Green Audit Report

VELLORE INSTITUTE OF TECHNOLOGY (VIT)

Katpadi, Vellore - 632014, Tamil Nadu, India

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Prepared by

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Section 1: Executive Summary

The term “Green” means eco-friendly or not damaging the environment. The primary goal of the green audit is to secure the best practices for environmental sustainability. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area. Green Audit focuses on the Green Campus, Waste Management, Water Management, Animal Welfare, Energy Management, Carbon Footprint, and Environmental Compliances etc., in order to reduce the possibilities of health hazards and threats for the students on the learning campus. As a part of such practice, an internal audit (Green Audit) is conducted to evaluate the actual scenario at the campus.

The Green audit can be a useful tool for a University to determine how and where they are using the most energy or water or resources; the University can then consider how to implement changes and make savings. Green auditing and the implementation of mitigation measures is a win-win situation for the University, the learners and the planet. It can also create health consciousness and promote environmental awareness, values and ethics. It provides staff and students a better understanding of the Green impact on campus. The Green auditing promotes financial savings through the reduction of resource use. It allows the development of ownership, personal and social responsibility for the students and teachers.

The audit process involved Initial Data Collection, Site walk through with the team of VIT including the management policies, activities, and records. This was followed by staff and student interviews, collection of data, review of records, observation of practices and observable outcomes. The baseline data collected from VIT, Vellore are analyzed and a conclusion is made.

Section 2: Introduction to VIT

VIT was established with the aim of providing quality higher education on par with international standards. It persistently seeks and adopts innovative methods to improve the quality of higher education on a consistent basis. The campus has a cosmopolitan atmosphere with students from all corners of the globe. Experienced and learned teachers are strongly encouraged to nurture the students. The global standards set at VIT in the field of teaching and research. The highly motivated youngsters on the campus are a constant source of pride. Memoranda of Understanding with various international universities are the major strength and thus provide for an exchange of students and faculty and encourage joint research projects for the mutual benefit of these universities.

It was established under Section 3 of the University Grants Commission (UGC) Act, 1956, and was founded in 1984 as a self-financing institution called the Vellore Engineering College. The Union Ministry of Human Resources Development conferred University status on Vellore Engineering College in 2001. The University is headed by its founder and Chancellor, Dr. G. Viswanathan, a former Parliamentarian and Minister in the Tamil Nadu Government. In recognition of his service to India in offering world class education, he was conferred an honorary doctorate by the West Virginia University, USA. Mr.Sankar Viswanathan, Dr.Sekar Viswanathan and Dr.G.V. Selvam are the Vice-Presidents; Dr. Rambabu Kodali is the Vice-Chancellor and Dr. Partha Sharathi Mallick is the Pro-Vice Chancellor

Now VIT has blossomed into a multi-disciplinary Institute offering more than 100 UG & PG programs, besides Doctoral programs, through 15 Schools and 45 Departments. Programs have the approval of the relevant Statutory Regulating Agencies such as UGC, AICTE, PCI, BCI, NCTE, DGS etc. VIT has student strength of close to 35894 and faculty strength of 2538 among nearly 190 foreign faculties. VIT has been accredited by NAAC with a (A++) grade in the last three consecutive cycles. VIT has got NIRF ranking at University level 8, Engineering at 11, Research at 11 and overall at 17. The Shanghai (ARWU) ranking of World Universities-2022, VIT was ranked 2-3 in India. VIT has received an overall world rank of 240 and India ranked 9 from the QS World University in Engineering and Technology. The impact ranking, 11th India Rank from the UNIRANKS, Top 2 per cent scientists, 12th India ranking from the Round University Ranking, 9th India ranking from the University Ranking by Academic Performance, Turkey, received by the VIT are mentioned below.

An enriched teaching, learning and evaluation process is carried out in VIT catering to the diversity of students and faculty. Students entering VIT enjoy a multivariate learning process. Bridge Courses are conducted to prepare the students to their respective study environments. The entire Teaching-Learning process is student centric focusing on LMS, KMS, and E-Learning resources. Interactive and instructional lectures, classroom deliberations, practical classes, hands-on training, projects, presentations, workshops and guest lectures help students to hone their technical skills. Comprehensive lesson plans are prepared regularly by faculties for effective teaching. Independent, Interactive, Collaborative and Participatory learning is encouraged and the required facilities are available for students in terms of SMART Classrooms, Wi-Fi enabled Campus, Industrial Interactions, Projects and visits. Video lectures of VISTAS recorded using EduTech, NPTEL, EDX and other MOOCs to enhance student learning. Virtual learning through the AVIEW and Moodle programs of IIT are available. VIT employs an effective Mentor-Mentee system for counseling students on regular basis. Class committee meetings are conducted regularly for all types of learners. Remedial and tutorial classes are conducted for slow learners to enhance the learning. Fast learners are involved in NPTEL courses, industrial problems and projects. All the programs offered by VIT have clearly defined POs, PSOs and COs and the outcomes are assessed through direct and indirect methods. VIT adopts Continuous Assessment System, where both formative and summative assessments are ensured to measure the attainment of course outcomes.

VIT core values are aligned to its vision and mission and are reflected in the curricular and professional growth of the VIT community. With Equity as its premier value and a Women's Forum as its mouthpiece, VIT promotes gender sensitivity among all stakeholders. Girls are given special counseling to overcome depression, abnormal behaviour etc. VIT have well-defined policies like Sustainable Investment Policy, Sustainable Procurement Policy, The Climate Roadmap – VIT's, Path towards Carbon Neutrality by 2050 and Energy Use Policy (included in this report as annexures).The campus is green, serene and pleasant and also steps have also been taken by VIT management to conserve energy and reduce carbon as well as the best practices such as tobacco- free campus, conserving natural resources, sourcing renewable energy and carbon neutrality. The E-waste is again sold back to the contractors. Being situated in the heart of city, VIT enjoys the privilege of creation of direct and indirect employment opportunities for the local unemployed youth. Good connectivity and presence of industries in the vicinity are major advantages.

VIT follows the Best practices such as Outcome Based Education, Student Mentoring, External Academic and Administration Audit, ERP in all the activities, NSS Unit-Swach Bharat Abhiyan, Student`s Feedback about Teachers, MHRD Digital Initiatives, Research culture, Institution-Industry Interaction, Use of Renewable Energy, Internship for Students, Parent Corner in the Website etc. The Industry- Institution relationship is very strong at VIT. Industries are busy in developing products at the Incubation Centre. Some academic programs such as B.Tech and MBA are run in collaboration with M/s IBM. Experienced Professors are active in solving industrial problems as part of consultancy projects. VIT vision is to provide quality education. Hence, as part of ensuring quality, External Academic and Administrative Audit is performed in all the departments every year.

A centre, named, 'Centre for Advanced Research and Development' (CARD) has beenestablished with the aim of promoting research. Besides 12 advanced dedicated research labs in various schools, a Central Instrumentation lab is set up housing advanced instruments such as BET Surface Area Analyzer, Field Emission Scanning Electron Microscope, High Performance Thin Layer Chromatography, X-Ray Diffractometer, Particle Size and Zeta Potential Analyzer, Raman Spectrometer, etc. Research scholars from nearby universities also use VIT lab for research. Due tostrong Industry – Institutional tie-up, senior faculty are busy in solving industrial problems as consultancy projects. Ten industries are active at Incubation Centre in developing products useful to the society. Staff members are given incentives to publish papers and attend seminars. During the last three years 1374 research papers have been published in the UGC listed journals. Turnitin software is available to eliminate plagiarism.

Under Unnat Bharath Abhiyan program, VIT has initiated promotion of institutional social responsibility through activities undertaken in the rural community. Generic Medicines are made available to the society through Pradhan Mantri Jan-Aushadhi Yojana Scheme. Vision of VIT is to make this an International Institute wherein students from all the countries will assemble to enrich themselves in terms of knowledge. VIT wants to provide physical and academic infrastructure including lab facilities which will create “reverse flow” of students. Ambition of VIT is to have 100 corers worth of research projects by 2030.On the whole, the Institute is committed to excellence in every activity, intelligent planning of each activity and ensuring focused effect on each of them for attaining excellence.

Section 3: General Information of VIT-Vellore

The structure of Governance in VIT facilitates Autonomy, Transparency and Accountability through participation of various stakeholders. It provides the differentiation and integration of various activities in VIT. The Organizational structure has been designed as per UGC Regulation. The Regulatory bodies of VIT include Board of Management, Academic Council, Planning and Monitoring Board, Board of Studies and Finance committee. They have been functioning as per guidelines of UGC and Memorandum of Association and they meet periodically. The various key stakeholders of VIT, which includes faculty, students, parents, industry experts, academic peers and alumni, are involved in decision making at every level. For smooth functioning of VIT several sub-committees comprising the faculty and student representatives have been constituted. In order to decentralize administrative/ academic machinery, authority has been delegated by setting up of Deans for various Schools, Admissions, Academics, Research, Student Affairs, Faculty, IQAC, etc., For transparent functioning, the Admission, Academics, Administration, Accounts and Examination processes are automated by using ERP.

Section 4: Facilities Available-VIT-Vellore

1.Academic Block

A striking feature of VIT is the well-planned and comprehensive premises provided for both students and faculty. There are seven academic blocks in VIT which are extremely specialised in their own particular field, namely;

- Dr.M.G.R Block
- Silver Jubilee Tower
- Technology Tower
- Sri.M.Vishweshwaraiah Building
- CBMR

- G.D. Naidu Block
- CDMM Building
- A.L. Mudaliar Block
- Gandhi Block
- PRP Block

The layout has been excellently planned to make the maximum utilisation of the 372 acre campus. The idea behind these separate blocks (Photograph 1) is to make every block equipped with the necessary amenities whilst providing the perfect atmosphere for both studies and research.

Photograph 1: View of Academic Block-VIT,Vellore

2.Auditoriums and Conference Facilities

VIT University firmly believes in providing its students exposure to national and international knowledge experts, through regular national and international conferences / symposia and workshops hosted on campus. It is with this view that a wide choice of modern conference facilities have been meticulously planned and incorporated into the VIT campus. ‘Anna Audi‘ (Photograph 2) commonly used by students is nothing short of being a marvel. Able to accommodate 1800 students and spread over an area of 15436 sq. feet, it has been built with centralised air conditioners, Wi-fi service and a spectacular stage along with green rooms and perfect amount of lighting. This auditorium is used for various events and conferences. It is located beside the volleyball and basketball courts and serves as a landmark in VIT. Other auditoriums with seating capacities are mentioned below.

- Anna Auditorium (Seating capacity – 1800)
- Dr. M. Channa Reddy Auditorium (Seating capacity – 469)
- Dr. Ambedkar Auditorium (Seating capacity – 198)
- Kamaraj Auditorium (Seating capacity – 128)
- Multi-purpose Hall (at Gandhi block) (Seating capacity –462)

Photograph 2: View of Auditorium-VIT,Vellore

Photograph 3: View of Data Centre – VIT,Vellore

3.Centre For Technical Support

Centre for Technical Support (CTS) maintains the policies governing the use of VIT computing and IT communication resources (Photograph 3). The IT Policy applies to the resources administered by the administrative departments such as Library, Computer Laboratories,

Offices of the Institution, Hostels and Guest houses wherever the network facility was provided by the Institution.

Further, all the faculty, students, staff, departments, authorized visitors/visiting faculty and others who may be granted permission to use the IT Infrastructure, and must comply with the guidelines. Certain violations of IT policy laid down by VIT by any institution member may even result in disciplinary action against the offender by the institution authorities.The acceptable use policies are applicable to Employees, Students, and Vendors & Visitors. CTS has framed various policy like Procurement, Installation, of Hardware, Network and software. E-mail account has been facilitated to Employee and students under E-mail Use policy which is reviewed and maintained whenever the modification happens. Website Hosting and Database Usage policy has its method and hierarchy which is followed systematically.

IT infrastructure has been widely spread across connecting 56 buildings with very high-speed robust network backbone. Our Computer network is built on CISCO switching platform with backbone running on 10 Giga at present. 12000+ IP enabled devices are connected to this fast network. Understanding the demands of faculty and students to use digital media for their research, teaching & learning process, 6 Gbps of internet bandwidth is made available through three major Internet service providers. Details are given in Table 1.

Table 1: Internet Facilities Details– VIT,Vellore

SL .No	Service Provider	Bandwidth
1	JIO	6 Gbps
2	AIRTEL	6 Gbps
3	BSNL	1 Gbps

Over 2548 WIFI access points are positioned across the campus to facilitate internet access to our students, faculty and guests while they are in the campus. Seamless internet access given to students through Hotspots and well planned WIFI network at Hostel rooms.

VIT has invested heavily in building up the energy efficient SmartRow Data Centre in 1000 Sq.Ft. area. The features include 10 Smart Row Racks, 3 Libert CRV In-Row Cooling Solution, 90KVA Modular UPS with batteries, Fire Alarm Systems, Biometric Access Control Systems, CCTV and Remote Monitoring & Management Software. VIT maximizes the use of efficient energy solutions at the Data Center while minimizing the impact on the environment.

The comprehensive infrastructure includes 68 physical servers with 366TB of storage for Private Cloud with 220+ Virtual Machines and 500 Virtual Desktop Infrastructure (VDI) implemented for the students to work with engineering software anytime anywhere from any device. Our campus IT facility secured by implementing the best of the security solution from

Palo Alto, McAfee, CISCO AMP and K7 which includes Next Generation firewall, Application firewall, Email Security, Advance Malware Protection, Endpoint Threat Protection, OpenDNS etc. IT-infrastructures of VIT- Vellore are listed in the following Table 2.

Table 2: Details of IT-Infrastructures– VIT,Vellore

Description	**Model**	**Nos.**
Network Security Devices		
Palo Alto Networks Enterprise Firewall	PaloAlto	2
Proxy Server	Mcafee	1
APPWALL 200 MBPS Web Application Firewall	Radware	1
F Secure Messaging Security Gateway	F-Secure	1
Vulnerablity Scanner	Nessus	1
Open DNS	CISCO	1
Advance Endpoint Protection	CISCO	1
Anti Virus	K7 Computing	1
Network Switches and Wireless		
Network Core Switches	CISCO	2
Cisco Nuxes Switches	CISCO	2
Network Switches	CISCO	408
Network Switches - POE-Wireless	BROCADE	41
Network Switches- CCTV	ALLIED TELESIS	129
Wi-Fi Access Point	Ruckus	2231
Wi-Fi Controller	Ruckus	2
Surveillance		
Description	Model	Nos.
Biometric Device	I clock 900	261
Surveillance Camera	Hikivision / CPplus / Dauha	1796
NVR	Hikivision	46
Physical Servers		
Brand	Model	Qty
Dell	PowerEdge R420/R430/R520/R720/R7425 - 12740 X D M630	16
HP	Proliant DL 120/165/360/380/385 - Gen 6/8/9	19
IBM	SystemX3550/X3650/Blade Servers HS22	31
Sun Solaris	Sunfire X4100	2
DGX - NVIDIA	DGX - INTEL XEON E5 - 2698 - 20 core (512 GB RAM) GPU - 8 X 32GB = 256 GB GPU (1 PETA FLOP) (40, 960 CUDA CORES) 5120 TENSOR CORES	2
	Total	70

Description	Model	Nos.
Storage Devices		
HP	MSA 2040 SAN	158.8 TB
Dell	SCv2020	147 TB
Lenovo	V3700 V2	13.36 TB
IBM	STORWIZE V3700 - 5 TB	5 TB
RAID STORE	IPSAN R-US-208i- 9TB	9 TB
DELL EMC	vSAN	150 TB
DELL EMC (EXCHANGE)	DELL VSAN	246 TB
HP STOREEASY	STOREEASY 1660	194 TB
	Total	923.16 TB
Thin Clients		
Brand	Thin Clients	No's
N - COMPUTING	N SERIES - N400	120
DELL WYSE	DELL WYSE 3040	100
SNAP VDI	SNAP VDI	100

VIT has proper budgeting process to arrive the IT budget needs of every school/department. Requirement gathering happens at the school/departments. Once the IT budget is finalized at the school/department level, the approved budget is consolidated at CTS and arrive the total IT Budget requirement.

An average Annual Budget of Rs.17.87 Corer per year, provided on improving the IT facility shows the commitment of our Management in building the world class IT facility in our campus. This includes the Capital and Operational budget of Vellore and Chennai Campus.

IT expansion is done based on assessing the requirement and also understanding the need of implementing the best of the breed technology to support the teaching and learning process. Also understand the industry requirement with respect to advance technology to ensure that our students are well aware of the technologies prevailing in the market.

4.Sports Facilities

A world class excellent sports facilities available in the VIT,Velllore campus are shown in photographs 4 to 10.

Photograph 4: Tennis Ground

Photograph 5: Snooker Play Area

Photograph 6: Gym Park

Photograph 7: Weightlift Room

Photograph 8:Basketball Ground

Photograph 9:Swimming Pool

Photograph 10: Squash Courts

5.Canteen

VIT has been amply blessed with seven fully equipped multi cuisine canteens present at five strategic locations in college. Two at the far ends of college, one each in G D Naidu Block and the Silver Jubilee Tower, one at PRP block, one at Gandhi block and one more at the centre of the college near the Technology Tower. Canteen kitchen (Photograph 11) is on contract basis with external caterers and provides quality food at student friendly prices. Hosting a wide array of cuisines and dishes, they cater to the needs of the students from every corner of country providing them home style food with no compromise on the quality.

Photograph 11: Canteen Kitchen-VIT,Vellore

6.Smart Classrooms

The smart classrooms (Photographs 12) are well designed and air conditioned to incorporate everything needed for a pleasant learning atmosphere. The wide spacious smart classrooms contain a smart board along with white board and projector with conferencing and recording facilities that are used for teaching. As a result professors can switch to different modes of teaching as and when required so that the teaching isn't monotonous and the lectures are put across in the best way possible. This hi-tech equipment enables the faculty to conduct classes in a way that enable students to make use of every available resource at the click of a button. These classrooms are also often used for seminars and events from time to time.

Smart Classroom (Interior View)

Video capturing facility

Photographs 12: Smart Class Room Facilities -VIT,Vellore

7.Hostel Facilities

A spacious Visitors' Lounge has recently been added for the benefit of visiting parents/guardians, supplementing the residential guest house facilities available. The spotlessly maintained and spacious vegetarian and non-vegetarian dining halls in the hostels serve wholesome, nutritious food with the help of a unique steam cooking facility. Foreign students can also choose from a limited list of special food items. A Chinese mess is functioning separately.

For those who want to try out different cuisines, a variety of hygienic food facilities are available on campus. A popular eating spot is the 600 square meters Food Court that serves delicious non-vegetarian and vegetarian food at reasonable prices. Fast food outlets are also attached to both the Men's and Women's Hostels.

VIT, Vellore campus has 26 Hostels. Out of which 18 blocks are boys' hostels and the rest are girls' hostels. The blocks, in total, cater to over 22,000 residents every year. Facilities and amenities (Photograph 13) include

* AC (Air-Conditioned) and Non-AC single and shared bed options.

* Rooms equipped with ergonomically designed furniture which includes a cot, chair, study table, study lamp, bookshelf and a cupboard.

* First aid centre, pharmacy, photocopy service, food kiosks, gymnasium (AC & Non-AC), swimming pool, sport amenities, laundry service, Wi-Fi service, beauty salon, tailoring unit, driving, dance and music classes, utility shop and visitor rooms.

* Residential Counselors, Wardens, Supervisors, maintenance staff and security guards available 24x7.

* Security guard to chaperone and safe transit students to and from the campus to the nearest railway station and bus stops for late night / early hours of the day.

* 24 hours water supply and power supply supported by stand-by captive generators.

*Total Number of students in Hostels - 21,936
*Total Number of Toilets in Hostels - 3,372
*.Separate toilets for differently abled - In Men's Hostel / Women's Hostel

R.O.Plant for Drinking water supply

Geyser for bathing

Photographs 13: Hostel Facilities-VIT,Vellore

The following are the key feature of available infrastructure facilities of VIT:

- 238 classrooms with 60 seating capacity along with LCD projectors
- 22 smart class rooms
- 18 Boys Hostels
- 09 Girls Hostels
- Air-conditioned auditoria with a capacity of 1200, 250 & 120
- Air-conditioned seminar halls with a seating capacity of 150
- Main Canteen is available which can cater to 200 persons at a time and smaller canteens are also available
- Bank with ATM
- Pharmacy & Ambulance
- RO Plant
- Transport facilities
- Diesel Generators

- Power backup
- Solid and liquid resource Management
- Solar Plant
- Insurance for all students and staff members
- All the Fire Safety Equipment are provided in the premises
- Having necessary Wheel Chairs and Ramps in all the buildings in campus.
- The institution is having adequate toilet facilities for physically challenged persons.
- Lift facilities are available
- All members of staff (Teaching, Non-teaching & Students) are covered through accident cum hospitalization insurance.
- Two separate Health Clinics are available - One for Boys and One for Girls.
- One Male Medical Officer and One lady Medical Officer are available.
- Tie-up with nearby hospitals
- Chettinad clinic located within the campus.
- 24 Hrs Ambulance facility
- Nursing Assistants

8.Library Facilities

The Central library (Photograph 14) spreads over an area of 7770 m^2 with six floors (Excluding ground floor). It has specialized collections of books, journals & other resources in Mathematics & Sciences, Engineering and Technology, Biotechnology, Humanities, Social Sciences and Management ranging from printed books, e-books, back volumes and CDs\DVDs. The Central Library subscribes to national and international journals in print and e-Journals. The library has a video conferencing facility and NPTEL video courses, ePGpathashala, Swayam Programme and other E-Learning resources initiated by the Government of India. Central Library is using Koha software for Library automation and has implemented RFID technology with self-issue and return kiosk, WEB-OPAC (Online Public Access Catalogue), and online renewal facility.

Resources

The following Table 3 shows library facilities details.

Table 3:Library Resources Details of Vellore-VIT campus

Library Resources	Vellore Campus
Total Number of Books	2,44,575
Total Number of Back Volumes	18,350
Print Journals / Magazines	412
National	330
International	82
Online databases/E-Journals :(On and Off Campus access facility) ABI Inform Complete (Pro-Quest),ACM-DL, ACS Publications, ASCE-DL, ASME-DL, ASTM Journals and Standards, Bentham Science, British Standard Euro Codes, CMIE Reports (Prowess IQ, Economic Outlook and Industry Outlook, EBSCO Business Source Complete, Electrochemical Society (ECS Digital Library), EMERALD Management Journals, Emerald Emerging Market Case Studies (EEMCS), Engineering Refrex, IEL (IEEE & IEE), Indian Standards, MathSciNet, Springer Nature Journals (Nature Research Journals) and Scientific American , Royal Society of Chemistry Archives (1841-2007) , Royal Society of Chemistry (RSC) Journals, Proquest e-brary, SAE Technical Papers (SAE Mobilus), SAGE Online Journals, ScienceDirect, Scifinder Scholar, Scopus, Springer Nature 1980 E-Journals, Indiastat and ProQuest-Dissertation & Theses (ETD) Part A & B (Science and Engineering, Humanities and Social Science) Web of Science, Web of Science - back-files (1997-2020).	15,053
E-Book - (On and Off Campus access facility)	3,64,664
Media Resources	
CD / DVD	15,650
Video cassettes	561
Audio cassettes	317

Services

- Circulation Service
- Reference Service
- Web OPAC (On-line Public Access Catalogue)
- Study Book Service
- STARS Book Bank
- Resource Sharing (Inter Library Loan)
- Multimedia Resource Service
- On-line Databases
- NPTEL e-Learning Facility
- User Education Program
- Tele / Video Conferencing

Membership

All students, faculty members and staff of the institute are membership of the library.

Institutional Membership

- BCL, Chennai
- American Information Resources Center, Chennai

Library Networks Membership

- DELNET, Delhi
- INFLIBNET, Ahmedabad
- MALIBNET, Chennai

Photographs 14: Library Facilities-VIT, Vellore

Section 5: Layout-VIT- Vellore

Vellore Campus

The details of layout of VIT-Vellore campus is shown in Figure 1 and the land particulars are explained below.

Total Area Size of the Campus - 8,27,746.85 Sq.m
Build-up area - 6,49,393 Sq.m
Greenery area - 5,84,005 Sq.m

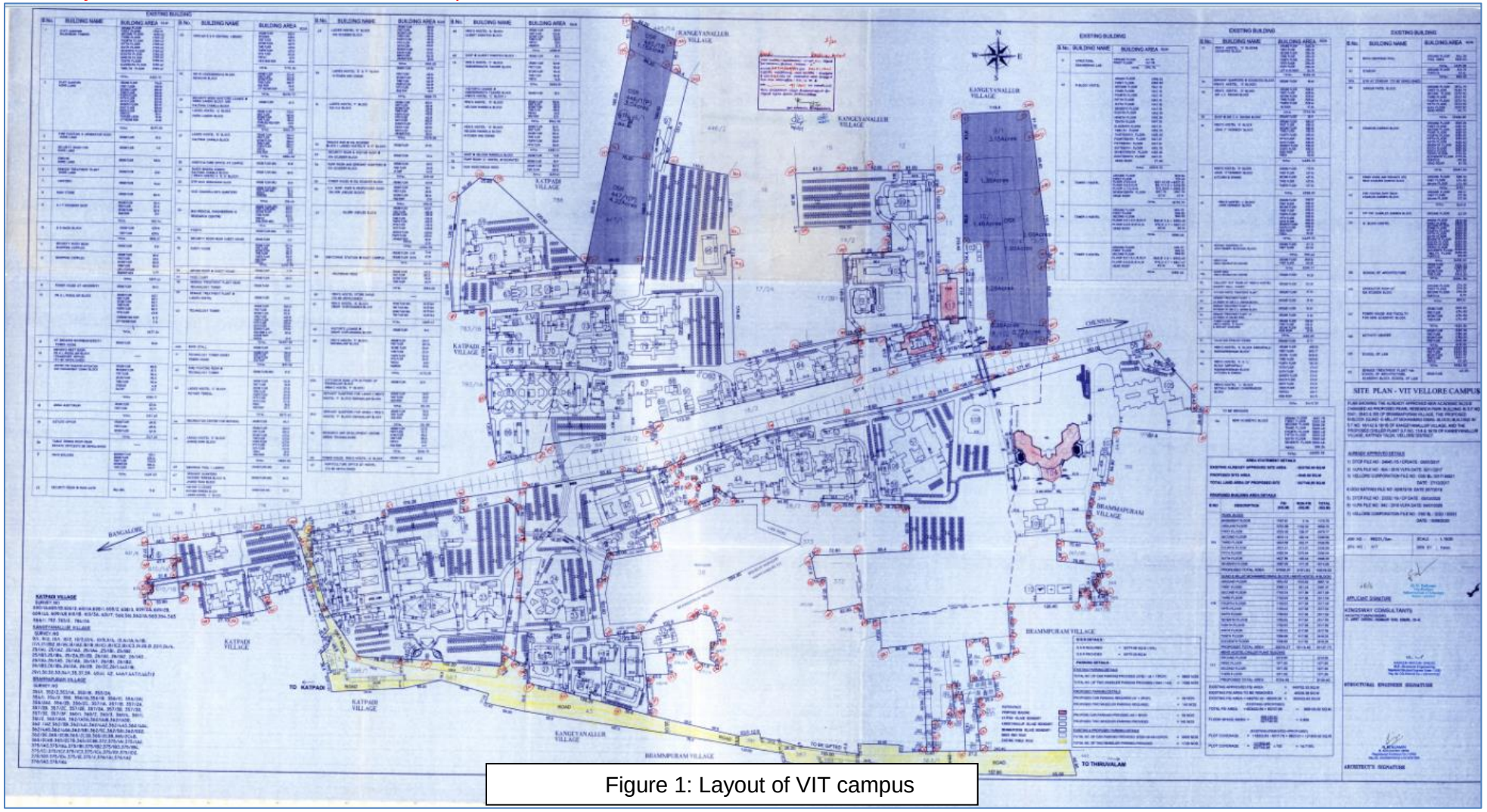


Figure 1: Layout of VIT campus

Section 6: Vision, Mission and Core Values of VIT-Vellore

Vision

- Transforming life through excellence in education and research.

Mission

- World class education
- Cutting edge research
- Impactful people
- Rewarding co-creation
- Service to society

Core Values

- Student focus
- Strong ethics
- Striving for excellence
- Social development
- Respect for all

Section 7: Management's Commitment – VIT-Vellore

The Management of the VIT wants to be a model university, aiming to imbibe best practices in the way it engages the resources available at the disposal of the organization and save mother earth for future generations through sustainability initiatives for conservation and scrupulous use of water, soil, air and other natural resources in VIT and the greater community.

The management of the University was willing to formulate policies based on green auditing report by following their goals towards true green.

Section 8: Scope and Goals of Green Audit

A clean and healthy environment aids effective learning and provides a conducive learning environment. Green Audit is the most efficient and ecological wayto manage environmental problems. It is a kind of professional care which is the responsibility of each individual who are the part of economic, financial, social, environmental factor. It is necessary to conduct green audit in University campus because students become aware of the green audit, its advantages to save the planetand they become good citizen of our country. Thus, Green audit becomes necessaryat the University level.

Goals:

- Be a socially responsible institution in promotion of waste management among communities in and around Vellore towards Refuse, Reduce, Reuse, Repurpose and Recycle of waste.
- Be a model in green practice and transfer technology in green practices and install best practices among youth.
- Awareness about waste management, reducing waste, segregation of waste, recycling, safeguard clean air, water and soil conservation for future generations.
- Promote alternative employment opportunities in water management- Plastic, Paper etc.,
- Enactment the cleanliness and hygiene campaign towards Zero waste generation.
- Bring out various models in recognizing clean water accessible for all individuals.
- Model centre in vermi-compost manure by the segregated waste in the campus for showcasing best recycling models
- Ensure community intervention for understanding the importance of keeping the surroundings clean through various viable technologies.
- Pilot affordable technologies which help rural communities for transformation and promotion of sanitation and hygiene indicators.

Section 9: Benefits of the Green Audit

- More efficient resource management
- To provide basis for improved sustainability
- To create a green campus
- To enable waste management through reduction of waste generation, solid-waste and water recycling
- To create plastic free campus and evolve health consciousness among thestakeholders
- Recognize the cost saving methods through waste minimizing and managing
- Point out the prevailing and forthcoming complications
- Authenticate conformity with the implemented laws
- Empower the organizations to frame a better environmental performance
- Enhance the alertness for environmental guidelines and duties
- Impart environmental education through systematic environmental managementapproach and Improving environmental standards

- Benchmarking for environmental protection initiatives
- Financial savings through a reduction in resource use
- Development of ownership, personal and social responsibility for the Universityand its environment
- Enhancement of University profile
- Developing an environmental ethic and value systems in youngsters.
- Green auditing should become a valuable tool in the management and monitoringof environmental and sustainable development programs of the University.

Section 10: Target Areas of Green Audit

Green audit forms part of a resource management process. Although they areindividual events, the real value of green audits is the fact that they are carried out, at defined intervals, and their results can illustrate improvement or change over time. Eco-campus concept mainly focuses on the efficient use of energy and water minimize waste generation or pollution and also economic efficiency. All these indicators are assessed in process of "Green Auditing of educational institute". Eco- campuses focuses on the reduction of contribution to emissions, procures a cost effective and secure supply of energy, encourages and enhance energy use conservation, promotes personal action, reduce the institute's energy and water consumption, reduce wastes to landfill, and integrate environmental considerations into all contracts and services considered to have significant environmental impacts. Target areas included in this green auditing are Water, Energy, Waste, and Environment.

Section 11: Methodology

The purpose of the audit was to ensure that the practices followed in the campus arein accordance with the Green Policy adopted by the institution. The criteria, methods and recommendations used in the audit were based on the identified risks. The methodology includes: preparation and filling up of questionnaire, physical inspectionof the campus, observation and review of the document, interviewing responsible persons and data analysis, measurements and recommendations. The methodology adopted for this audit was a three-step process comprising of:

1. Data Collection – In preliminary data collection phase, exhaustive data collection was performed using different tools such as observation, survey communicating with responsible persons and measurements.

Following steps were taken for data collection:

- Site Visit
- Data about the general information was collected by observation and interview.
- The power consumption of appliances was recorded by taking an average valuein some cases.

2. Data Analysis - Detailed analysis of data collected include: calculation of energy consumption, analysis of latest electricity bill of the campus, Water consumption, Waste Generation and Greenery Management.
3. Recommendation – On the basis of results of data analysis and observations, some steps for reducing power and water consumption were recommended. Proper treatments for waste were also suggested. Use of fossil fuels has to be reduced for the sake of community health.

The above target areas particular to the University was evaluated through questionnaire circulated among the students for data collection.

The following data collected for the following areas during the assessment.

1. Environment & Waste Management
2. Energy Management
3. Water Management

Section 12: Auditing for Green Campus Management

Unfortunately, biodiversity is facing serious threats from habitat loss, pollution, over consumption and invasive species. Species are disappearing at an alarming rate and each loss affects nature's delicate balance and our quality of life. Without thisvariability in the living world, ecological systems and functions would break down, with detrimental consequences for all forms of life, including human beings. Newly planted and existing trees decrease the amount of carbon dioxide in the atmosphere. Trees play an important ecological role within the urban environment, as well as support improved public health and provide aesthetic benefits to cities. In one year, a single mature tree will absorb up to 48 pounds of carbon dioxide from the atmosphere, and release it as oxygen. The amount of oxygen that a single tree produces is enough to provide one day's supply of oxygen for people. Trees on our campus impact our mentalhealth as well; studies have shown that trees greatly reduce stress, which a huge deal is considering many students are under some amount of stress.

VIT adopts eco-friendly and green initiatives to promote sustainable practices in its lush and verdant campus. A few remarkable efforts include energy conservation, water conservation and waste water

recycling. The in-house transportation policy and the extensive research programmes are other sustainable initiatives to uphold green values. Having adaptive thinking and adaptability in relation to environmental context and sustainable development is one of the Program outcomes of VIT. Students are trained to work for sustainable development. One of the Schools of VIT has a vision to be a leader in imparting world class education leading to nurturing of scientists and technologists of highest caliber who would engage in sustainable development of the globe.

The following subjects are taught to students for imparting knowledge and skills needed to promote sustainable development.

1. MGT1006 Environmental and Sustainability Assessment
2. CHY1002 Environmental Sciences
3. MEE3999 Technical Answers for Real World Problems (TARP)
4. MEE1011 Renewable Energy sources
5. MEE2052 Sustainable Energy
6. MGT1049

Sustainable Business Model CO2 Research and Green Technologies Centre of VIT is a unique advanced research laboratory, to carry out research on carbon capturing and utilization (CCU) with a focus on green energy technologies development. The laboratory has been set up keeping in view the growing significance of Carbon Capturing and Storage (CCS) in recent times. The main objectives of the centre are:

- To develop technologies for CCU
- To develop sustainable and renewable green energy technologies
- To work on waste heat recovery, energy, water conservation and waste management.

Green programmes are initiated by several clubs including NSS, NCC, Biosphere Club, Energy and Environment Club, etc., which involves over 400 students and 7 faculty members. The programmes are conducted on campus and nearby village adopted by VIT Chennai and Government Schools around the campus. VIT Chennai was awarded the prestigious IGBC Gold rated Green Campus Award. Indian Green Building Council had presented the award during 4th Green Building Congress held at Mumbai on the theme “Sustainable Built Environment for All”.

Sustainable Development Goals of VIT - 2022

SDG 1 - NO POVERTY

SDG 2 - ZERO HUNGER

SDG 3 - GOOD HEALTH & WELL BEING

SDG 4 - QUALITY EDUCATION

SDG 5 - GENDER EQUALITY

SDG 6 - CLEAN WATER AND SANITATION

SDG 7 - AFFORDABLE AND CLEAN ENERGY

SDG 8 - DECENT WORK & ECONOMIC GROWTH

SDG 9 - INDUSTRY INNOVATION & INFRASTRUCTURE

SDG 10 - REDUCED INEQUALITIES

SDG 11 - SUSTAINABLE CITIES & COMMUNITIES

SDG 12 - RESPONSIBLE CONSUMPTION AND PRODUCTION

SDG 13 - CLIMATE ACTION

SDG 14 - LIFE BELOW WATER

SDG 15 - LIFE ON LAND

SDG 16 - PEACE JUSTICE & STRONG INSTITUTIONS

SDG 17 - PARTNERSHIPS FOR THE GOALS

SDG - OVERALL REPORT

Greenery

The following Tables 4,5 and 6 shows details of tree species and shrubs within VIT, Vellore campus

Table 4: Details of Trees and Shrubs – VIT,Vellore

SL. No.	Tree Species	Shrubs
1	Alstonia Scholaris	diefenbachia
2	Artocarpus (Bread fruit)	nacteria
3	Azardirachta	arwa
4	Bauhinia	Ixora
5	Bignonia	Nerium oleander
6	Callistemon	Pentas dwarf red
7	Calophyllum Inophyllum	Rhaphis excelsa
8	Cassia	Tabenaemontana dwarf
9	Cordia	Russelia
10	Dalbergia	Caesalpinia
11	Delonix Regia	Graptophyllum
12	Eugenia Jambolana	Golden duranta
13	Ficus benjamina	Ficus
14	Ficus bengalensis	Acalypha nuda
15	Ficus religiosa	Phyllanthus snow bush
16	Filicium	Clerodentrum
17	Lagerstroemia	Acalypha rosea
18	Mahagoni	Rhoeo discolor variegated
19	Mimusops	Aralia
20	saraka indica	Syzygium australe
21	Peltophorum	Dracaena
22	Pongamia	Bamboo
23	Plumeria	Hibiscus
24	Rose wood	Pseuderanthemum
25	Samanea saman	Schefflera variegated
26	Spathodea	Heliconia varieties
27	Tabebuia	Alpinia
28	Termanilia cadapa	Ficus panda
29	Vengai	Song of india
30	Millingtonia	Areca palm
31	Mangifera indica	Rhapis excelsa
32	Araucaria	Murraya paniculata
33	Delbergia sisoo	Plumeria
34	Sterculya	pennisetum
35	Red sandal	Phoenx palm
36	Simarouba	Caryota urens
37	Thespesia	Washingtonia filifera
38	Putranjiva	Furcraea

SL. No.	Tree Species	Shrubs
39	Indian aricaria	Pedilanthus
40	Badam	yucca
41	Poliyalthia	Aglaonema
42	Aveerhoa (Star fruit)	Dianelia
43	Acacia	Allamanda dwarf
44	Clusia rosea	Hamelia patens
45	Ceiba	Bixa
46	Kadamba	Bamboo
47	Melia	Bougainvillea
48	Giruvillia	Euphorbia
49	Terminaria	Hibiscus
50	Tamirend	Gardenia
51	Kigelia	Murraya paniculata
52	Gmelia	Tecoma capensis (red&yellow)
53	Termanelia mentalaya	Plumbago capensis
54	Barringtonia	Pentas
55	Coconut	Lantana
56	guaicum	Lemonia spectabilis
57	Albezia	Beloperone
58	Jacranta	Lillies
59	Ficus recemosa (Athi)	Hemigraphics
60	conocarpus	Agassitatio varigated
61	pachira	pisonia alpa
62	palm tree	Pendanus
63	Moringa (Drum stick)	costus
64	Sapota	peperomia
65	Ram seetha	podocarpus
66	Hoosberry	sanzia nobillies
67	Banana	Zambia
68	Pappaya	sansevieria
69	pomogranate	scindapsus
70	Artocarpus heterophyllus (Pala maram)	curcuma
71	-	Vadilia
72	-	Canna indica
73	-	Alternanthra
	Above70 nos. of varieties	Above 73 nos. of varieties

Table 5: Details of Green Vellore Project - VIT,Vellore			
GREEN VELLORE PROJECT TREE PLANTING WORK ON 01.07.2022			
SL. NO.	**DATE**	**STREET**	**NO OF TREES**
1	06.07.22	2rd Cross main road-Gandhi nagar	27
2	17.08.22	4th cross main road Gandhinagar	16
3	18.11.22	4th cross main road Gandhinagar	20
4	07.10.22	8th east cross road Gandhinagar	9
5	15.10.22	7th east cross road Gandhinagar	6
6	19.10.22	District sports ground	720
7	21.10.22	10th east cross road Gandhinagar	17
8	21.10.22	VG RAO NAGAR	51
9	27.10.22	puthu koil	16
10	9.11.22	Viruthambet to kangeyanallur road	40
11	18.11.22	purnicepuram	25
12	25.11.22	Varagatheswarar temple	30
13	06.12.22	5th & 12 Th cross road gandhi nagr	8
14	06.02.23	6th cross	13
		TOTAL	998

Table 6: Details of Lawn ,Trees and Shrubs - VIT,Vellore				
SL. No.	**Location**	**Lawn area in acres**	**Trees (Nos.)**	**Shrubs (Nos.)**
1	Academic side	36	11000	62000
2	Hostel side	31	3800	41000
3	Hill area	0	3500	750
4	Green vellore project till 09.11.2022	0	10902	15000
5	MIYAWAKI	AREA 78000 SQFT	1350	276
	TOTAL	67	30552	119026

The view of VIT-Vellore campus greenery is shown below in Photographs 15.

Photographs 15: Green campus – VIT Vellore

Section 13: Recommendations Green Audit

Common Recommendations

- Increase Green belt coverage
- Plant more carbon dioxide absorbing plants like Pine, Oake, Douglas, Neem, Peepal, Black walnut, Bamboo, Cassia, Banyan Matoe , Saga….. which will help in Carbon Neutralising.

Section 14: Participation of Teams

In VIT the green auditing was done with the help of Eco Services India Pvt. Ltd involving different student groups, teaching and non-teaching staff. The green audit began with the teams walking through all the different facilities at the University, determining the different types of appliances and utilities (lights, taps, toilets, fridges, etc.) as well as measuring the usage per item (Watts indicated on the appliance or measuring water from a tap) and identifying the relevant consumption patterns (such as how often an appliance is used), continuous monitoring through smart meters at each power houses for electricity consumption, smart water meters from different resources like open wells and bore wells and their impacts. The staff and learners were interviewed to get details of usage, frequency or general characteristics of certain appliances. Data collection was done in the sectors such as Energy, Waste, Greening, Carbon footprint and Water use. College records and documents were verified several times to clarify the data received through survey and discussions.

Greenery Committee

The greenery committee list is shown in the following Table 7.

Table 7 - Committee For Sustainability Initiatives– VIT,Vellore

SL.NO.	NAME WITH DESIGNATION	
1	Dr. Partha Sharathi Mallick, Pro-Vice-Chancellor, VIT Vellore	Chairman
2	Dr. Sekar S K, Professor Higher Academic Grade & Director-Estates, SCE	Member
3	Dr. Palanisamy K, Professor Grade 1 & Dy. Dir-EM & Projects, SELECT	Member
4	Dr. Shantha Kumar S, Professor Grade 2 & Director-CCE	Member

SL.NO.	NAME WITH DESIGNATION	
5	Dr. Senthil Kumar A, Professor Higher Academic Grade & Director, CO2 Research	Member
6	Dr. Chandrasekaran S.S, Professor Grade 2 & Director, CDMM	Member
7	Dr. Porpatham E, Professor Higher Academic Grade & Director, ARC	Member
8	Dr. Sundara Rajan C.R, Professor Grade 1 & Asst. Director-CSRD& RS, VITBS	Member
9	Dr. Mahenthiran S, Assistant Professor Sr. Grade 2, HOD, Environmental and Water Resources Engineering	Member
10	Dr. Sujatha R, Associate Professor Sr. & Asst. Director-SW	Member
11	Dr. Balaji K, Assistant Professor Sr. Grade 2, SMEC	Member

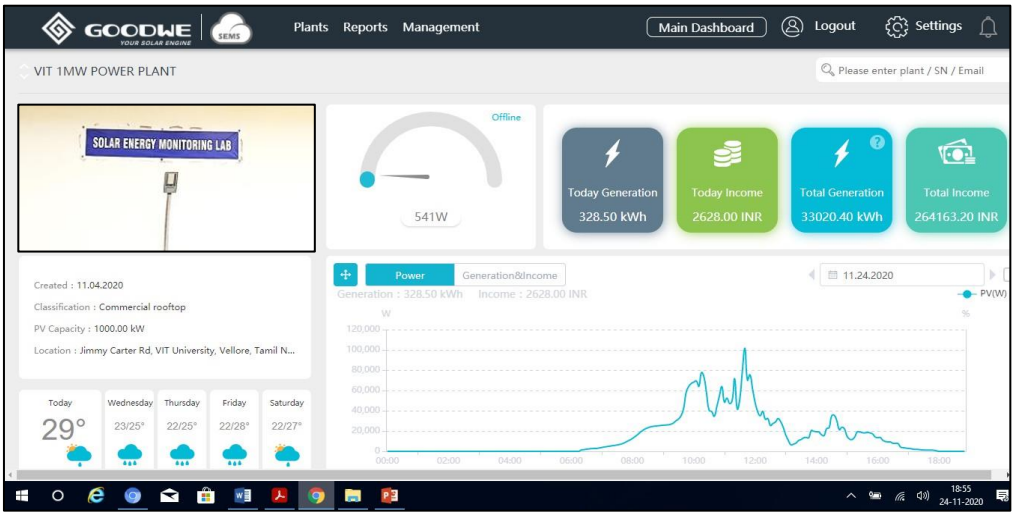
Section 15: Best Practices / Initiatives done by the University

A. Solar System

Total solar panel (Photographs 16) installed with capacity (Total 6813 Nos) → 2.113 Mega Watt Rooftop is installed within the campus along with online energy monitoring system (Photographs 17,18 and 19) and energy savings method (Figure 2) as shown below.

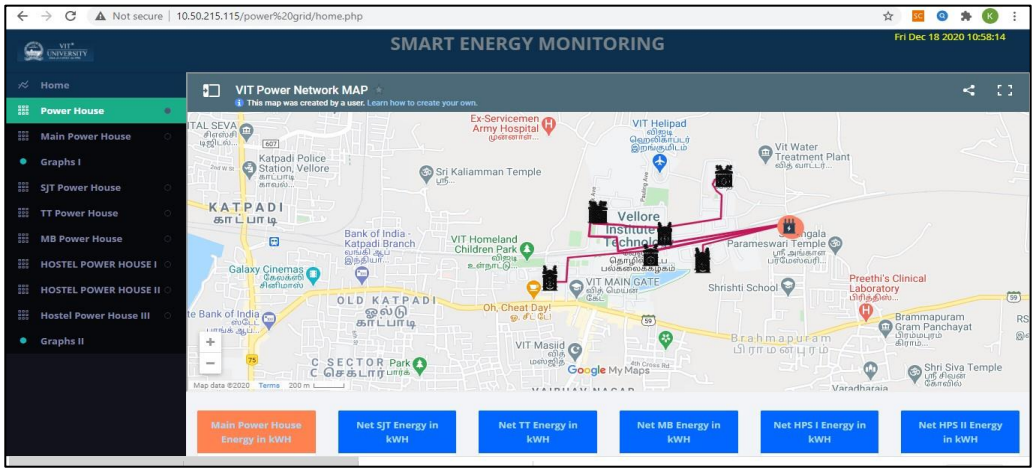
Photographs 16: View of Solar Panels – VIT,Vellore

1. Solar PV Generation Online Monitoring



Photograph 17: Solar PV Generation Online Monitoring

2. Online Energy Monitoring



Photograph 18: Online Energy Monitoring

3. Energy Saving by using LED Lights

Photograph 19: Energy Saving by using LED Lights

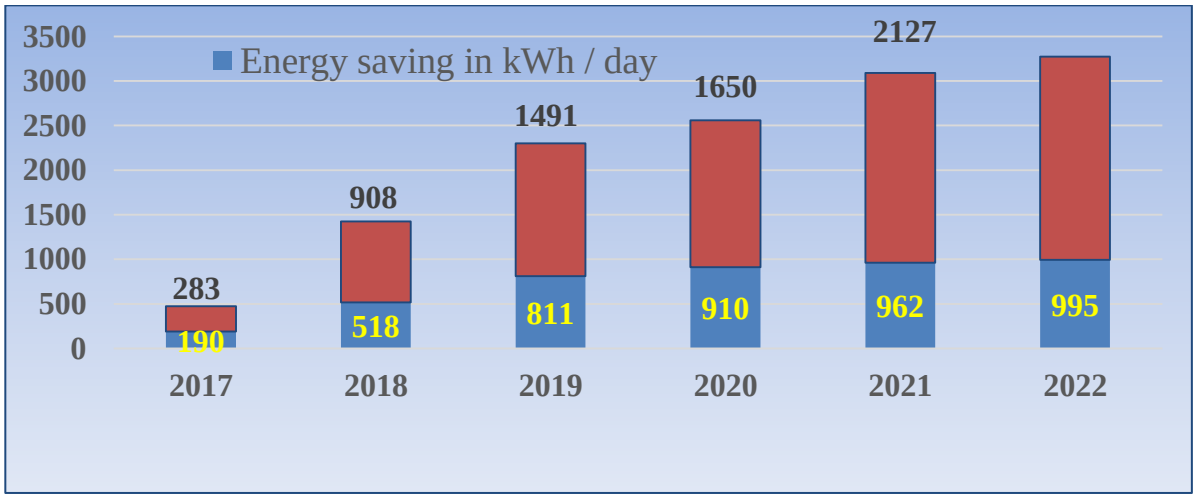


Figure 2: Installed LEDs in all new buildings and renovated buildings, corridors, rest rooms of old buildings, street lights and focussed lights (Energy savings in 2022 is not mentioned)

B. Rain Water Harvesting

Vellore City receives rainfall during North-East Monsoon (Oct - Dec) and South-West Monsoon (June - September). A major portion of the rainfall is during North-East Monsoon. Sometimes the city also receives rainfall during January and February, but that is quite rare.

The annual rainfall in Vellore is in the range of 800- 900 mm. The cities like Vellore and outer stretch due to the fast rate of urbanization, the city has become a concrete jungle and it is very difficult to find open surfaces which would enhance the recharge of ground water. Even the open space left is paved with concrete or bitumen which does not allow the natural recharge of ground water. This highlights the need to implement measures to ensure that the rain falling over a region is tapped as fully as possible through appropriate water harvesting techniques for recharging the ground water aquifers as well as for direct storage and use of rainwater.

1. Rain harvesting system

Keeping in mind the importance of water and it scarcity it is implemented to conserve water by rainwater harvesting by which the subsoil water condition / moisture content is maintained / improved to a great extent. And the rainwater collected from open paved and landscape area is being collected in the storm water drain which is connected to recharging pit.

2. Details of Rain Water Harvesting Pits

The rain harvest pits of suitable size are constructed along the rainwater collection drain. The rain harvest pit consists of 1.2 diameter borehole for depth of 3 m. Boreholes are made with casing pipes in position, and then filled up with 10 % of Fine sand and second layer is filled up with 20% of core sand and third layer is filled with 20 % of 20 mm Jelly stones and fourth layer is filled with 40 mm jelly stones for reaming 50% of area.

Taking into consideration the intensity of rainfall in the last 10years, which is considered as 900 mm/year, an effective scheme for rain water disposal has been designed. The run off rain water rooftop is being drained out effectively by providing sufficient number of rain water outlets. These pipes are routed with necessary slope and dropped vertically down to horizontal stack at stilt floor ceiling level .The Rain water pipe has been taken to ground through retaining wall. At ground level through a network of UPVC/RCC Hume pipes with suitable diameter and catch basin/saucer drain of suitable sizes for surface catchments, the rain water is finally terminated to the harvesting pit of suitable capacity. Set of Rain water down takes are connected to a Horizontal header on basement ceiling and terminating to Rain water storage tank,

where the rain water will be reused for domestic usage after necessary treatment .Overflow water is being pumped to the external rain water drainage system and let into the lake. Details of rainwater harvesting within VIT-Vellore campus is shown in the following Table 8 and photographs 20.

Table 8: Rainwater Harvesting Details of VIT-Vellore

Sl.	Name of the Building	Bore Height	No. of. Bores	Bore Dia	PVC Pipe Height	No. of Pipes
1	Main Building	Water sent to well through filter media				
2	Anna Auditorium	Water sent to well through filter media				
3	Library Building	52'0"	4 Nos.	9"	10' 0"	4 Nos.
4	Hexagon Building	52'0"	4 Nos.	9"	10' 0"	4 Nos.
5	L.H. M & N Block	53'0"	4 Nos.	9"	10' 0"	4 Nos.
6	Workshop & Health Centre	53'0"	4 Nos.	6 ½"	10' 0"	4 Nos.
7	Guest House	25'0"	1 No.	6 ½"	10' 0"	1 No.
8	Canteen	13'0"	1 No.	6 ½"	5' 0"	1 No.
9	Car parking area	50'0"	4 Nos.	9"	10' 0"	4 Nos.
10	L.H. 'C' Block	58'0"	4 Nos.	6 ½"	10' 0"	4 Nos.
11	L.H.E & F block	Water sent to well through filter media				
13	Cdmm building&car parking	65'0"	4nos	6 ½"	10'0"	4nos
14	Homeland	65'0"	4nos	6 ½"	10'0"	4nos
15	Men's Hostel 'A' Block	41'0"	1 No.	9"	10' 0"	1 No.
16	Men's Hostel 'A' Block	72'0"	2 Nos.	9"	10' 0"	2 Nos.
17	Men's Hostel 'A & C' Block	85'0"	3 Nos.	9"	10' 0"	3 Nos.
18	Men's Hostel 'D' Block	50'0"	3 Nos.	9"	10' 0"	3 Nos.
19	Men's Hostel 'E' Block	62'0"	3 Nos.	9"	10' 0"	3 Nos.
20	Men's Hostel 'F' Block East	74'0"	3 Nos.	9"	10' 0"	3 Nos.
21	Men's Hostel 'F' Block West	62'0"	3 Nos.	9"	10' 0"	3 Nos.
23	Men's Hostel K and L Block	45'0"	10 Nos	6"	10'0"	10 Nos
24	Men's Hostel M Block	250'0"	4 Nos	4 ½"	40'0"	4 Nos
25	Men's Hostel N Block	250'0"	4 Nos	4 ½"	40'0"	4 Nos
26	Biomass area	50'0"	6 Nos.	6 ½"	10' 0"	6 Nos.
27	Stadium	53'0"	4 Nos.	9"	10' 0"	4 Nos.
28	Stadium	37'0"	4 Nos.	9"	10' 0"	4 Nos.
29	Near Railway Gate (Culvert left)	60'0"	4 Nos.	6 ½ "	10' 0"	4 Nos.
30	Railway Gate (Culvert Right)	32'0"	4 Nos.	6 ½ "	10' 0"	4 Nos.
31	For Govt. Area V-Mess (Hill Area)	37'0"	3 Nos.	9"	10' 0"	3 Nos.
32	Stadium (Hill Area)	45'0"	3 Nos.	9"	10' 0"	3 Nos.
33	G Block	40'0"	3 Nos.	6"	10' 0"	3 Nos.
34	Swimming Pool Drain	50'0"	5 Nos.	6"	10' 0"	5 Nos.
35	Mens Hostel STP Plant area	45'0"	10 Nos.	6"	10' 0"	10 Nos.

Photographs 20: View of Rainwater Harvesting Structures – VIT,Vellore

C. Bio Composter

A 300 m^3 biogas plant (Photographs 21) using the sludge from the waste water treatment plant has been fully functional since December 2012. This initiative, funded by MNRE, provides the power required to run a 50 and 40 kVA biogas engine. The evacuated power is supplied to the waste water treatment plant. Additionally 15 kVA producer gas engine has been installed for research purpose.

Photographs 21: View of Bio-composters - VIT,Vellore

D. Water Consumption

The total water requirement for the campus is 5300 KLD. The wastewater generation from the project is about 3900 KLD, which is treated in the sewage treatment plants of 8 different capacities of STP and is being recycled for flushing and gardening. The total capacity of STP is 3920 KLD. The detail of water requirement and the water balance chart is shown in table below. About 60% of the total water demand is being met through the recycled water from the STP's which used for toilet flushing and green belt development within the premises. For this duel piping system has been incorporated in the campus. The following Table 9 represents monthly water usage within VIT-Vellore campus and the sewage water treatment in the photographs 22.

Table 9: Monthly RO and STP Water Usage – VIT,Vellore

Academic Side			**Men's Hostel Side**		
Location	**Inlet water**	**Outlet Water**	**Location**	**Inlet water**	**Outlet Water**
Home land STP	7013000	6726000	Plant-1	4506000	4250000
TT Plant-1	3896000	3559000	Plant-2	8917000	8710000
TT Plant-2	6943000	5473000	Plant-3	10090000	9029000
ILH Plant (approx)	20552000	19158000	Plant-4	5326000	4695000
3 MLD Plant	8964000	4906000	M & N STP Old	19393000	17460000
--	--	--	M & N STP New	16964000	14820000
Total	**4,73,68,000**	**3,98,22,000**	**Total**	**6,51,96,000**	**5,89,64,000**
Academic Side			**Men's Hostel Side**		
ALM Block Plant	659000		B Block Plant	608000	
Tech Tower Plant	787000		H Block plant	503000	
RT Plant	146000		L Block plant	894000	
SJT plant	744000		N Block Plant	838000	
LH Plant	208000		Q Block Plant	782000	
--	--		R Block Plant	22000	
Total Production	**25,44,000**		**Total Production**	**36,47,000**	

Photographs 22: View of Liquid Waste/Sludge Treatment Plant - VIT,Vellore

E. Renewable Energy

This indicator addresses energy consumption, energy sources, energy monitoring, lighting, appliances, natural gas and vehicles. Energy use is clearly an important aspect of campus sustainability and thus requires no explanation for its inclusion in the assessment. However, many may not realize how much influence the higher education sector has in the larger energy market. Energy sources utilized by all the Schools and common facility centers include electricity.

Major use of energy is in office, canteen, hostels and laboratories for HVAC, lighting, and laboratory work. The total connected load is 14850 kVA and sanctioned demand from TNEB is 10500 kVA. The VIT campus is achieved utilizing the Solar Energy to generate 1998979 kwh (For 2023) out of the total consumption. Furthermore the followings Tables 10 and 11 shows power related details of VIT-Vellore.

Table 10: Transformer and Diesel Generator Details– VIT,Vellore

S. No	Power House	Transformer	Qty	Total Capacity	Generators	Qty	Total Capacity
1	University Power House	2000 kVA	1	3000 KVA	500 KVA	3	2310 KVA
		1000 KVA	1		810 kVA	1	
2	Tech Tower Power House	800 KVA	2	1600 KVA	500 KVA	2	1250 KVA
					250 KVA	1	
3	East Campus Power House	1000 KVA	3	3000 KVA	500 KVA	3	1500 KVA
4	PRP Power House	2000 kVA	1	2000 kVA	810 kVA	1	810 kVA
5	Gandhi Block Power House	950 kVA	1	950 kVA	500 kVA	1	500 kVA
6	Hostel Power House-1	630 KVA	1	3430 KVA	500 KVA	2	1430 KVA
		800 KVA	1		250 KVA	1	
		1000 KVA	2				
7	Hostel Power House-2	1000 KVA	2	2000 KVA	500 KVA	3	1500 KVA
8	Hostel Power House-3	1000 KVA	2	2000 KVA	500 KVA	1	1960 KVA
					650 kVA	1	
					810 kVA	1	
9	Home Land	-	-	-	250 KVA	1	250 KVA
10	Railway Land bore well area	-	-	-	82.5 KVA	1	82.5 KVA
11	MH Chiller plant	2000 kVA	2	4000 kVA	-	-	-
12	LH Chiller plant	2000 kVA	2	4000 kVA	650 kVA	1	650 kVA
			21 Nos	**25980 kVA**		**24 Nos**	**12242.50 kVA**

Table 11: Energy Consumption Details (2022 and 2023) – VIT,Vellore

Year	June	July	Aug	Sept	Oct	Nov	Dec
2022	24,10,320	28,95,720	38,09,160	39,71,280	33,93,480	34,65,000	27,12,960

Year	Jan	Feb	Mar	Apr	May	June	July	Aug
2023	28,66,440	31,34,400	40,45,200	44,65,200	42,60,240	37,67,640	34,43,160	41,24,760

F. Electrical & LV Systems

a. All lifts are provided with AC variable voltage, variable frequency drives (ACVVF).
b. Power factor maintained at 0.99 or higher. This will reduce electrical power distribution losses in the installation.
c. LED lamps are used for Class rooms, Hostel rooms, corridors areas. Also the street lights and focusing lights of metal halide and sodium vapour lamps also replaced with LED lights
d. Energy efficient LED lamps which give approx. 60% more light output for the same watts consumed and therefore require less nos. of fixtures and corresponding lower point wiring costs.
e. An detuned APFC relay based on thyristor switching is used to effect the power factor correction / improvement within a few cycles of deviation from the setting & also to reduce inrush currents.
f. Transformers have minimum no load losses as compared to conventional transformers. During the Covid period we switched of the transformers and two power houses in the hostel side are interconnected via LT and saved the no load losses of the transformers. Also the solar PV are very effectively used for the reduced load and conserved the energy.
g. All cables are derated to avoid heating during use. This also indirectly reduces losses and improves reliability.
h. Solar water heater system with heat pump concepts are used in hostels blocks.
i. Pumps used at our STPs, WTPs and other sumps to over head pumping are replaced with IE5 pump which is very high efficiency when compared to other pumps and HNS system
j. Centralized chiller plant based AC system is used which is consuming 40 % energy of the conventional ACs. Also VRF/ VRV AC systems are also in place which consumes around 70 % of the conventional Split / Window ACs.
k.

1.Replacement of conventional lightings with LEDs

All the newly constructed hostel blocks are installed with 10 W LED lamps and the hostel toilets and corridors are installed with 20 W and 15 W LED lamps. A few of the washrooms/ restrooms in the academic buildings are equipped with occupancy sensor based appliance control for saving nearly 50 % of energy.

2.Biodiesel heavy vehicles and solar powered cars in campus

Busses are operating within the campus are powered with 30% biodiesel. These vehicles have covered more than 60,000 km without any breakdown. A Laboratory model glass unit produces the biodiesel. At present, Pongamia and Jatropha oil are used for biodiesel production (Photograph 23). Works are in progress to use Sterculia and Vilosa seeds too. Apart from the seeds, even the use of kitchen waste for biodiesel production has become a thrust area of research.

Photograph 23: View of Bio Diesel Production-VIT,Vellore

A solar powered (255W x 4 solar panels) 6 and 8 seater car and 4 numbers of buses equipped with a pair of 3.7 kW DC motor, christened as the 'Green Energy Vechicle', is fully operational (nearly 8 hours a day) during the working hours (Photographs 24). The total wind power purchased from June 22 to August 23 is 1,50,41,297 kWh

CO2 related research

Photographs 24: View of Green Energy Vechicles – Bus – Auto – VIT Campus-Vellore

Biomass related research

Wind Power

The total wind power is generated varies from 1,50,31,141 and 1,60,40,211 kWh/annum (Table 12).

Table 12: Details of Wind Power Units– VIT,Vellore

Barath Enterprises			BBK Shoes	
Year	**Wind power supplied in kwh**	**Wind power payment paid to vendor in Rs**	**Wind power supplied in kwh**	**Wind power payment paid to vendor in Rs**
2018	97,039	2,52,232.00	NIL	NIL
2019	50,31,575	2,26,88,423.00	3,99,902	15,20,834.00
2020	37,49,393	1,68,52,475.00	NIL	NIL
2021	37,59,122	1,38,80,290.00	NIL	NIL
2022	63,73,990	3,04,58,527.00	15,55,525	73,88,630.00
2023	42,60,550	2,15,86,628.00	28,41,076	1,47,35,892.00
Total	**2,32,71,669**	**10,57,18,575.00**	**47,96,503**	**2,36,45,356.00**

3.Replacement of conventional desktop with Virtual Desktop Infrastructures VDI's

Advantage of VDI over traditional Desktop is its lower power consumption, (37Watts/Node) which sums up to an annual saving of around INR 1 million per annum (Figure 3).

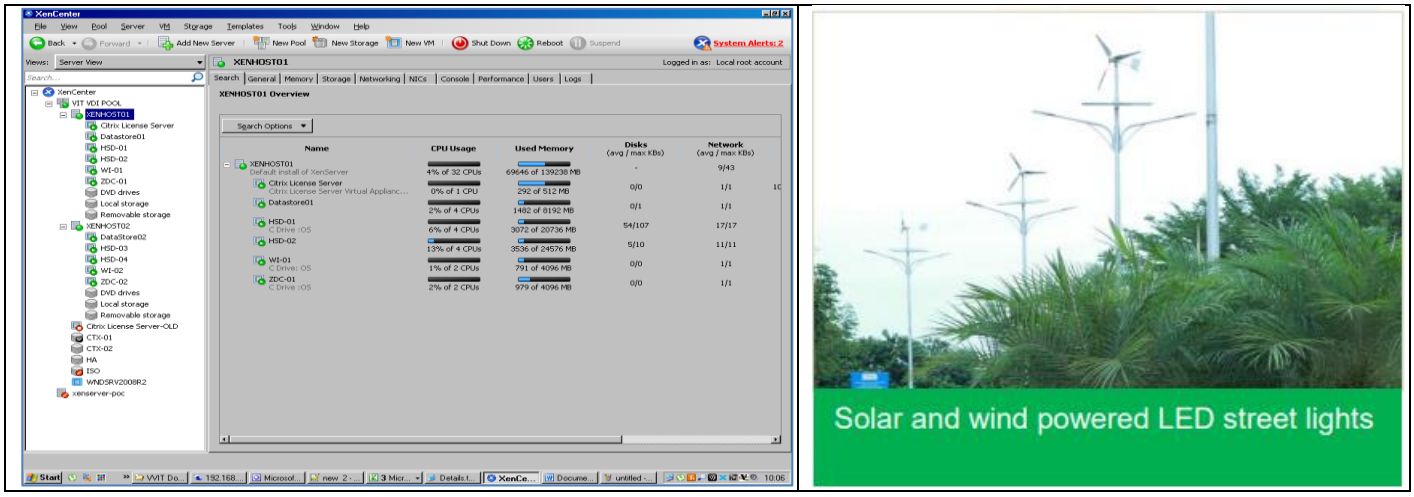
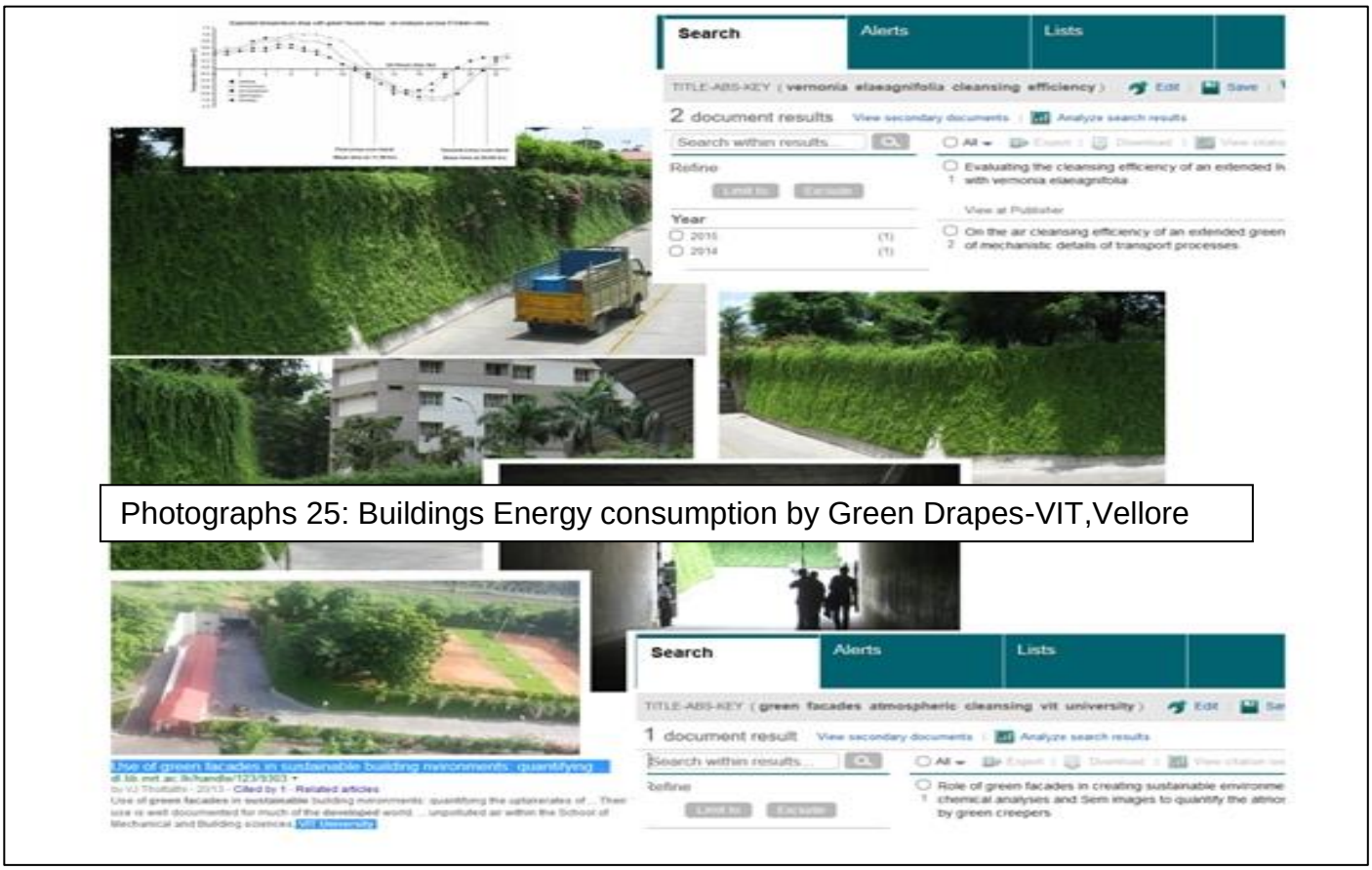


Figure 3: View of Private Cloud Infrastructure – VIT

VIT commission the private cloud infrastructure and replaced 47 physical servers by an equal number of virtual servers. The power consumption has been reduced by 65%. The on-going project aims to build energy efficient Green Data Centre. The modular rack based cooling system can bring down the energy cost drastically (by about 38%).

The green façade drape subway walls are yet another unique feature in VIT. They absorb the entire atmospheric pollutants spewed by the vehicular emissions. The on-going research activities on these green drapes have proved their atmospheric cleansing capability. A physical green drape on high-rise buildings can save considerable amount of building's annual energy consumption (Photographs 25). The green drapes can serve as excellent acoustic dampers too.



Photographs 25: Buildings Energy consumption by Green Drapes-VIT,Vellore

The School of Electrical Engineering (SELECT), in association with the School of Electronics Engineering (SENSE), has developed low cost energy efficient systems, in particular, energy efficient light automation devices, which are fully functional in some of the new laboratories and hostels.

4.Energy Conservation Practices

The Energy conservation practices adopted in the VIT campus are shown in the photographs 26.

Photographs 26: View of Energy Saving Machines-VIT,Vellore

A.Energy Saving through Hot Water system

i.Solar Water Heater

Capacity – 47000 Liters per day (Photographs 27)

ii.Heat Pump Water Heater

Capacity – 16800 Liters per hour

iii.Electric water heater

Capacity – 34110 Liters per hour

Photographs 27: Solar Water heater with heat pump - VIT,Vellore

5.Innovative Cooling System - Gandhi Block

- The main aim is to develop innovative cooling system, energy efficient solution for the educational building (Photographs 28)
- To promote advancement in building thermal comfort,district energy system in accordance with India cooling action plan (ICAP)Radiant cooling + Indirect Evaporative Cooling - open classrooms and the corridors
- Radiant cooling + Chiller system - seminar halls, laboratory and closed classrooms

Photographs 28: Cooling systems installed at Gandhi block – VIT,Vellore

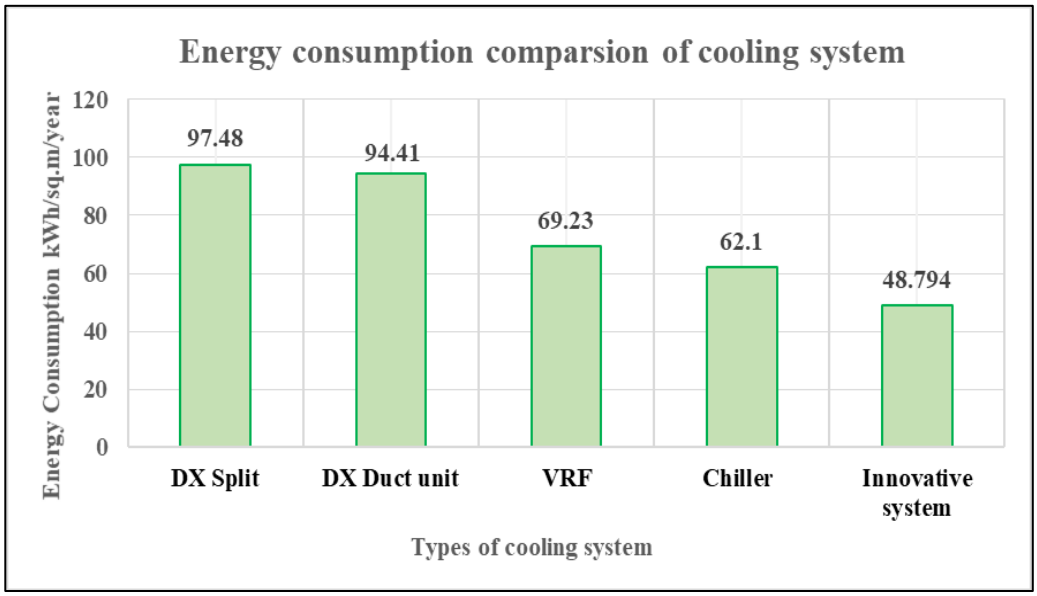


Figure 4: Energy Consumption Comparison

The energy saving of the Innovative cooling system, when operated in the combined modes that is radiant and evaporative cooling, radiant and chiller saves energy on an average about 50% (Figure 4).

G. Promoting Sustainable Practices

VIT has established the CO_2 Research and Green Technologies Centre, which is a unique and advanced research laboratory, to carry out research on Carbon Capturing (better)-and Utilization – CCU, whereas many other leading research institutions are concentrating on Carbon Capturing and Storage – CCS. The centre was inaugurated on 15th Feb 2010 by Dr. Farooq Abdullah, Hon'ble Minister for New and Renewable Energy (MNRE) Govt. of India. The carbon footprint details are given below.

CO_2 Footprint in Vellore Institute of Technology

CO2 Absorption:

By Trees:

1 acre of forest can accumulate 100 tons of CO_2.
Tree coverage is in 75649 sq. m
4046.85 sq.m – 1 acre.
75649 sq.m = 18.69 acres
Therefore 1869 tons of CO_2 is captured by trees in VIT per year

By Open Land:

Total open Area = 0.5* 12,63,857 sq..m
= 6,31,928 sq.m
Absorption rate @ $1*10^{-6}$ mol/(sq.m*sec)
Total absorption = 876 tons /year

By Shrubs, small plants & lawn:

Total area of small plants, shrubs, lawn = 3,33,908+14000+8070 sq. m
= 3,55,978 sq.m
= 35.6 ha
Absorption rate @ 1.95 tCO_2 ha/year
Absorption = 69.44 tons /year

Total absorption = 1869+876+69.44 tons or 2814.44 tons /year

Equivalent CO_2 emission from use of electricity:

Total electricity consumption = 37,00,000*12 units per year
= 444,00,000 units per year
Total inhouse solar generation by 1313 kW (This capacity to be verified) plants = 1313*1350 = 17,70,000 units
Wind energy purchase = 99,00,000 units
Biomass generation = 1,20,000 units

Total renewable energy consumption = 117,90,000 units
Net consumption from Grid = 326,10,000 units
Total equivalent CO_2 emission of power from grid @0.813 kg/kwh = 265,11,930 kgs
= 26,511 tons of Co_2

Emissions through Use of Petrol & Diesel:

Qty of petrol per year = [5,315 +2400] = 7715 lrs / year
Qty of Diesel for emergency power = [1,82,000 +48,000] = 2,30,000 LRs/year
Qty of Diesel for transport = [67,057 +18,000*12] = 2,83,057 LRs/year
Total Diesel consumption = 5,13,057 LRS/year
Qty of LPG used in canteen / Mess / Guest house = [5,60,000 +2,87,544]
= 8,47,544 kgs/year
= 1.96* 8,47,544 lrs/year
= 16,61,186 l/year
CO_2 equivalent emission of petrol = 0.00166 ton / lr
CO_2 equivalent emission of diesel = 0.00333 ton / lr
CO_2 equivalent emission of LPG = 0.00152 ton / lr
Total CO_2 emissions = [0.00166*7715+0.00333*513057 +0.00152*16,61,186] tons
= 4246.29 tons per year
Total CO_2 emissions = **30757 tons per year**

Net emissions = [30757 – 2814.44] = 27942.85 tons per year

Section 16: Conclusion

The green audit assists in the process of monitoring and verifying the performance in the environmental arena and is fast becoming an indispensable aid to decision making in VIT.

The green audit reports assist in the process of attaining an eco-friendly approach to the sustainable development of the University. Hope that the results presented in the green auditing report will serve as an opportunity to improving the environment related practices and resource usage at the university as well as new activities and innovative practices. A few recommendations are added to the waste management using eco- friendly and scientific techniques. This may lead to the prosperous future in context of Green Campus and thus sustainable environment and community development.

It has been shown frequently that the practical suggestions, alternatives, and observations that have resulted from audits have added positive value to the audited organisation. An outside view, perspective and opinion often helps staff who have been too close to problems or methods to see the value of alternative approaches. A green audit report is a very powerful and valuable communications tool to use when working with various stakeholders who need to be convinced that things are running smoothly and systems and procedures are coping with natural changes and modifications that occur.

Section 17: Disclaimer

Eco Services India Pvt. Ltd has prepared this report during August 2023 for VIT based on input data submitted for the period June 2022 to May 2023 by the representatives of the University. It is further informed that the conclusions are arrived following best estimates and no representation, warranty or undertaking, express or implied is made and noresponsibility is accepted by Audit Team in this report or for any direct or consequentialloss arising from any use of the information, statements or forecasts in the report.

Eco Services India Pvt. Ltd, its staff and agents shall keep confidential all information relating to your organisation and shall not disclose any such information to any third party, except that in the public domain or required by law or relevant accreditation bodies.

Annexures:

Sustainable Investment Policy

(Ver. 2.0)

The policy is made by considering re-cycling and pollution control strategies, renewable and alternative energy, adaptive response to climate change, reduced health risk for Vellore Instituteof Technology (VIT) employees and contractors, less risk for operations and maintenance, reduced life cycle costs and prevention instead of treatment. This policy outlines how the Vellore Institute of Technology is incorporating environmental, social, and governance (ESG) factors within their investments, reflecting the ambitious sustainability agenda within the University in line with the Vellore Institute of Technology SDG 2050 objective of achieving net zero carbon emissions. It also establishes the objectives and parameters of the investment portfolios.

The specific components of the policy are listed below.

- The Vellore Institute of Technology (VIT) will make direct investments that are spread across sustainability topics and that are specifically designed to generate both environmental and social return.
- VIT invests on retrofitting and renovation to improve the sustainability
- Waste & Materials: VIT invests on zero waste policy by waste segregation and handling, composting techniques, bio gas, bio-mass generation to handle organic wastes and inorganic wastes recycling.
- Clean Energy: VIT invests on clean energy transition policy as soon as is practical, any investment of the Portfolios in the energy sector will actively reflect the University's aspiration to

support energy transition towards clean energy addition. Clean energy generation capacity via roof top solar PV generation, wind and solar power procurement through third party power purchase.

- Energy conservation : VIT invests on the use of energy efficient techniques and appliances in all the new projects example electrical systems like lighting, fans, pumps,lifts and HVAC systems
- Water conservation: VIT invests further in water reuse via STP treated water for flushing, feed water for HVAC systems, vehicle washing and gardening.
- VIT invests on Electric Vehicle usage for internal shuttling and more EV green chargingslots
- VIT invests on sustainable buildings
- VIT invests on outside campus sustainability, clean and green environmental initiatives
- VIT invests heavily on research to bring sustainable development
- VIT invests on creating awareness and competency about sustainability in all its academic activities
- Sharing VIT Expertise with the public, educators, and students to provide opportunities to participate in our Mission, foster innovation, and contribute to a strong national economy and global sustainability.

Registrar

Sustainable Procurement Policy

(Ver. 2.0)

VIT follows the following policies while procuring to ensure the sustainability not only in the activities of the organisation but also along its supply chain. When making purchase decisions, environmental and social factors are given the same weightage, availability, and performance criteria."

- The purchase committee includes Senior Manager - Purchase, a technical expert and an expert on sustainability. This committee will weigh the consideration of sustainable measures appropriately while evaluating the tender. The procurement for more than Rs. 1,00,000 (Rupees One Lakh) will be constantly monitored by the purchase committee.
- Purchase office approve the vendors only based on the sustainable practices followed by the industries as per government norms.
- On the basis of their possible environmental implications, environment impact

assessments (EIAs) should be carried out on new purchases, projects, or activities as well as on the extension or modernization of already-existing projects or activities.

- The purchase office will ensure that the specification complies with sustainability criteria, regulatory requirements for environmental protection or pollution control, and any other applicable legislative requirements or internal norms.
- The following government regulations to be followed by the purchase office (i) The National Green Tribunal Act, 2010, (ii) The Air (Prevention and Control of Pollution) Act, 1981, (iii) The Water (Prevention and Control of Pollution) Act, 1974, (iv) The Environment Protection Act, 1986, (v) The Hazardous Waste Management Regulations, (vi) The Environment and Climate Change guidelines.
- Eco-labels compliant with ISO 14020 or voluntary environmental standards can be used to define environmental sustainability criteria. Priority should be given to the purchase of sustainable, environmental friendly items through the use of properly formulated Technical Specifications.
- All necessary qualitative, functional, environmental, and performance requirements (such as material composition, physical attributes, dimension and tolerance ranges, workmanship, and manufacturing process, when applicable; test schedule, if any) must be analysed,
- The concept of "price" or "cost" has been further defined as "Life Cycle Cost" (LCC) to include not only the initial cost of acquisition but also the costs of use, maintenance,

  and disposal over the course of the external resource's life. Along with the cost of purchase, the purchase office should include in all operational expenses for the equipment (maintenance, electricity, water, consumables, etc.).
- A value for money analysis should be conducted based on the conditions for participation and evaluation that have been published, and it may take into account a number of variables, including: i) fitness for purpose; ii) a potential vendor or contractor's experience and performance history; iii) flexibility (including innovation and adaptability over the course of the procurement); iv) environmental sustainability (such as energy efficiency and environmental impact); and v) total cost of ownership.
- In order to reduce inventory carrying costs, care should be made to avoid buying quantities that are excessive. Reduce the number of times you need to buy the same pieces of equipment. Ensure that utilization of the purchased items to the

maximum possible extent.

- The purchase office should make sure that the specification has a strong emphasis on elements like effectiveness, optimal fuel/power utilisation, use of environmental friendly materials, low noise & pollution levels, low maintenance costs, and so forth.
- The Computing Technical Service (CTS) team's refurbishing services can be used in place of fresh purchases of computer systems or electrical equipment.
- The purchase of chemicals and electronics with certain environmental features (such as reduced or no harmful components, recycled-content, built for recycling, decreased material use, energy-efficient, prolonged product life/upgradable, remanufactured, etc.) should be considered.
- The purchase office should make sure that the packaging is manufactured from recyclable materials.
- Procurement of products that can be recycled or disposed with minimal environmental damage.
- Avoid environmentally damaging products wherever possible
- To learn best practises, market knowledge, and basic ideas of educational procurement, the staff of the purchasing department must attend training for at least one week each year.
- Use of sustainable furniture to support waste reduction and environmental protection while also promoting healthy living.
- Construction materials for buildings should be evaluated based on their sustainability, and the Government of India's Energy Conservation Building Code (ECBC) and Bureau of Energy Efficiency guidelines. Also, to lower the peak demand, it is essential to buy market-available, highly efficient appliances that have been approved by the energy auditor / manager.
- Ozone-depleting refrigerants must not be purchased.
- Fixed-speed air conditioner purchases to be discouraged.
- Appliances that are being used inefficiently must be identified and replaced on a regular basis.
- According to the recommendations set forth by the Government, the waste management / disposal committee should assist the estate team for secured disposal of waste (chemical, landfill, food, etc.).
- Reduce the use of paint inside the campus by introducing exposed concrete method.

- The sustainability should be improved through regular maintenance, retrofitting and renovating.
- Procurement committee should develop awareness among the user community by arranging seminars, forums and other commodity focused groups which should include sustainability content.

Registrar

The Climate Roadmap – VIT's Path towards Carbon Neutrality by 2050 (Ver.2.0)

Summary of proposed measures for 2023 – 2050

1. Background

1.1. Global Scenario and Perspectives

1.2. India's low carbon strategy

1.3. The climate action initiatives in the Indian higher education system

2. Carbon Footprint

3. Climate Roadmap/goals for a sustainable future

Goal 1: Ecologically sustainable campus

Goal 2: Low-carbon travel

Goal 3: Promoting sustainable campus canteen meals

Goal 4: Research and education highlighting global sustainability issues

4. VIT's contribution so far to obtaining the target of net-zero

Goal 1: Green Campus

- Reducing emissions
- Waste reduction and recycling
- Enhancing campus biodiversity
- Banning the usage of plastics on campus
- Smart buildings and facilities on campus

Goal 2: Sustainable Travel

- Sustainable transport on campus

- Making business trips with careful consideration and taking into account their low carbon levels

Goal 3: Sustainable Canteen

- Emphasize more vegetarian meals
- Reduce daily food wastage
- Demonstrating sustainable catering

Goal 4: Sustainable Education System

- Educating responsible citizens and students on sustainable development
- Impactful research to address sustainable challenges through the development of new courses and study programs
- Organizing outreach programs to promote proper waste management in and around the University campus with active participation from students and staff
- Support from Management

4. Upcoming strategies yet to be undertaken by VIT

5. Responsibility and following-up

6. References

1. Background

This document outlines the Vellore Institute of Technology (VIT)'s energy conservation goals and methods. This includes projects over the next few years and a 2050 outlook. The university will keep energy conservation and sustainable energy supply in mind. The university pledges to become climate neutral by 2050. All campus energy will be made sustainable by then.

1.1. Global Scenario and Perspectives

Human emissions of greenhouse gases (GHG) have caused global warming, with global surface temperature rising continuously over the past decade (Figure-1). Over 2010–2019, global greenhouse gas emissions grew due to unsustainable energy usage, land use and land-use change, lifestyles, and consumption and production patterns across regions, governments, and individuals. Human-caused climate change is affecting numerous meteorological and climatic extremes worldwide. This has severely harmed food and water security, human health, economy, society, nature and people. Climate change disproportionately affects vulnerable groups. Emissions of GHG have increased rapidly over recent decades. These emissions have led to increases in the

atmospheric concentrations of several GHGs including the three major well- mixed GHGs: CO_2, CH_4 and N_2O. Formal detection and attribution studies employ climate models and observations to estimate that humans caused all the warming mainly between 1850–1900 and 2010–2019. Since 1750, human-caused GHG emissions have increased well-mixed GHG concentrations. Over the past 60 years, land and ocean sinks have absorbed 56% of human- caused CO_2 emissions, with regional variations. In 2019, atmospheric CO_2 concentrations reached 410 parts per million (an increase of 21%), CH_4 reached 1866 ppb (an increase of 20%), and N_2O reached 332 ppb (an increase of 13%) in the past 50 years. O_3 and halogenated gases also contribute to global warming. CH_4 and N_2O concentrations have reached levels not seen in 800,000 years, while CO_2 concentrations are likely higher than at any point in the preceding two million years. It is unequivocal that human influence has warmed the atmosphere (1-2^oC increment in the earth's surface temperature in the past 50 years), ocean and land. Widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere have occurred. In this regard, the Paris Agreement is a legally binding international treaty on climate change. On December 12, 2015, 196 Parties at the UN Climate Change Conference (COP21) in Paris adopted it. It took effect on November 4, 2016. It aims to restrict “the increase in the global average temperature to well below 2°C above pre-industrial levels” and try harder to limit it to 1.5°C [1-4]. The key milestones in the pathway to net zero is shown in Figure-2.

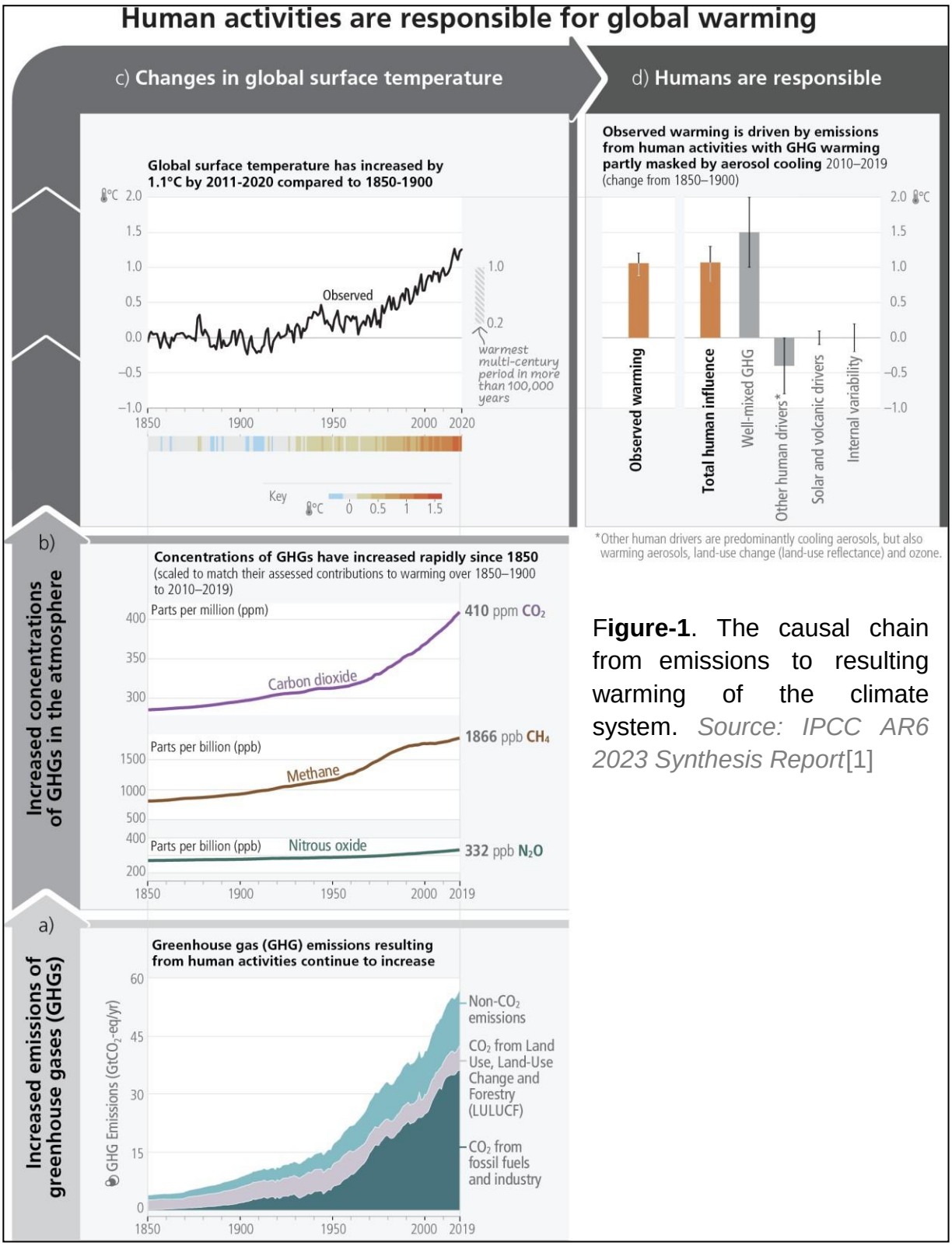


Figure-1. The causal chain from emissions to resulting warming of the climate system. *Source: IPCC AR6 2023 Synthesis Report*[1]

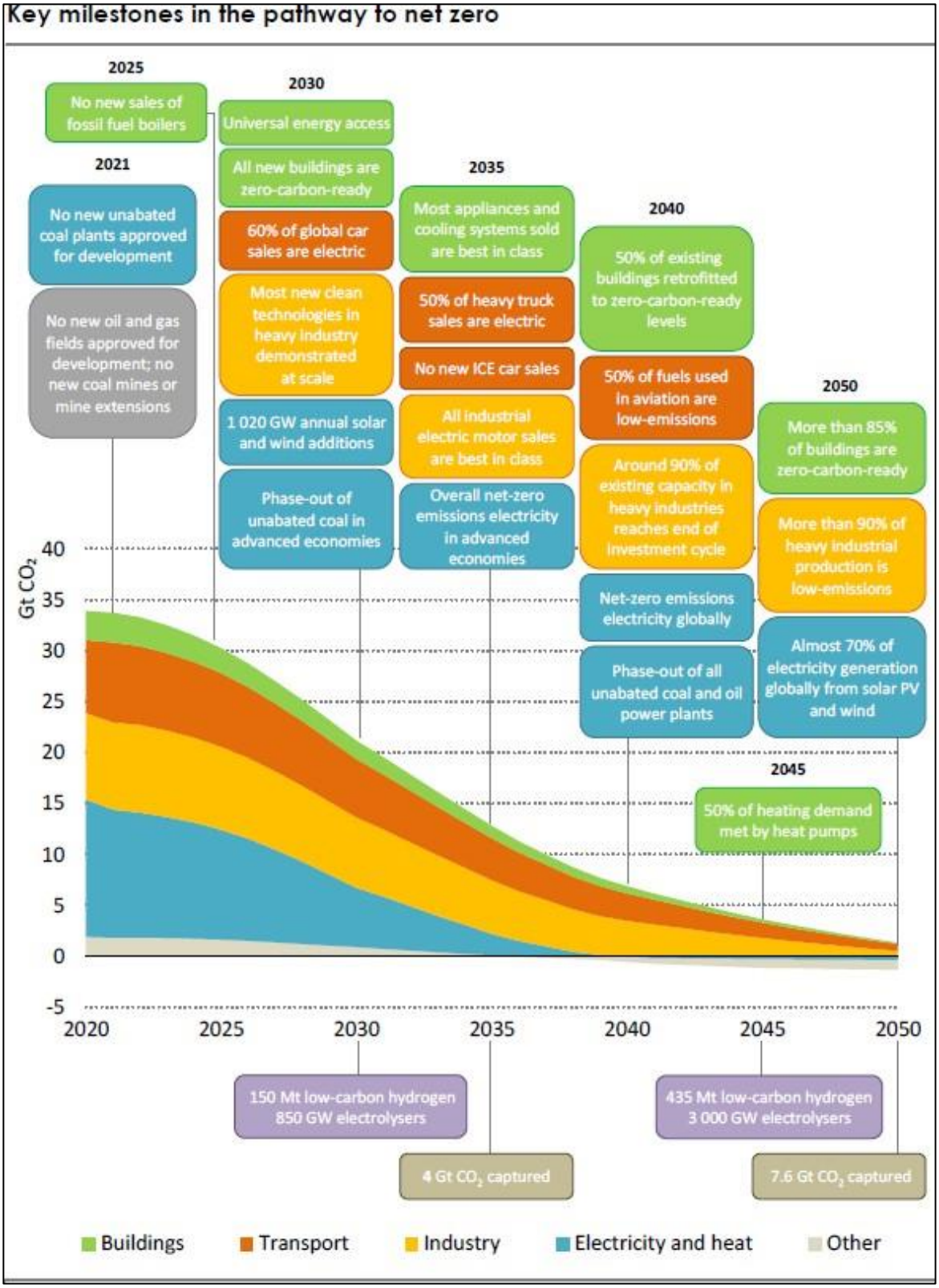


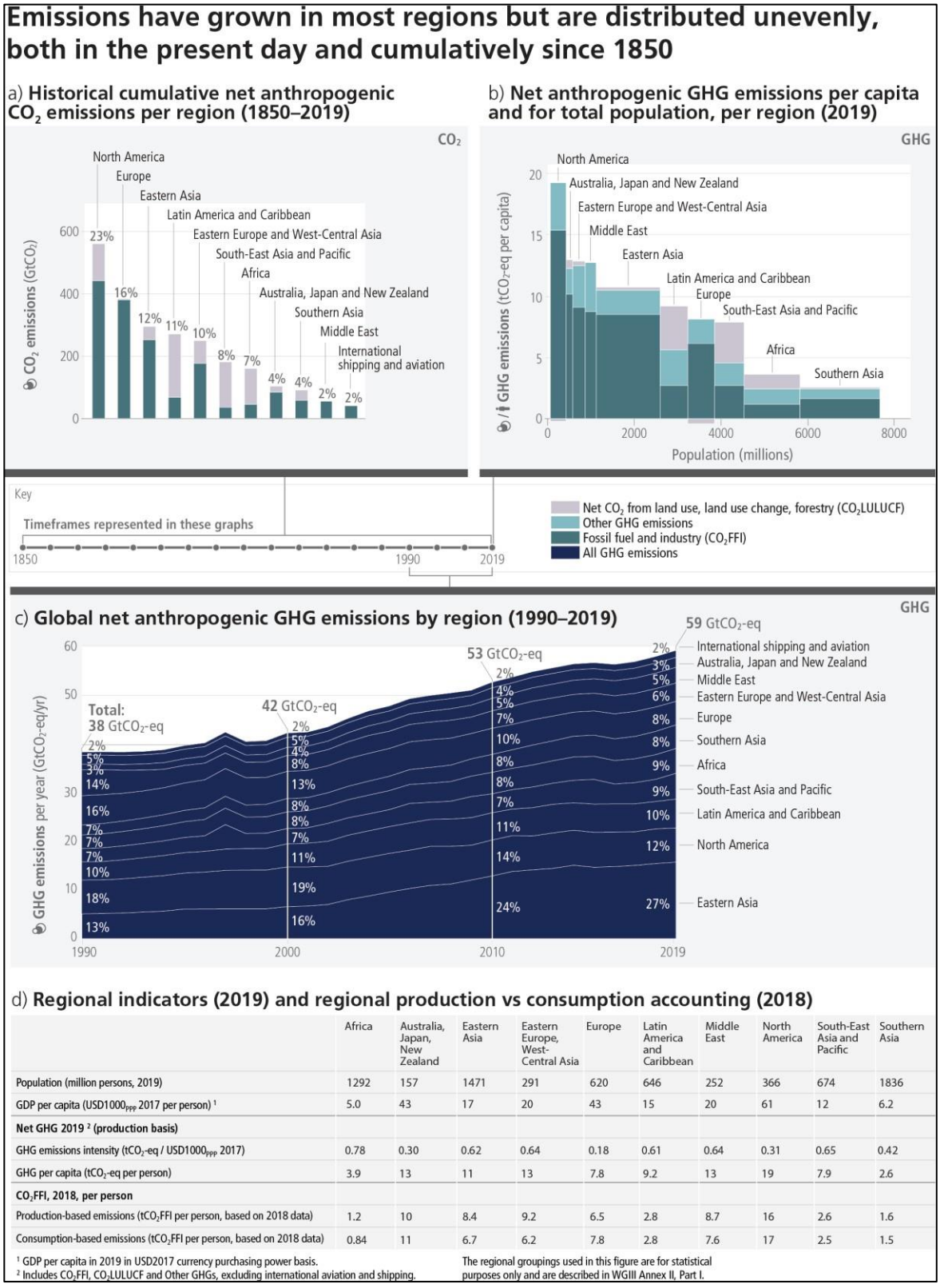
Figure-2. Key milestones in the pathway to net zero. *Source: International Energy AgencySpecial Report* [1]

1.2. India’s low carbon strategy

India has one of the fastest-growing economies and a population of approximately one-sixth of the world population. Global and sustainable developments depend on its expansion. Climate change affects India's growth. India's global warming is modest. However, India is dedicated to addressing climate change by implementing economic choices that enable low-carbon growth and development towards net zero by 2050. India supports equity-based multilateralism and the UNFCCC's idea of common but differentiated responsibilities and distinct capabilities to address climate change. Climate science suggests reducing cumulative emissions within the global carbon budget to reduce global temperature rise. India believes this budget should be shared fairly and used responsibly for equity and climate justice. Countries should limit their cumulative emissions within this budget. Thus, India's climate policy seeks to accomplish development goals within its fair share of the global carbon budget [5].

The Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC) [2023] [1] states that Southern Asia contributed only about 4% of historical cumulative net anthropogenic emissions between 1850 and 2019, even though the region has almost 24% of the global population (Figure-3). North America and Europe, with only 13% of the global population, have produced roughly 10 times more global cumulative emissions in this era. Despite possessing 17% of the world's population, India has contributed little to cumulative global GHG emissions. India's per capita annual emissions are around a third of the global average. India is correct in demanding that industrialized countries invest extensively in negative emissions and provide enough climate funding, technology transfer, and capacity development support to achieve early net-zero well before 2050.

Energy is crucial to India's development goals and deficits. India consumed 28.7 gigajoules (GJ) of primary energy per capita in 2019. Social development, demographic transition, rural and urban transition, and infrastructure development require energy. India prioritizes energy efficiency for low-carbon growth. While developed countries' decoupling of emissions from growth is still insufficient for the ambitious emissions reduction required by their historical and current responsibility, India's continued effort at increasing decoupling proceeds from a low baseline of emissions [5].



d) **Regional indicators (2019) and regional production vs consumption accounting (2018)**

	Africa	Australia, Japan, New Zealand	Eastern Asia	Eastern Europe, West-Central Asia	Europe	Latin America and Caribbean	Middle East	North America	South-East Asia and Pacific	Southern Asia
Population (million persons, 2019)	1292	157	1471	291	620	646	252	366	674	1836
GDP per capita (USD1000$_{PPP}$ 2017 per person) [1]	5.0	43	17	20	43	15	20	61	12	6.2
Net GHG 2019 [2] (production basis)										
GHG emissions intensity (tCO$_2$-eq / USD1000$_{PPP}$ 2017)	0.78	0.30	0.62	0.64	0.18	0.61	0.64	0.31	0.65	0.42
GHG per capita (tCO$_2$-eq per person)	3.9	13	11	13	7.8	9.2	13	19	7.9	2.6
CO$_2$FFI, 2018, per person										
Production-based emissions (tCO$_2$FFI per person, based on 2018 data)	1.2	10	8.4	9.2	6.5	2.8	8.7	16	2.6	1.6
Consumption-based emissions (tCO$_2$FFI per person, based on 2018 data)	0.84	11	6.7	6.2	7.8	2.8	7.6	17	2.5	1.5

[1] GDP per capita in 2019 in USD2017 currency purchasing power basis.
[2] Includes CO$_2$FFI, CO$_2$LULUCF and Other GHGs, excluding international aviation and shipping.

The regional groupings used in this figure are for statistical purposes only and are described in WGIII Annex II, Part I.

Figure-3. Growth of anthropogenic CO2 emission across the globe. *Source: IPCC AR6 2023Synthesis Report* [1]

On June 30, 2008, India established the National Action Plan on Climate Change (NAPCC) witheight climate change missions [6]. These include:

1. National Solar Mission
2. National Mission for Enhanced Energy Efficiency
3. National Mission on Sustainable Habitat
4. National Water Mission
5. National Mission for Sustaining the Himalayan Eco-system
6. National Mission for a Green India
7. National Mission for Sustainable Agriculture
8. National Mission on Strategic Knowledge for Climate Change

1.3 The climate action initiatives in the Indian Higher Education System

Teacher training policies in India emphasize environmental education and equipping teachers totalk to students about the environment. "Emphasize the environment and its protection, living in harmony within oneself and with the natural and social environment," declares the National Curriculum Framework for Teacher Education (2009). This Framework defines environmental education research and pedagogical practices. The National Curriculum Framework (2005) recommends remote learning, courses, and outdoor camps for environmental education professional development. The Climate Project Foundation, an independent foundation, offers a Climate Change Teacher's Training Program in India since 2010. Digital training spreads climate change information in urban and rural classrooms nationwide. It teaches pupils how to adapt to climate change. The science, consequences, and climate change solutions training program promotes sustainability. 7000 teachers from 500+ schools have been educated to discuss climate change with students and communities. India has networks to help educators discuss environmental and climate change education. The 2016 university-based Green Educators' Network brought environmental educators and students together. The 500-educator Network uses newsletters and knowledge forums to improve teachers' environmental and climate awareness [7].

2. VIT'S Carbon Footprint (Tons/year of CO_2 equivalence emission)

Before getting into the action plan, it is mandatory to get information about the carbon footprint. The term "carbon footprint" is defined as the total amount of greenhouse gases (majorly CO2, CH4 & N2O) that are generated by our day-to-day actions. In general, the carbon footprint is reported in terms of tons of CO2 equivalent (CO2e; e = equivalence) emission per unit of comparison, such as per year (preferably), person, kg protein, km traveled and alike. The carbon footprint of a product includes the CO2 emission for the entire lifecycle from production along with the supply chain to its final consumption.

The average carbon footprint for a person in the United States of America and India is about 16 (one of the highest rates in the world) and 1 tons per year respectively. Globally, the average carbon footprint is closer to 4 tons. To have the best chance of avoiding a 2^0 C rise in global temperatures, the average global carbon footprint per year needs to drop to under 2 tons by 2050.

Calculations of the carbon footprints are based on the types of CO2 emission (Figure-4):

Scope-1: Emission from direct sources like industry, transport vehicles, burning stoves and wood, etc.

Scope-2: Emission from the indirect sources, upstream (production and service) and/or downstream (usage and disposable). For example, transportation of materials and fuels is under the upstream case and emissions associated with selling the product are under the downstream case.

Scope-3: Emissions derived from the activities of an organization but from sources which they do not own or control (accounted for ~90% of business-related activities)

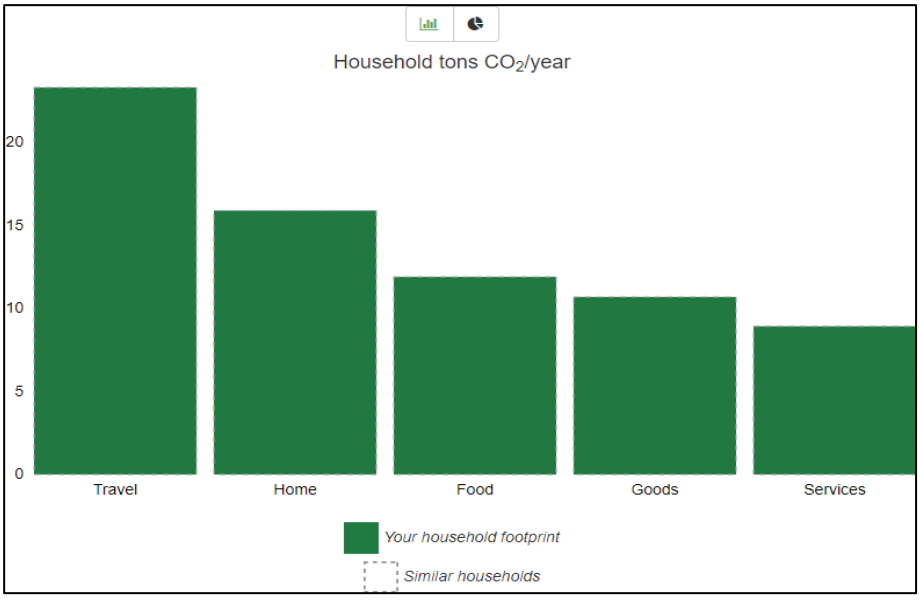


Figure-4. Bar chart for the carbon footprint data (tons of CO2/year) of various human activities.

The calculation of the carbon footprint of a product, service or sector requires expert knowledge and careful examination of what is to be included. For example, the factors and their associated contents like Travel, Home, Food, Goods and Services are accounted for in the calculation as in Figure-5.

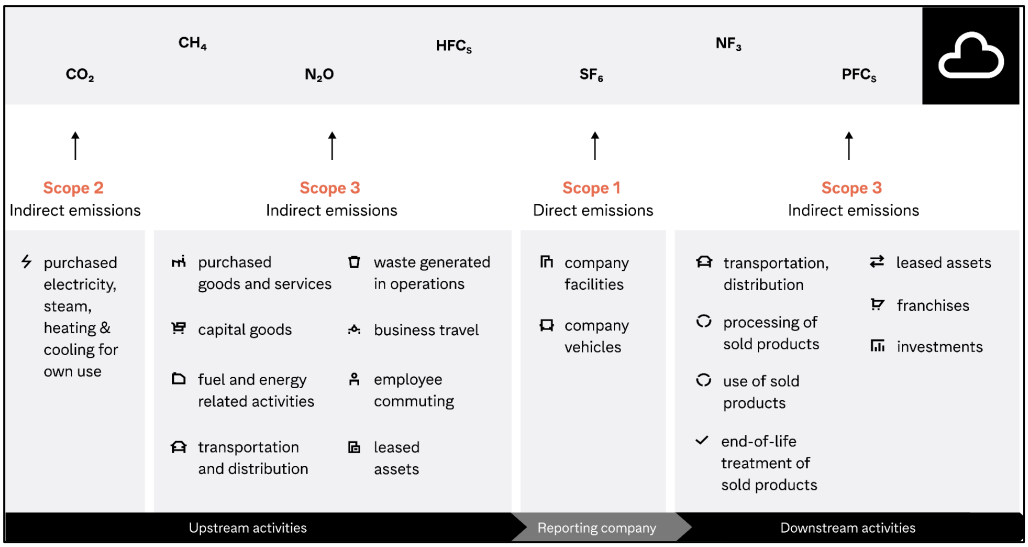


Figure-5. Chart for the footprint data for Scope 1-3 activities.

Source https://normative.io/insight/upstream-downstream-emissions/

Note that Stockholm University's carbon footprint has remained stable, at around 37 ktonnes of carbon dioxide equivalents (CO2e) per year between 2016 and 2019, but the 2020 carbon footprint of around 26.5 ktonnes of CO2e is 28% lower (Figure 3). This is of course a consequence of the coronavirus pandemic which reflects a shift in our activities where much of the regular activities continued, while business travel was significantly reduced. On average between 2016 and 2019, the carbon footprint was 1.4 tonnes CO2e per student (full-time equivalent), or 7.7 tonnes CO2e per employee (full-time equivalent), while the 2020 carbon footprint was 0.9 tonnes CO2e per student (full-time equivalent), or 5.4 tonnes CO2e per employee (full-time equivalent). Their largest emission categories for the period 2016-2019 are (share of total average carbon footprint indicated in parentheses): Transport and travel (26 %); Buildings and facilities (25 %) & Purchase and consumption of goods (21 %) [10].

We have been working on the calculation part of the VIT CO2e. The next version will include quantitative measures of it and its associated actions.

3. Climate Roadmap/Goals For A Sustainable Future

Figure-6. UN Sustainable Development Goals relevant to sustainability [8]

Our goal of achieving net-zero emissions by the year 2050 entails striking a balance between the amount of greenhouse gases produced and those removed from the atmosphere. This should be accomplished by rapidly reducing carbon emissions, but in cases where achieving zero carbon emissions is not feasible, carbon offsets or sequestration through technical or natural means must be used. Figure-6 shows the 17 Sustainable Development Goals designed to serve as a "shared blueprint for peace and prosperity for people and the planet, now and into the future [8].

VIT's 10 point climate action plans are detailed in Figure-7:

Figure-7. VIT's 10-point Climate Action Plan

4.VIT'S Contribution so far to Obtaining the Target of Net-Zero

We at VIT are aware of the threat posed by the climate catastrophe and that we must do our share to address it. This Climate Action Plan provides strategic direction for VIT University to control its greenhouse gas emissions profile and presents future scenarios, echoing the commitments made under the Paris Agreement [2]. The Plan represents VIT's commitment to precisely track, record, and control the University's emissions profile. Schools like VIT are important public institutions with buildings, infrastructure, and a sizable workforce and student body that are vulnerable to climate change. To manage the changing climate, VIT's respected management has been extremely supportive and has already over the past 10 years undertakenseveral strategies to mitigate these serious environmental issues as stated below:

Goal 1: Green Campus

- Reducing emissions from energy and water consumption
- Waste reduction and recycling
- Enhancing campus biodiversity
- Banning the usage of plastics on campus
- Smart buildings and facilities on campus

A significant component of VIT Vellore's activities and strategy has long been sustainable development. The 372 acres that make up the VIT campus constitute a sizable area. The cutting- edge infrastructure that VIT offers to both students and professors is one of its most impressive features. By eliminating emissions and minimizing the quantity of emissions produced, VIT seeks to become carbon neutral. The objective is to determine the most dependable method of making up for the residual emissions. The campus is modern and energy-efficient, and it makes good use of its available space. With current and new initiatives, emissions related to energy and water use will continue to be reduced. The goal is to utilize less energy and water while switching to more environmentally friendly energy sources. Reducing the requirement for energy is largely achieved through the efficient use of facilities.

- Solar panels are installed on the roof of most of the academic and hostel buildings. More than 50% of lighting power on the campus is met through LED bulbs.
- A comprehensive rainwater harvesting system is implemented and 100 % harvesting is ensured. 90% of used water is recycled and reused for secondary applications.
- Air conditioning is provided only where it is an emergency, e.g. for constructing laboratories with sophisticated instruments.

- In order to avoid the wastage of water in departments and hostels, taps with sensors havebeen installed.
- Waste management is taken care of properly on the whole campus with utmost importance. Waste is collected daily from various sources on the campus and is separatedas dry and wet wastes.
    - Color-coded dustbins are used for different types of waste. Daily garbage is collected by housekeeping personnel and handed over to authorized Municipal personnel.
    - Efforts have been taken to produce compost manure from the canteen's

solid waste and waste from other sources.

- Manure is used for the purpose of herbal gardens as well as for planting trees.

- Chemical solid wastes are properly collected, separated and recycled.
- Almost the entire campus is full of greenery and dedicated staffs are available for Gardenmaintenance.
- VIT is spending about 400 Lakhs per year to maintain the green campus. A total of 431447 sqm is covered with lawns, trees, shrubs, hedges and potted plants.
- VIT campus consists of more than 90 species of plants which includes medicinal plants also.
- Green cover facilitated by efficient use of water resources improves the campus microclimate and reduces summer time shade temperature by 3^0 C. Use of personal motorized vehicles by resident students is prohibited and use of bicycles is encouraged onthe campus.
- Different kinds of birds flock around the campus often because of its greenery. Single-useplastics are banned inside campus.
- Development of smart buildings and facilities on the campus such as the Pearl Research Block (PRB) and the Silver Jubilee Tower (SJT). In PRB, a wide green promenade that is encircled by the building's convergent design welcomes visitors to the green civic core, which serves as the center for student interaction.
- The building offers separate spaces for not just student research activity but has independent technology parks for industry professionals to do their research activity as well.
- The Silver Jubilee Tower adds glory to the magnificent campus of VIT. Apart from enormous and spacious classrooms, brilliantly designed smart classrooms and galleries add to the list of unique features of SJT.

Goal 2: Sustainable Travel

- Sustainable transport on campus

The transportation policy at VIT is unique inside the campus. The students residing in the hostels are encouraged to use bicycles. Students are not permitted to own any vehicle that uses fossil fuel. Moreover, cabs run inside the campus to help the students commute. Those cabs are all runby batteries that have zero emissions on the campus.

Goal 3: Sustainable Canteen

- Emphasize more vegetarian meals
- Reduce daily food wastage
- Demonstrating sustainable catering

Healthy, ecologically and socially sustainable cuisine is served at the University's canteens. For instance, Fairtrade products are extensively used. Demand for vegetarian food rises due to its appeal and variety. Offering vegetarian meals at a lesser price increases its popularity. Food waste reduction reduces negative impacts. Restaurant services will continue to phase out single- use plastic products or look for replacement products produced from more sustainable materials. At the moment, plastic straws are no longer used, and products manufactured from recycled materials include takeaway mug lids and spoons. Replacement products have been found for plastic takeaway containers. Diners are aware of the problems of food waste, and use their own actions to reduce its emergence. Sustainable development and responsibility will be emphasized in university seminars, conferences, and other events that provide food or drinks. The catering serves Fairtrade, local, and organic food.

Goal 4: Sustainable Education System

- Educating responsible citizens and students on sustainable development
- Impactful research to address sustainable challenges through the development of newcourses and study programs.
- Organizing outreach programs to promote proper sustainability in and around theUniversity campus with active participation from students and staff.
- Support from Management

Graduates from VIT have a good basic knowledge of sustainable development regardless of theirfield of study. Sector-specific education on sustainability is also available. All new students and employees are briefed on sustainable development. Environmental Sciences and Studies are two mandatory courses provided to all first year B.Tech students irrespective of their disciplines. Overall, the course offering for sustainable development is of high quality and diverse. Sustainable development and responsibility are highlighted during the orientation phase for new students. New employees are familiarized with sustainable development and responsibility and the associated practical methods of operation. The University encourages students to develop projects on sustainability. Research funds are allocated to projects working on sustainability for undergraduate as well as research programs. Sustainability research is highlighted more boldly. The necessary resources are available for researchers to support their communication.

Research and publications related to the university's sustainable development are better highlighted and communicated comprehensively in different communication channels. Making research groups and projects related to sustainability and responsibility more known and visible. Organization of annual events open to all, such as webinars, related to sustainable development and responsibility. The student chapters are encouraged to organize more outreach programs like trainings, workshops and seminars among the staff as well as residents around the campus and make them aware of sustainable living, increase awareness to conserve water and energy, create less pollution and live a healthy life. Sustainable solutions are promoted in the public and private spheres to disseminate conceptual and practical knowledge, and training materials and create awareness of sustainability.

4. Upcoming Strategies yet to be Undertaken by VIT

- Business Travel:
  - Making business trips with careful consideration and considering their low carbon levels.
  - The carbon footprint of business trips decreases as remote meetings reduce the need to travel. In case of shorter trips of one to two days, employees will only fly if absolutely necessary. Direct flights are preferred when traveling by air.
  - Land travel will be encouraged. Sustainable land transport and accommodations will be preferred [9,10].

- **Construction activities:**
  - We have to choose a benchmarked target rather than an absolute reduction because our building construction activities vary over time, making it difficult to evaluate their emissions impact.
  - Ensuring central resources for efficient and effective planning of future premises demands, with a focus on using existing premises rather than constructing new buildings.
  - Ensuring that climate considerations are a central part early in the upcoming design and construction strategies [10].

- **Procurement of goods and services:**
  - Examine methods to improve supply and material transport coordination to reduce carbon emissions, such as by requiring contract drafting during procurement and signed contracts.
  - Explore product groups with extended usable life or reuse and discover

requirements/criteria that encourage lifespan extension.

- Establish or purchase a central furniture/fixtures/equipment reuse system, includinglaboratory equipment [9,10].

➢ **Development of new courses and study programs:**

- Develop new sustainability courses and degree packages as needed and reduce administrative impediments to developing multidisciplinary and inter-faculty educational courses.
- Assess the demand for sustainability professional development for teachers and researchers interested in teaching multidisciplinary environmental and climate concerns.

➢ **Academic collaborations:**

- Strengthen VIT's brands and reputations in sustainability and beyond. Highlight the University's sustainability-related cooperation spaces.
- Strengthen universities' strategic knowledge contribution for timely, scientifically- based decisions needed for a sustainable society.
- In collaboration with the Vellore Municipal Corporation, non-profit and social governance organizations, and the business community, facilitate new inter-faculty research and education.
- Provide central resources for university collaborations on national and international climate action and sustainability research and projects.

➢ **Management and operational support:**

- Ensure that the responsible boards/committees have the necessary expertise to assist University strategic decision-making.
- Ensure that there are Human Resources within the University's administrative departments that can provide expert professional support in the implementation ofthe necessary activities.
- Develop space in existing management curricula for all administrative and academicmanagers to learn about climate challenges and sustainability.
- Define and set timeframes for different bodies' roles in the Climate Roadmap's measures.
- Increase communication about the University's climate action initiatives to make VIT's carbon neutrality efforts clear internally and externally. Highlight climate action efforts by individuals, academic departments, or administrative departments.
- Guarantee the Environmental Management System's development is

clearly linked to the Climate Roadmap and the University's action plans. This will highlight that the Climate Roadmap is an inherent aspect of the Environmental Management System and that each School (or Center) must work on both parts within its activities.

5. Responsibility and following-up

- ✓ The Climate Roadmap depicts the University's plan until 2050. Any organization struggles to relate to a distant promise. This timeframe must be considered while revising and monitoring plans. Thus, the Management must examine the Climate Roadmap every two years to ensure its short and long-term efficacies. Climate action will be assessed using the Climate Roadmap. Actions may be needed to achieve goals.

- ✓ Senior administration at the University must guarantee carbon neutrality by 2050. The respective Schools and Centers are required to report their implemented and ongoing activities in accordance with the Climate Roadmap. Locally, each School (or Center) must examine its own operations to identify areas where budget cuts might have the most effects. Local environmental action plans should include objectives and techniques for reducing operating emissions in the short term.

- ✓ The two-year action plans of the administrative departments and the university administration specify who will carry out the actions. Duty emphasis is possible in action plans. Management must regularly review each measure to make sure the job is progressing.

- ✓ Additionally, the Climate Roadmap should be linked to the University's action and strategic goals and integrated into the Environmental Management System of the institution. The Environmental Management System will implement concrete initiatives across the campus.

6. References

1. Synthesis Report Of The IPCC Sixth Assessment Report (AR6), https://www.ipcc.ch/report/sixth-assessment-report-cycle/
2. UNFCCC (2020), What is the Paris Agreement? https://unfccc.int/process-and-meetings/the-paris-agreement
3. Net Zero by 2050: A Roadmap for the Global Energy Sector,

https://www.iea.org/reports/net-zero-by-2050

4. Net Zero Strategy: Build Back Greener, https://www.gov.uk/government/publications/net-zero-strategy
5. India's Long-Term Low-Carbon Development Strategy, https://moef.gov.in/wp-content/uploads/2022/11/Indias-LT-LEDS-2.pdf
6. India's National Action Plan on Climate Change (NAPCC), https://static.pib.gov.in/WriteReadData/specificdocs/documents/2021/dec/doc202112101.pdf
7. India: Climate Change Communication And Education, https://education-profiles.org/central-and-southern-asia/india/~climate-change- communication-and-education

UN (2020), The 17 Goals, https://sdgs.un.org/goals

8. Eight steps into the future – Action Program for Sustainable Development and Responsibility: University of Eastern Finland 2022–2025, https://www.uef.fi/en/sustainable-development
9. The climate roadmap – universities' path towards carbon neutrality: Stockholm University, https://www.su.se/english/about-the-university/sustainable-development/the-university-s- climate-and-environment-work

Registrar

Energy Use Policy

1 Introduction

1.1 Purpose of the Policy

The main purpose is to frame the objectives that the Vellore Institute of Technology needs to reduce its energy use and limit its influence on climate change impact.

1.2 Scope of the Policy

This policy is applicable to all faculty, students, consultants, staff, and contractors.

2 Vision

2.1 United Nations Sustainable Development Goals (SDGs) - Global Context

VIT has a financial, legislative and ethical responsibility to reduce energy use and associated carbon dioxide emissions. By reducing energy use, VIT reduces its impact on global climate change. The United Nations adopted the SDGs in 2015 with targets to achieve by 2030. The targets include addressing the inequality, poverty, environmental degradation, climate, prosperity and peace and justice. There are two goals which link strongly to this policy.

Goal 7 "Affordable and Clean Energy"

Goal 13 "Climate action"

3 Principles

3.1 Energy Assessment

VIT will monitor electricity, gas and heat use via a series of sub-meters across the institute's buildings. VIT will quantify energy consumption and identify its usage trends to prioritize projects and interventions.

3.2 Target for Reducing the Energy Consumption

This policy targets a 10% reduction in the consumption of energy by keeping the baseline as 2022/23 academic year which needs to be achieved by 2025/26 academic year.

(The feasibility of achieving the 10% reduction target has been evaluated through a comprehensive analysis of ongoing and future energy reduction initiatives. This assessment encompasses a review of the current energy conservation projects that are currently underway

and those that have been funded for implementation. Additionally, the anticipated energy savings resulting from these initiatives have been thoroughly examined. Furthermore, the assessment takes into consideration the Institute's projected development plans and expected fluctuations in student enrolment figures. By analysing all these factors, the capability to meet the 10% reduction target.)

3.3 Conserving Energy

VIT will monitor, control the use and maintenance of electrical power generator and HVAC systems through building management and facilities team. VIT will replace older less efficient lighting with new more efficient Light Emitting Diodes (LEDs) over a wide variety of buildings and locations in the campus. VIT will also increase the installation of solar panels. Conduct thorough investigations into potential opportunities for implementing on-site

renewable energy generation and actively develop strategies to utilize renewable energy sources within the campus.

3.4 Compliance

The compliance provided by the legislative authorities will be ensured by the institute for conserving the energy and its management.

3.5 Building and Maintenance Standards

VIT will pursue the best standards of energy efficiency in construction and refurbishment of buildings to minimize the emissions. VIT will follow and provide good standards of maintenance, proper training and guidance for utilizing equipment to reduce the energy consumption.

3.6 Procurement

VIT will assess its suppliers, designers or construction companies by having a clear idea on the energy policy and its requirements during the tender stage itself for the betterment of sustainability. In near future, VIT will strive to balance the cost of renewable and non-renewable energy sources.

3.7 Engagement and Collaboration

VIT will engage all its faculty, staff and students in reducing electricity consumption. The institute will take initiatives like awareness programme regarding the need for energy conservation and effective electricity consumption without any loss and to take action in reducing electricity usage.

4 Policy Statement

VIT committed to reduce the energy consumption and increase its efficiency. In 2022/23, VIT used 4206000 kWh of energy. About 10% reduction has set as target in energy consumption by 2025/26 academic year. All students, staff, faculty, contractors and consultants are anticipated to cooperate to achieve the target.

The following adequate resources will be provided by VIT to meet required objectives

1. Assess and quantify energy use across VIT and reporting its effectiveness.
2. Ensure compliance with all relevant legal requirements related to energy.
3. Energy performance of VIT will be optimized by adopting best building management operations control systems for HVAC and lighting.

4. VIT will study the possible opportunities for different renewable energy sources
5. Introduce standards for low energy consumption equipment as part of all procurementprocesses.
6. Involve faculty, students and staff by inspiring them towards energy conservation.
7. Collaborate with and support academics and students on sustainable energy researchand projects.

5. Governance

5.1 Implementation Strategy

The draft would be circulated at the Policy Development and Monitoring Group 2 (Centre for Clean Environment, CO_2 Research and Green Technologies Centre, Centre for Disaster Mitigation and Management, School of Civil Engineering, School of Mechanical Engineering and School of Electrical Engineering) as well as Deans/ Directors of Schools/Centres.The policy will be communicated on the VIT website. Employees will be made aware of the policy in the institute induction programme.

5.2 Policy Revision and Updation

This policy will be reviewed and revised once in 3 years. The revised policy will be submitted to the Institute Core Group for more suggestions and approval.

5.3 Reporting

Performance against the target established in this policy will be monitored on a yearly basis by the Policy Development and Monitoring Group 2. The outcome will be reported to the Deans/ Directors of Schools/Centres.

6. Legislative context

VIT will meet all relevant legal requirements of Government of India and Local Urban Body by Government of Tamil Nadu.

T. Fayat
REGISTRAR
