2025 – 15.03.2025	12, 13
37	Centre for Energy Regulation (CER) at IIT Kanpur successfully hosted the 6th Regulatory Conclave on Energy Transition and Renewable Purchase Obligation	13.03.2025	7, 8 10
38	Sustainable Water Harvesting: Principles and Technologies	10.03.2025 – 11.03.2025	6, 13
39	Designing and Building a Net-Zero Home: A Step Towards India's Sustainability Goals	19.03.2025	9, 13
40	Shaping the Next Era of Power Sector Reforms in India	25.03.2025	7
41	Material innovations in energy and environmental technologies for a sustainable future	27.03.2025 – 28.03.2025	7
42	Shrouding, Tundish Metallurgy & Clean Steelmaking	30.03.2025 - 31.03.2025	9,12
43	ESG and Business Sustainability	10.05.2025 - 14.09.2025	9, 17

Webinars/ talks on topics related to sustainable growth

#	Title of talk	Date	SDGs

1	Water, Droplets and Ice, Examples of Science for Sustainability by Prof. Thalappil Pradeep from Indian Institute of Technology Madras (IITM), Chennai, India.	25 March 2025	6
2	Panel discussion on “Well-being as an Advantage: Including Mental Health & DEI in Strategy” as part of Prabandhan'25 (Department of Management Sciences Annual Fest)	22 March 2025	3
3	Driving Change for Clean Air and Climate: Interlinking Solutions for Scalable Transformation by Ms. Anumita Roychowdhury, the Executive Director of the Centre for Science and Environment	20 March 2025	13
4	Towards a Unified Field Theory of Socio politics: Explaining the Political Process by Dr. Jeffrey Broadbent (Emeritus Professor in the Department of Sociology, University of Minnesota)	24 January 2025	1, 3, 5, 8, 10
5	Climate Justice - The Scales Must Be Balanced by Mr. Rajan Mehta (Founder Climate Ventures Partner / Climate Action Labs, Harvard University)	4 December 2024	13
6	The Carbon Challenge: Background, Current Status and Evolving Carbon Capture Technologies by Dr. Ramesh Gupta	8 November 2024	6
7	What does coal phasedown even mean for different Asian countries? By Mr. Aditya Lolla (Asia Programme Director at Ember)	17 September 2024	1, 3, 5, 8, 10
8	Coal Pahse out and Job Displacement: Lessons from the UK by Prof. Juan Pablo Rud (Professor of Economics at Royal Holloway, University of London)		1, 3, 5, 8, 10
9	Water Security in the Era of Climate Change by Mr. Bishwadeep Ghose (Managing Trustee of Water for People India Trust)	6 September 2024	6, 13
10	An Indian pathway to shared, sustainable prosperity by Mr. Hisham Mundol (Chief Advisor of the Environmental Defense Fund)	26 August 2024	11, 13
11	Green Skills: Insights and Trends from LinkedIn's Economic Graph by Ms. Aditi Jha (Director & Country Lead: Legal & Government Affairs LinkedIn)	26 May 2024	4

12	Understanding CO_2 Capture, Utilization and Sequestration (CCUS) from a Sustainability Viewpoint by Prof. Rajnish Kumar, IIT Madras	10 May 2024	6
13	Transitioning India's Heavy-Duty Vehicles by Mr. Amit Bhatt (India Manager Director the International Council on Clean Transportation)	23 April 2024	7, 11
14	Degendering STEM: Why So Slow? By Dr Prajval Shastri, Emeritus Scientist of Astronomy and Astrophysics, Raman Research Institute	8 March 2024	5
15	Sustainable Energy Transition Mr. Partha S. Bhattacharyya (Former Chairman and Managing Director Coal India Limited)	03 February 2024	1, 3, 5, 8, 10
16	Building a sustainable future by Prof. Priyanka Ghosh	28 February 2024	1-17
17	Integrating climate considerations into business strategies by Prof. Wasim Ahmad	7 March 2024	13, 17
18	Sustainability as a business imperative: Balancing profit and purpose by Ms. Bhuvana Subramanyan, Mr. Ashok John, Mr. Mohaniraj Khodade, Mr. Shekhar Sood	4 February 2024	13, 17
19	ESG Risk Assessment: Identifying financial risks associated with environmental and social factors by Mr. Sanket Agarwal, Ms. Parvati Neelkantan, Ms. Neha Gupta, Mr. Seshadari Sevalgi	3 February 2024	5, 8 ,13, 17
20	ESG Branding: Building a sustainable and socially responsible brand by Mr. Ankit Chaturvedi, Dr. Ram Manohar Vikas, Mr. Karan Rajpal, Mr. Milind Tapaswi	3 February 2024	5, 8 ,13
21	Predictive analysis for ESG by Mr. Bhupesh Sharma	2 February 2024	17
22	Transforming waste flowers into sustainable leather to create a positive social impact by Mr. Gaurav Rawal, Research Scientist at Phool.Co	13 January 2024	7, 11, 12, 17
23	Exploring the potential of drones in AgriTech, revolutionizing how we approach agriculture by Prof. Rajiv Sinha	13 January 2024	11, 12, 13
24	Harnessing technology to improve soil health, paving the way for a greener, more sustainable future by Mr. Rajat Vardhan, CEO - AgroNxt Services Pvt Ltd	13 January 2024	9, 11, 12, 13

25	Some technological challenges and sustainable practices in agriculture by Dr. Anil K Rajvanshi, Director Nimbkar Agricultural Research Institute	12 January 2024	9, 12, 13

Outreach Events

#	Name of the event	Date	SDGs
1	5 km run & walk by Gender Cell	22 March 2025	4, 5, 10
2	A Gender Cell talk by Ms. Seema Kushwaha, an advocate at the Supreme Court of India and Founder of Samridhi Bharat Trust	8 March 2025	4, 5, 10
3	Ranjit Singh Rozi Shiksha Kendra at IIT Kanpur celebrated the Unnati Utsav. They set up a vibrant artisan haat, where visitors enjoyed unique handcrafted products, terracotta pottery, and organic food, along with the tasty and delicious chulha roti and other local delicacies—celebrating the rich traditions of rural India.	5 March 2025	1, 8 ,9, 12, 13
4	Farmers workshop: Ranjit Singh Rozi Shiksha Kendra had introduced an innovative solar dehydration technique to the participants.	14 February 2025	1, 2, 9
5	Integrating sustainability into curriculum by Prof. S. N. Tripathi. A talk delivered to schoolteachers.	13 December 2024	4
6	Terracotta Pottery Workshop: Design Development Program by Ranjit Singh Roji Shiksha Kendra with aim to introduce new design thinking and improved processes that will help the potters create products that are more attractive to consumers.	6-11 January 2025	1, 2, 8, 9
7	A 6-day Workshop on home furnishing products by Ranjit Singh Roji Shiksha Kendra with a mission to preserve traditional craftsmanship and connect it with modern design.	December 2024	1, 2, 5, 8, 9
8	Art Appreciation: Blockmaking and Printing by Prof. Shatrupa Thakurta Roy	7 July 2024	1, 2, 5, 8, 9
9	SolarButterfly - the largest solar-powered vehicle - comes to IITK!	4 November 2024	4

10	Bridging Gaps: Student-Level Sessions for Freshers'24 to increase awareness about sexual harassment, gender biases, and the available methods for filing complaints.	30 September – 1 October 2024	5
11	Suicide Prevention Day	10 September 2024	3
12	Mental Health Day	10 October 2024	3
13	Workshop on Substance and Behavioral Addiction	9 October 2024	3

Research

IIT Kanpur's research publications on sustainability span diverse disciplines, addressing climate change, renewable energy, waste management, and sustainable technologies. These cutting-edge studies offer innovative solutions to global challenges, fostering a greener and more sustainable future.

Some of the research at IITK focuses on the following aspects:

- Developing multifunctional hybrid nanostructures for energy and environmental applications; synthesizing nanomaterials through eco-friendly methods. Explore the charge transport properties of semiconducting materials to design efficient photocatalysts for wastewater treatment and investigate the potential of nanostructured metal oxides as electrode materials for high energy/power density energy storage systems.

- Exploration of perovskite materials for photovoltaic applications, focusing on understanding film formation, composition/interface engineering, and device degradation to optimize the performance and reliability of perovskite solar cells.

- Developing sustainable energy conversion systems, including electrolysis, fuel cells, and batteries. Efforts revolve around enhancing these technologies' efficiency, durability, and cost-effectiveness to make them mainstream solutions for the future.

- Work on innovations like solar reflector/concentrator and PV panel dust deposition, heat transfer fluids for solar thermal systems, and simulations for turbulent fluid flow.

- An MoU is signed with Mars Antennas & RF Systems Pvt Ltd. to collaborate on the design, development, fabrication, and testing of Smart Electric Vehicle Chargers and Smart Hybrid Inverters for Energy Storage System applications.

Publications

Every year we publish 100s of papers in the field of energy materials, wind energy, solar energy, green solutions, photovoltaics, smart grids, waste management, renewable energy, climate & policy, and various other topics covering environmental, social and governance aspects of sustainable development.

Student bodies at IITK

IIT Kanpur's student bodies for sustainability are e for their dedicated promotion of sustainability. Initiatives, awareness campaigns, and eco-conscious efforts set an inspiring example for a greener future.

1. **Sustainability Cell:** The Sustainability Cell, founded in early 2023, is an independent student body mentored by the Department of Sustainable Energy Engineering and supported by the Chandrakanta Kesavan Centre for Energy Policy and Climate Solutions.

   The primary aim of the cell is to work in close collaboration with the institute's administration and the campus residents to make the campus more sustainable and healthier to live, study & work in. Also, to educate & engage the community on various issues and foster a culture of debate & discussion on the global polycrisis. (Website: Sustainability Cell)

2. **IGBC Student Chapter**: The IGBC Student Chapter fosters student interest in sustainable development, green building, and conservation. It promotes eco-conscious professionals for a greener future through workshops and networking opportunities. (Web: IGBC inaugural event)

3. **Prakriti:** Prakriti is dedicated to the environment and sustainability as a part of the Community Welfare Cell. Their mission is to inspire EcoEngineers, drive sustainable innovation, and raise climate change awareness for a greener future. (Website: Prakriti)


Prakriti organized a Cleanliness drive on 9th April, 2023

Startups incubated at IITK

IIT Kanpur's sustainability-driven startups showcase innovation and commitment to a greener future, inspiring positive change, and impactful solutions for environmental challenges.

List of Startups

Agnys Waste Management Private Limited: The company is making a "Bio-composting of Horticulture & Organic waste into Manure Indigenously (BHOOMI)" composter. The composter has Carbon filters, Solar panels, Air pumps, Shredders, Mixers, and Separate liquid & solid waste compartments to ensure odourless, aerobic, eco-friendly, and rapid composting.

Baud Resources Private Limited: Baud Scientific Resources is working in the domain of Energy Storage space. The company has two proprietary products, DeepStorage Technology, and wind-train technology.

Climec Labs: The Climec Startup is a climate tech-based startup trying to revert and fix the damage caused to our environment due to Climate change and Global warming. They specialise in carbon capture and have made a unique domestic air purifier which creates a hyperlocal clean air zone by not only filtering air off its harmful components like bacteria, viruses, Particulate matter 2.5 and 10, VOC and other pollutants but at the same time produces oxygen worth of 22 trees and sequesters six trees worth of carbon-dioxide and holistically ameliorates the quality of air inside your house. It comes with more unique features that offer a bunch of useful value propositions to the customers.

Cultech Wave Private Limited: The company is a creative and cultural enterprise that aims to strengthen heritage education through content, Olympiad, excavation kits and virtual experiences.

Cycle Spirit Private Limited: Cycle Spirit is building low-cost, affordable electric bi-cycle and tricycles.

Deusent: Green hydrogen production

Earthface Analytics Private Limited: Earthface Analytics have developed a device for analysing and monitoring water quality through an easy-to-use colourimetric test strip based on smartphone technology that screens multiple important water quality parameters in less than 2 minutes.

Green Trek: Green Trek is an eco-friendly brand focusing on resource efficiency. It strives to positively impact the planet through smart ways of recycling steel waste. It does this through innovative melting processes where GHGs are minimised, the environment is safeguarded, and a circular economy is implemented.

IAP Media: India Action Project is a collection of young Indians trying to unlock Bharat's social, economic, and political potential. The civic-tech startup is on a mission to solve the most pressing issues using technology and data. The entity

developed a Jan Sampark App, with the help of which they are trying to make public welfare schemes accessible and hassle-free for all.

Invoviron Industries Trading: The startup that focusses on developing compostable polymer resin as a sustainable alternative to certain single-use plastic applications. The innovative polymer is synthesized using chicken feather keratin, resulting in a hydrophobic, non-burning, biodegradable, and durable material similar to nylon.

Jalconserve Technologies Private Limited: The company has developed an on-site, low-cost, sustainable solution for recycling residential greywater.

Jivoule: Bio CNG production from organic biomass

JustDataAnalytics Private Limited: The dedicated team employs cutting-edge methodologies to monitor field dynamics, policy developments, and technological innovations, providing timely and insightful analyses related to energy transition and other environment-related issues.

Kritsnam Technologies Private Limited: Kritsnam Tech has developed a cost-effective infrastructure for low-power, long-range RF-based wireless communication systems that will enable continuous real-time monitoring in the rural landscape for smart irrigation, education, health, smart grids and hydrological research and efficient water resource management.

LCB Fertilizers: It is a farming company. Their flagship project is NavyaKosh, a high yield organic fertilizer. Farmers using this fertilizer need less water and fertilizer to grow their crops, which reduces investment and increases farmer revenue.

Offgrid Energy Labs Private Limited: Offgrid is building novel, cost-efficient & sustainable batteries for utility & mobility markets. Its first product, 'ZincGel® battery', is packed with breakthrough innovations that enable it the performance of lithium-ion at one-third the cost, creating a disruptive impact on target markets.

Oxy Neuron India Private Limited: The company makes "The Lipon Inverter," a new and innovative device that helps store electricity and reduce carbon footprint. The company manufactures an optimum quality assortment of Solar AC, Solar Wate geysers, Solar fridges, Solar Water pumps, and Solar generators.

Pacing Grass Private Limited: The mission of the company is to replace plastics and metals with eco-friendly sustainable alternatives that drive a transformative shift across industries. They are dedicated to developing cutting-edge materials that not only meet the demands of modern production but also contribute positively to the environment.

Pi Hemp Private Limited: Pi Hemp provides zero-waste, sustainable alternatives to petrochemical plastics using the power of industrial hemp. Being anti-bacterial and biodegradable, it has potential applications in medical devices, healthcare products, dental office equipment, packaging solutions, the sports industry, and 3D printing filaments.

Prayas Environment system: Prayas is an environmental management solution provider company with a CEMS approach, while Plasma provides solutions for Plastic Waste (PW) with plants supplied in India and Europe. They convert the IW as a resource with a solution that fits the circular economy with technological intervention to close open loops of the environment. Currently, for PW they have developed a decentralised solution for a plastic waste processing modular facility with financial viability. This unique approach is viable locally for plastic waste with global applicability. This is currently at the Validation stage. This solution can potentially resolve the global menace of plastic – on land/water generated/accumulated.

Saptkrishi Scientific Pvt Ltd: It is an agritech startup determined to solve the problem of the perishability of fruits and vegetables for street hawkers, and small & marginal farmers. Globally, it is estimated that up to 40% of horticultural produce is wasted, which not only leads to economic losses of approximately $160 billion

per year but also contributes to around 5% of greenhouse gas emissions and consumes about 10% of the world's freshwater resources. To solve this Saptkrishi has developed one of its kind affordable storage named SABJIKOTHI which maintains freshness and extends the shelf-life of fruits and vegetables anywhere around 3 to 30 days without using any chemicals, preservatives or refrigerants.

Vasundhara Biofibers: The company is focused on developing biodegradable packaging materials using Agricultural Wastes like Rice Straw, Kans, Bagasse.

Virya Paramita Energy Private Limited: Virya Paramita is developing a wave energy-based desalination technology for harvesting wave energy for seawater desalination (producing freshwater).

Concluding Statement

In conclusion, the IIT Kanpur Sustainability Report reflects our institution's unwavering commitment towards creating a greener and more sustainable future.. Through collective efforts and innovative solutions, we plan to take significant strides in addressing climate change, managing carbon emissions, conserving water resources, and promoting responsible waste management. Our dedication to academic excellence, research, and partnerships will continue to drive positive change for a more resilient planet as we move forward.

One of the first steps is expanding renewable energy capacity, particularly Solar PV. Moreover, our commitment to sustainability goes beyond energy generation. We are resolute in making a tangible difference in building operations as well. We pledge to transform at least one of our buildings into a net-zero energy structure. Through innovative design, energy-efficient technologies, and smart practices, we aim to ensure that the energy consumed by this building is entirely offset by renewable energy generation. Our third major step will be becoming a Zero Landfill waste campus.

We aim to stand at the forefront of sustainability, inspire others to follow suit and create a lasting positive impact on society, the environment, and future generations. We hold the key to shaping a better, more sustainable future.

“ We are committed to making our campus a Carbon neutral campus by 2030.”