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 recognise 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.

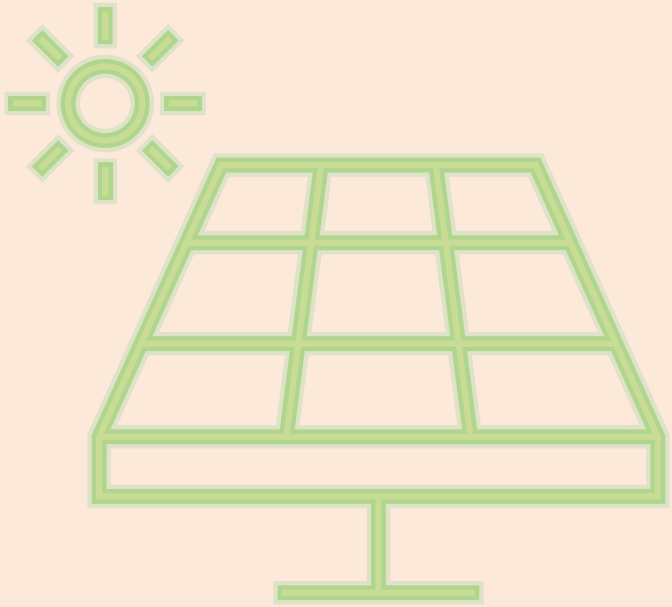
This report exemplifies the collective efforts of our faculty, researchers, students, and staff, who have tirelessly pursued pioneering research and innovative solutions in various sustainability-related domains. From developing cutting-edge sustainable technologies to advocating for responsible waste management practices, these endeavours 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. Abhay Karandikar
Indian Institute of Technology Kanpur

CONTENTS



Preamble

In our commitment to environmental stewardship and a sustainable future, the Indian Institute of Technology Kanpur (IITK) proudly presents this comprehensive Sustainability Report. Recognising the significant impact of carbon emissions, water management, waste reduction, and energy efficiency, we endeavour 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 optimise 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 recognise 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

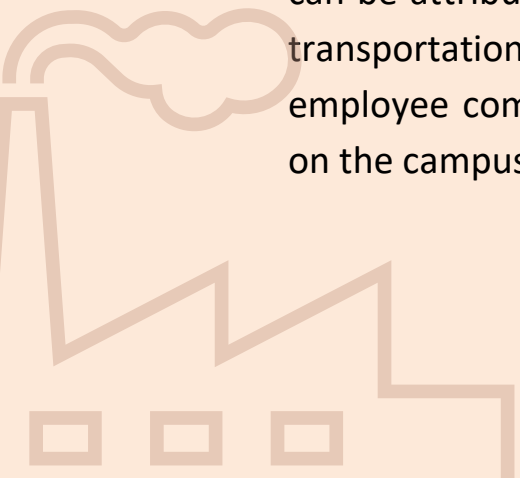
Colleges and universities, like any other organisation, contribute to carbon emissions through their operations and activities. Carbon emissions due to our institute come from various sources, including, but not limited to, energy procurement, lab equipment & teaching aids, travel, waste management, and construction activities.

These are the emissions we, as an institute, 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 generating purchased electricity, heating, or cooling consumed by the institute. These emissions occur due to the production of energy by the utility company, which the institute then uses. This includes emissions from the generation, transmission & distribution of the electricity consumed.

- **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 & maintenance work undertaken on the campus, and waste disposal.



Type	Data		Amount	Unit	Emissions (tonnes of CO2eq.)
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.

Initiatives

Our campus is committed to achieving carbon neutrality, **aiming to achieve Net Zero carbon emissions by 2030** through a comprehensive and strategic plan. This significant step aligns with our vision of becoming a carbon-neutral institution, leading toward a greener and more sustainable future.

The current area of our campus is about 1100 Acres (4.45 sq. km). The institute has over 80,000 trees, and over 3,000 saplings are planted yearly. The dense plantation helps lower the temperature compared to the city. The institute preserves about 20-25% of perennially green areas to maintain a healthy environment.

Several strategies and actions must be implemented to achieve carbon neutrality. Here are some **major areas of focus:**

Energy Efficiency: Implement energy-efficient measures across the campus, such as upgrading lighting systems, optimising HVAC (heating, ventilation, and air conditioning) systems, and improving building insulation. The step can reduce energy consumption and associated greenhouse gas emissions.

Renewable Energy: Move to cleaner energy sources like solar photovoltaics. The deployment will help offset the use of fossil fuels for electricity consumption and reduce Scope 2 emissions. We plan to replace **~1 MW** of fossil fuel-based power with renewable energy through in-house deployment or Renewable energy contracts (RECs).

Green Buildings: Incorporate sustainable building design principles in new construction and renovations. The interventions will include using eco-friendly materials, optimising natural lighting and ventilation, and employing energy-efficient technologies.

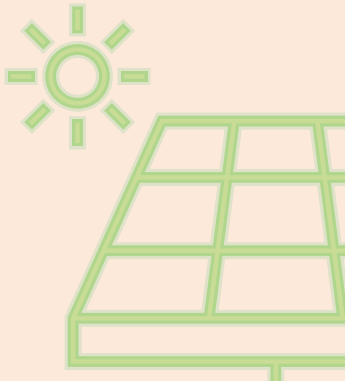
Regular monitoring, tracking, and reporting of emissions will be essential to assess progress and identify areas for improvement. It is vital to develop a comprehensive carbon reduction plan and involve all stakeholders to ensure the successful implementation of these strategies.

Energy

Energy consumption is the most significant contributor to carbon emissions for IITK. 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. They produce little to no greenhouse gas emissions during operation, helping to reduce carbon dioxide and other harmful pollutants released into the atmosphere. We must significantly decrease carbon emissions by shifting away from fossil fuels and increasing the share of renewable energy in our energy mix.

Improving energy efficiency is another critical aspect of reducing carbon emissions. Energy efficiency uses less energy to achieve the same or even better results. It involves adopting technologies and practices that minimise energy waste and maximise energy output. We must reduce energy demand and carbon emissions by implementing energy-efficient measures in buildings, transportation, and appliances.



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.

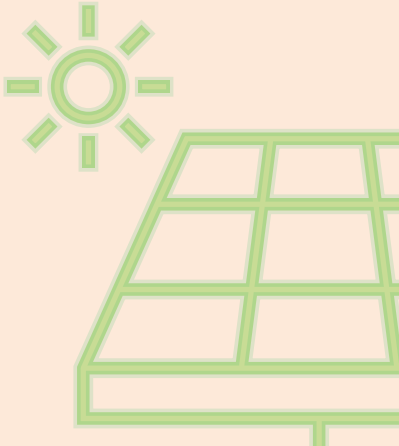
Current Initiatives

Energy Advisory Committee (EAC):
A policymaking body on environmental issues was constituted at IIT Kanpur in 2013.

Centralized Air Conditioning in Academic Area:
Centralised air conditioning saves energy by optimising cooling distribution, reducing redundant cooling units, and improving temperature control. It allows for efficient energy use 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 for their hot water needs. Solar water heaters save energy by harnessing sunlight to heat water, eliminating the need for conventional energy sources like electricity or gas. 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 an installed Solar generation 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.



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:

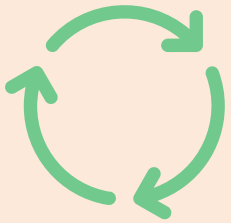
We plan to convert one of our existing buildings on campus to Net zero energy; this building will be off-grid and will be able to produce enough energy to complete its regular operation.

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 IITK's waste management techniques are to effectively manage waste, minimise waste generation, promote recycling and reuse, and ensure proper waste disposal.

Here are some standard modes of waste production and their disposal methods currently practised at IITK:

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 2022 data. ***Agnys Waste Management***, an IITK-incubated startup**,** composts this**.** The drum composting method is used in each hall to convert the waste into compost. Each drum has a capacity of 200 kg maximum, and it takes 20-22 days for each cycle of waste conversion to compost. The compost generated is distributed to the campus residents free of cost.

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

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.

Current Initiatives

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

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.

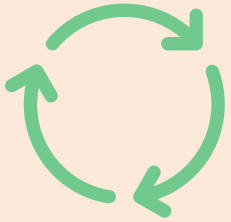
BHOOMI stands for Bio-composting of Horticulture and Organic waste into Manure Indigenously. Engineers India Limited supported the Research & Development of the device. The device has advanced features like carbon filters, shredders, air pumps, and solar panels, which systematically convert waste into manure in just 10-20 days. The process is more convenient and rapid than the conventional technologies. BHOOMI has been a significant development in this regard. It follows the basic science of composting and converts organic waste into manure in just 10-20 days, making it one of the fastest composting solutions.

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, some organic waste goes to composting, and the cooked food waste is handled unorganised and inefficiently. Installed effectively at various levels in IITK, we can use the biogas released 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 IITK 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, emphasising sustainability and addressing fundamental water security issues.

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

At IITK, water conservation is recognised as a critical component of maintaining a sustainable campus. The institute emphasises responsible consumption and

implements water recycling and reuse practices. These efforts aim to address the challenges of water availability, quality, and distribution while considering the rapid development and impending impacts of climate change.

Current Scenario

The water requirement for our campus at IITK 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 litres per day (MLD)**.

To address wastewater management, IITK 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 utilised for horticultural purposes, such as irrigation & gardening.

While our campus has tried to treat wastewater and reuse 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.

Planned Initiatives

The existing **water supply network at IITK is being analysed** 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 optimise 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.

Rain Water 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.

Academic Programs & Research

IIT Kanpur's target of becoming a more sustainable and carbon-neutral campus includes educating people about sustainability and the technologies needed to conduct innovative research in this field. Various departments and centres are working independently and collaborating to achieve this target. More than 25 courses are offered across multiple departments teaching different renewable energy technologies, sustainable building practices, climate policies, environment, environmental economics, and climate change.

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.

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:

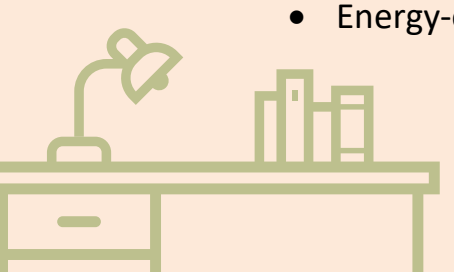
The National Aerosol Facility is a multi-purpose facility for studying aerosol behaviour under simulated conditions. IIT Kanpur successfully conducted its first artificial rain test under the supervision of this facility.

Degrees (related to sustainability) offered by IITK:

1. MTech, MS(R), and PhD in Environmental Engineering
2. MTech, MS(R), and PhD in Sustainable Energy Engineering
3. E-Masters in Sustainable Construction Practices and Project Management

Some of the relevant courses offered by IITK:

- An introduction to sustainable energy technologies
- Climate Change Economics and Policy
- Electric vehicles
- Energy systems: Modelling and analysis
- Solar photovoltaics
- Wind energy
- Solar thermal engineering
- Introduction to sustainable energy policy
- Energy-efficient building design



- Manufacturing energy systems

Research at IITK**:**

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:

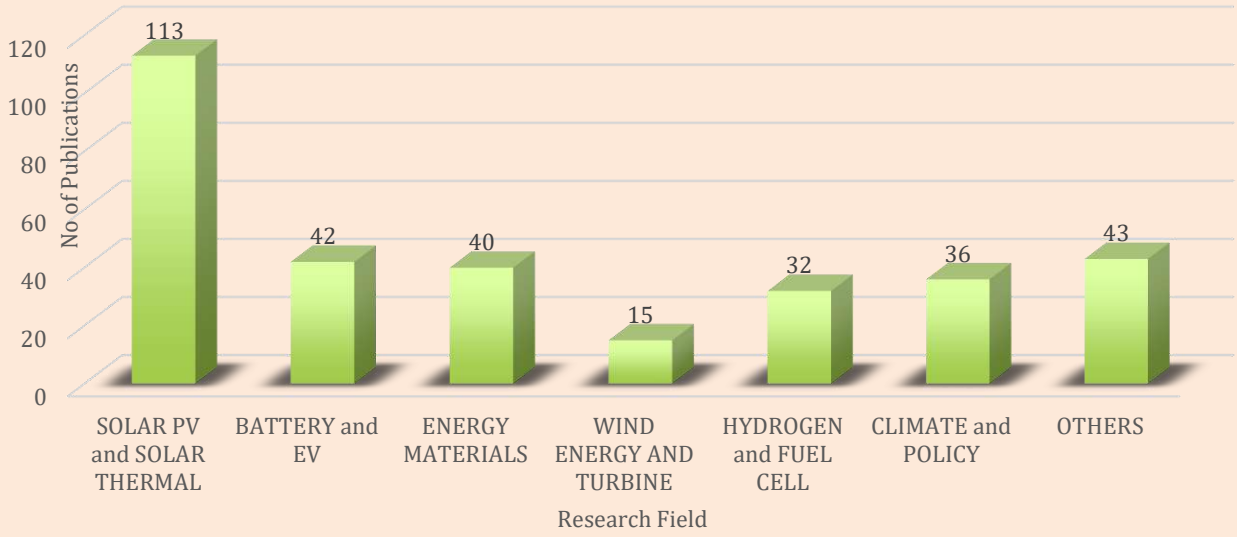
- Developing multifunctional hybrid nanostructures for energy and environmental applications; synthesising nanomaterials through eco-friendly methods. Explore the charge transport properties of semiconducting materials to design efficient photocatalysts for wastewater treatment and investigate the potential 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 optimise the performance and reliability of perovskite solar cells.

- Developing sustainable energy conversion systems, including electrolysers, 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.

Recent Research Publications in Sustainability



Research Field	No of Publications
SOLAR PV and SOLAR THERMAL	113
BATTERY and EV	42
ENERGY MATERIALS	40
WIND ENERGY AND TURBINE	15
HYDROGEN and FUEL CELL	32
CLIMATE and POLICY	36
OTHERS	43

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)

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.

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

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.

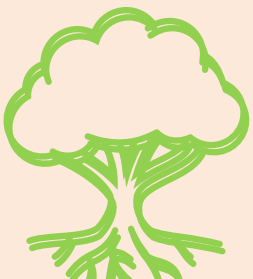
Offgrid Energy Labs Private Limited: Offgrid is building novel, cost-efficient & sustainable batteries for utility & mobility markets. Its first product, 'ZincGel® battery', is packed with breakthrough innovations that enable it the performance of lithium-ion at one-third the cost, creating a disruptive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

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.

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 to 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."