9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

SDG 9: Industry, Innovation and Infrastructure

BUILD RESILIENT INFRASTRUCTURE, PROMOTE INCLUSIVE AND SUSTAINABLE INDUSTRIALISATION AND FOSTER INNOVATION

Sustainable Development Goal 9 (SDG 9) aims to build resilient infrastructure, promote sustainable industrialization, and foster innovation. These elements are critical for fostering economic growth, creating job opportunities, and addressing various societal challenges. A focus on this goal is essential for achieving sustainable development and improving the quality of life for all.

Academic institutions, like the Indian Institutes of Technology (IITs), have a significant role to play in advancing these objectives. IIT Gandhinagar, a prominent member of the IIT family, has been actively working towards these goals through a variety of initiatives and activities. This report intends to shed light on the efforts of IIT Gandhinagar in contributing to Sustainable Development Goal 9.

IT Gandhinagar's mission is to excel in teaching and research, nurturing creativity, innovation, and entrepreneurship. The institute envisions becoming a leader in knowledge creation and dissemination for the benefit of society. These principles align closely with the objectives of SDG 9. Over the years, IIT Gandhinagar has made significant strides in academic excellence, research contributions, and commitment to sustainability. These achievements lay a solid foundation for the institute's efforts in promoting SDG 9.

RESEARCH

- Prof Susmita Mondal and Prof Sameer G. Kulkatni in an article titled Incentivization Model for Better Plastic Waste Management using Blockchain proposed a Blockchain-based incentivization model through which organisations can collect post-consumer plastics and reliably track their supply. They argued that the global state view of the entire supply chain will extensively benefit the users and recycling organisations. It also reduces carbon footprint along the process which will significantly help society. The reward system through Blockchain can substantially interest more people to participate in the system contributing to the greater social cause of plastic waste management to promote a sustainable environment.

- Prof B. Saha was part of team who undertook the preparation of few-layer graphene nanosheets from fruit waste: kinnow peel waste (KPW) for the first time, via two-step pyrolysis with activation using KCl as the activating agent followed by probe sonication. The confirmation of few-layer graphene (FLG) nanosheets from KPW was done with the help of RAMAN, XRD, FT-IR, SEM, and TEM.

- Prof A. Nema along with their team proposed an easy-to-implement water-reuse strategy that utilises intermediate storage tanks with finite capacities in their paper titled as "a simple strategy to maximise water-reuse in multistage, multiproduct batch processes." Strategy proposed by them relies on a simple heuristic that maps discharge from specific stages to be stored in corresponding tanks. A fallback sequence is also provided in case the tank cannot accommodate the entire discharge volume. They also proposed an analogous scheme for reusing water from the tanks in appropriate process stages. They further demonstrate using a textile industry case study that this simple reuse strategy can result in significant water savings.

Three research scholars from IITGN have won Gandhian Young Technological Innovation Awards 2021. Harini Gunda, a PhD scholar of Chemical Engineering, has won SRISTI-GYTI Award 2021 for developing 'Novel Boron Nano-additives for Improving the Performance of Solid Propellants'. Yogesh Singh, a PhD scholar of Mechanical Engineering, and Dr Chandan Kumar Jha, a PhD alumnus and now a postdoctoral fellow in Electrical Engineering, have won the BIRAC SITARE-GYTI Appreciation Awards 2021 for developing 'Wearable Interactive Parkinson's disease Assistive Device (WIPAD)' and 'An Intelligent Hand Rehabilitation and Assessment System for Stroke Patients', respectively.

Patents granted

Low-cost Hand-driven Bamboo-cored Incense-stick Making Machine: Inventors include Keshav Giriyapnavar (a BTech alumnus of 2012). Patent number is 375325.

Polymer Reinforced Metal Matrix Composites and a Process for Fabricating the Same: Inventors include Prof Amit Arora, Prof Chandra Sekhar Tiwary, Arpan Rout, Anurag Krishnakedar Gumaste, and Mahesh V P. The patent number is 389338.

Method for the Asymmetric Synthesis of (S)-Paraconic Acid: Inventors include Prof Chandrakumar Appayee and Dr Abhijeet Madhukar Sarkale. The patent number is 391941.

A Filter for Water Purification and a Process for its Manufacture: Inventors include Prof Chinmay Ghoroi and Dr Deepa Dixit. The patent number is 397587.

OPERATIONS

- IIT Gandhinagar has established a thriving incubation centre that serves as a nurturing ground for startups. This centre provides essential support in the form of infrastructure, mentorship, and access to funding, enabling entrepreneurs to transform their ideas into viable businesses.

- IIT Gandhinagar frequently organises entrepreneurship challenges and competitions to stimulate students' innovation and business ideation. These events often lead to the creation of new startups, which contribute to the development of new industries. Some of the key highlights have been as follows:

❖ During May 3-7, 2022, the IIT Gandhinagar Innovation and Entrepreneurship Center (IIEC) organised 'Build your Startup with B V Jagadeesh', a highly regarded serial entrepreneur, mentor, and angel investor, to help the participants understand the fundamentals of the entrepreneurial journey. In addition, the participants also received entrepreneurial lessons from other successful entrepreneurs such as Mr Jimmy Padia, Founder & CEO, Floatbot; Mr Sharad Sanghi, Managing Director & CEO, NTT Ltd, India; and Mr Naveen Varma Alluri, Co- founder, My Ally.

❖ Several startups incubated at IIT Gandhinagar have achieved notable success. Havi, a consumer electronics and robotics toys startup from IIT Gandhinagar Research Park, was selected for the prestigious Stanford Seed program in 2022. Additionally, MiCoB, an IITGN-incubated startup, raised $0.5 million in a seed round for its 3D concrete printing solutions, contributing to infrastructure development.

- Research Centres: The institute has established research clusters in areas such as renewable energy, sustainable development, and healthcare technologies. These centers conduct cutting-edge research with practical applications, contributing to industrial growth and infrastructure development.

- International Workshops and Collaboration: IIT Gandhinagar actively collaborates with international experts and institutions to promote innovation and research. For instance, the institute co-organized the 'International Workshop on Quantum Information in QFT and AdS/CFTII' and the 'Indian Symposium on Machine Learning (IndoML),' creating opportunities for knowledge exchange and collaborative research.

- Intellectual Property Initiatives: To foster innovation and entrepreneurship, the IIT Gandhinagar Innovation and Entrepreneurship Center launched the 'Intellectual Property Clinic.' This initiative provides guidance on various aspects of intellectual property and promotes the protection of innovative ideas and technologies. The first IP Clinic was organised on July 3, 2021, with Mr Nilesh Pandit, IPR Lead, Tata Consultancy Services (TCS). Dr Malathi Lakshmikumaran, Executive Director and Practice Head, Lakshmikumaran & Sridharan Attorneys conducted the second IP Clinic on July 10, 2021.

- IIT Gandhinagar inaugurated Maker Bhavan, a multidimensional academic makerspace, to nurture innovative thinking among students and motivate them to convert their ideas into actual prototypes. This initiative contributes to innovation and infrastructure development, as it equips students with the resources and space to turn their concepts into tangible products and solutions.

- The institute recognizes the importance of energy efficiency in infrastructure development. In collaboration with IIT Madras, IIT Gandhinagar initiated the "Kotak-IITM Save Energy Mission (KISEM) - IITGN" project to promote decarbonization of Indian industries. This project focuses on research, consultancy, education, and training to drive energy-efficient practices, aligning with SDG 9's goal of sustainable infrastructure.

- InfyU Labs, an agritech startup pre-incubated at IIEC and supported under the Nidhi Prayas programme, has raised Rs 1.8 crores in a seed round from Indian Angel Network (IAN). The company, currently part of IITGN Research Park, specialises in creating portable devices that determine the internal quality of fresh fruits without cutting them open.

EDUCATION

The institute offers a range of courses in entrepreneurship, business development, and management. These programs equip students with the skills and knowledge needed to initiate and manage their enterprises, aligning with the objective of promoting entrepreneurship under SDG 9. Some of the courses offered include:

CL 425: Process Synthesis and Design
ES 201: Introduction to Design and Innovation
ME 461: Integrated Design and Manufacturing II
MS 403: Engineering Entrepreneurship

COMMUNITY OUTREACH

IIT Gandhinagar actively engages with industries through various events. These interactions promote industry-academic partnerships, driving innovation and infrastructure development. Some of the key events have been:

- IITGN, in collaboration with Gujarat Urja Vikas Nigam Limited (GUVNL) and Gujarat Energy Training & Research Institute (GETRI), conducted a two-week advanced training programme on "System Operation and Commercial Aspects of Power Purchase, Open Access, & Energy Accounting" for senior officers/engineers of the state electricity companies from June 27 to July 8, 2022

- The institute organized a meeting with the Gujarat Chamber of Commerce and Industry (GCCI) to foster an understanding of industry needs and showcase the expertise available at the institute. March 3, 2022

IIT Gandhinagar's commitment to entrepreneurship and innovation has yielded remarkable success stories. Havi, a startup incubated at IIT Gandhinagar Research Park, was selected for the prestigious Stanford Seed program, promoting innovation in consumer electronics and robotics. MiCoB, another IITGN-incubated startup, secured $0.5 million in a seed round, advancing 3D concrete printing technology. These success stories highlight the institute's role in fostering startups and driving economic growth.

Industry Connections: IITGN conducted an Industry Connection meeting with the members of the Gujarat Chamber of Commerce and Industry (GCCI) on March 3, 2022. GCCI's Chemical Task Force Chairman, Mr Shrenik Merchant, and Vice-Chairman, Mr Prashant Patel, along with several other industry members attended the event. The meeting acted as a forum for understanding industry needs and knowing the expertise of various faculty at IITGN as well as the state-of-the-art facilities available at the campus. The event was coordinated by Prof Chinmay Ghoroi.

Mentorship programmes by IIEC: During the quarter, Shri Kamalesh Dwivedi, highly-regarded business leader, investor and mentor-in-residence at IIT Gandhinagar Innovation and Entrepreneurship Center, conducted the following programmes for the Institute community: Critical Success Factors for Early-stage Start-ups on January 6, 2022, Fundraising Masterclass on January 10, 2022, and Business Communication for Start-ups on January 12, 2022.

Invention Factory India 2022: After a gap of two years due to the global pandemic, IITGN hosted the third edition of the Invention Factory® India, a one-of-its-kind intensive summer programme in inventing. 20 students from 10 IITs participated and worked in teams of two to conceive, prototype, and pitch ten unique inventions that addressed various societal and consumer needs, and filed the US as well as Indian provisional patent applications for their inventions, over seven weeks. The teams were directly mentored by IITGN Professors Nithin George, Madhu Vadali, and Jaichander Swaminathan, as well as the founders of the original programme in the US, Cooper Union Professors Alan Wolf and Eric Lima.